Neat Image

plug-in for Photoshop (Mac)

To make images look better.

User guide

Document version 8.6, 27-Oct-2021

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1. Introduction

1.1. Overview

Neat Image is a filter software designed to reduce visible noise and grain in digital photographic images.

Neat Image detects, analyzes and reduces noise. Neat Image incorporates the most advanced image noise reduction algorithms in the industry. The filtration quality is also higher than that of other methods because Neat Image takes into account noise characteristics of particular image acquisition devices, making the filtration more accurate. Using device noise profiles, Neat Image adapts itself to almost any input device – digital camera, scanner, etc.

Noise is a serious problem that hinders high-quality digital image processing. In digital photography, the consumer- and prosumer-level cameras produce images with an easily noticeable noise component. This component is especially strong in images shot at high ISO rates. The noise reduces the visual quality of digital images and resulting printouts. Some image processing operations, like sharpening, make quality of noisy images even worse.

The rich control set of the noise filter allows you to easily achieve the desired level of noise reduction. In addition, Neat Image can make images look sharper without degradation of image quality (which is usually inevitable with noisy images). Smart application of sharpening based on preceding noise analysis makes such an effect possible.

Online examples of Neat Image noise reduction: https://ni.neatvideo.com/

Neat Image plug-in for Photoshop (Mac) is currently produced in three editions: Demo, Home and Pro. All editions provide top-quality noise reduction and sharpening. The key differences are the following:

- Demo plug-in is a free edition of the software with limited functionality
- Home plug-in processes only 8-bit images and does not support Photoshop actions
- Pro plug-in supports 8-bit, 16-bit and 32-bit images as well as Photoshop actions and smart filters

1.2. Features

Photoshop plug-in

- To **selectively apply** noise reduction to layers, channels, selections (areas of interest)
- To **automate** your workflow using Photoshop actions including Neat Image noise reduction
- To enable noise reduction in Photoshop **action-based batches**
- **64-bit** versions of Photoshop and compatible applications are supported and compatible applications are supported

Noise Reduction and Smart Sharpening

- **Advanced noise filters** to reduce noise and grain in digital images
- **Smart sharpening filter** to make images look sharper without amplification of noise
- **8-bit, 16-bit and 32-bit image support** to fully utilize capabilities of modern image acquisition devices and support HDR post-processing workflows
- **CUDA** and **OpenCL** acceleration to speed up processing using computation-capable GPUs

Device Noise Profiles

- **Auto Profile** to build noise profiles for your camera or scanner on the fly
- Rich set of **pre-built noise profiles** in the online profile library
- **Auto Match** to select the most suitable pre-built noise profiles

Some features are only available in the Home or Pro edition. Detailed feature map (page 59) explains the differences between Neat Image Demo, Home and Pro editions in details.

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1.3. Requirements

1.3.1. Hardware requirements

System requirements for practical use of Neat Image depend on size of input images. The more system RAM is available the larger the images that can be handled. The processing speed is determined primarily by the processor's number-crunching power (clock frequency, number of cores/processors, cache size), memory speed and availability of supported computation-capable GPUs.

Recommended system configuration to process photos produced by modern digital cameras:

- Intel i7 / i5 / Xeon; single or multi-processor
- MacOS 10.9.5 or newer

Optional CUDA acceleration (64-bit applications only) requires:

- NVIDIA GPU with CUDA compute capability from 3.0 to 7.5;
- The most recent version of the CUDA driver for MAC installed.

  If you experince a problem with the latest version of the driver, please check the known issues page for possible solutions:
  https://ni.neatvideo.com/support/known-issues

  You can download the latest and archive versions of the video drivers from
  https://www.nvidia.com/object/mac-driver-archive.html.

Optional OpenCL acceleration (64-bit applications only) requires:

- MacOS 10.9.5 or newer
- Supported video card:
  - AMD FirePro D300/D500/D700;
  - AMD Radeon R9 M290/M290X/M295X;
  - AMD Radeon R9 M370X/M380/M390/M395/M395X;
  - AMD Radeon Pro 450/455/460;
  - AMD Radeon Pro 555/560/570/575/580;
  - AMD Radeon Pro 555X/560X/570X/575X/580X;
  - AMD Radeon Pro Vega 16/20/48/56/64/64X;
  - AMD Radeon Pro 5300M/5500M/5600M;
  - AMD Radeon Pro 5300/5500XT/5700/5700XT;
  - AMD Radeon Pro Vega II / Vega II Duo;
  - AMD Radeon Pro W5700X;
  - some other models of AMD cards (contact support or try Demo to verify).

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1.3.2. Software requirements

The plug-in is compatible with the following plug-in hosts:

- Adobe Photoshop 2022 / 2021 / 2020 / 2019 / CC / CS6 / CS5.5 / CS5
- Adobe Photoshop Elements 2022 / 2021 / 2020 / 2019 / 2018 / 15 / 14 / 13 / 12
- Photoline 22 / 21 / 20 / 19 / 18 / 17 / 16 / 15 (64-bit)
- GraphicConverter v8+ (64-bit)
- Affinity Photo 1.4.3+

The plug-in may be compatible with other hosts as well.

1.3.3. Supported types of images

The following image types are supported:

- 8-bit / 16-bit / 32-bit per channel RGB images
- 8-bit / 16-bit / 32-bit per channel grayscale images

Color input images are supposed to be in a flavor of RGB color space, like AdobeRGB, sRGB, etc. If an input image is in some flavor of RGB color space then Neat Image produces the output image in exactly the same flavor of RGB color space.

The minimum size of an input image is 40x40 pixels; the maximum size is usually limited by the amount of system RAM available.

The plug-in can work with images stored using any file format that can be opened by Photoshop: PSD, TIFF, RAW, JPEG, etc.

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2. Key concepts

2.1. What it can do – functionality of Neat Image

Neat Image is a digital image filter. Its main function is to *reduce noise* in digital images.

Neat Image can work with images produced by any imaging devices – digital cameras, scanners, etc. Neat Image can be adjusted to a particular device by means of a *device noise profile*, which describes the noise characteristics of the device.

A device noise profile is built by analyzing featureless areas of an image – areas that contain no visible or important details and show only noise. Usually, the software can find such featureless areas completely automatically. In a difficult case, you can assist it and select a featureless area manually. Finding such areas is very easy for human eyes but may sometimes be a bit difficult for computer software.

By analyzing those featureless areas, the **Auto Profile** function builds a profile which describes the properties of the noise contained there. Using such a profile, Neat Image's noise filter can then efficiently reduce noise in the whole image.

When you have several such noise profiles for different device modes (for example, different ISO rates), the **Auto Match** function can automatically select the profile that matches a given input image. In this way, you can skip noise analysis and simply re-use one of profiles built earlier.

Smart Profile combines the power of **Auto Profile** and **Auto Match** by preparing two candidate profiles and then selecting the better one for actual image processing. This helps to achieve great results with less manual assistance.

The noise filter processes images in several *spatial frequency* ranges. This allows, for example, to accurately reduce noise in one frequency range while fully preserving details that may be present in other frequency ranges. In the same way, the filter can also selectively process the color channels.

In addition to the noise filter, there is the smart sharpening filter, which sharpens only details but not noise, so the noise is not amplified. Combining the noise reduction and sharpening in this way saves processing time and produces better overall results.

2.2. When it works – types of input images

Neat Image is designed to reduce noise in images produced by digital cameras and scanners, and can also be used to process images from other sources. For Neat Image to be efficient, input images should satisfy the following requirements:

- **Noise must be uniformly distributed throughout the image**, i.e., there should be no strong surges of noise intensity in some areas of the image or significant changes of noise characteristics across the image.

  Neat Image works fine, for example, on images with high ISO noise because such noise usually uniformly covers the whole image area. However, 'hot' or 'dead' pixels (produced by single 'broken' elements of image sensor) do not satisfy the uniformity condition and, therefore, are not efficiently removed by Neat Image.

  Another frequent source of noise is JPEG compression. The JPEG noise is approximately uniform when high quality setting (low compression rate, larger file size) is used. However, low compression quality makes noise non-uniform. Therefore, we recommend using the highest quality levels whenever possible. Try to avoid visible artifacts ('squares' or 'blocks' introduced by JPEG compression) in input images beginning from the early stages of image processing. If you can, use lossless file formats such as TIFF or RAW (any file format supported by Photoshop can be used with the Neat Image plug-in in Photoshop environment).

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3. Installing the plug-in

To install the Neat Image plug-in for Photoshop (Mac)

1. Make sure you have started Photoshop at least once before installing the plug-in. If you have not done it yet, start Photoshop and select **Quit** from Photoshop's menu;
2. Close Photoshop;
3. Download the DMG install package of that matches your version of Photoshop;
    - if you already purchased the product and have a current license for the Home or Pro plug-in, please use the download instruction supplied with the license to download the corresponding plug-in from the download area specified in that instruction;
    - if you want to try Neat Image before purchase please download the installer of the Demo version from this page: https://ni.neatvideo.com/download
4. Double-click the downloaded file to mount the DMG volume;
5. In the mounted volume, double-click ***NeatImagePS.Intel.pkg*** to start the installer;
6. Follow the steps of the installer wizard to complete the installation process;
   (you may be prompted to enter the Name / Password of the OSX administrator account).

To manually install Neat Image plug-in to:

- Photoshop / Photoshop Elements

  Method 1 (traditional one):

  In Finder, go to the folder ***/Applications/Neat Image v8 for Photoshop/*** and make an alias for the ***NeatImage8.plugin*** package.

  Move the alias into the ***/Plug-ins/***[1] subfolder in Photoshop / Photoshop Elements folder.

  Re-start Photoshop and find Neat Image in the menu: **Filter** >**Neat Image** >**Reduce Noise v8...**

  Method 2 (an easier one, available in Photoshop CC / CS6 / CS5.x / CS4 / CS3 / CS2 / CS / 7.0 and in Photoshop Elements):

  In Photoshop, go to the menu **Preferences** | **Plug-ins and Scratch Disks** and set **Additional Plug-ins Directory** to the Neat Image installation folder (typically, ***/Applications/Neat Image v8 for Photoshop/***).

  Then re-start the image editor, and find the Neat Image plug-in in the **Filter** menu under the **Neat Image** submenu.

- Other image editors (plug-in hosts)

  Please refer to the documentation of the corresponding plug-in host to find the correct way to install a third-party Photoshop-compatible filter plug-in. You can find the Neat Image plug-in itself (***NeatImage8.plugin***) in the Neat Image installation folder (***/Applications/Neat Image v8 for Photoshop/***).

If Neat Image has **not** become available in Photoshop, please contact Neat Image support for assistance.

[1] If the language of your version of Photoshop is other than English, you may have to use another Plug-Ins folder, for example, "Zusatzmodule" in German version, "Modules externes" in French, "Insteekmodules" in Dutch, "Plug-In" in Italian, etc.

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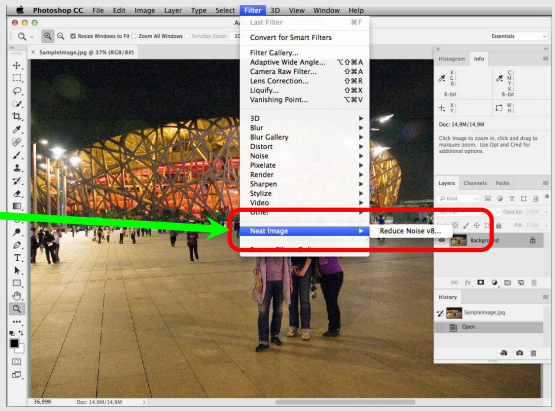
4. Filtration process overview

4.1. Overview of Neat Image filtration process

1. Prepare image

   – in Photoshop, open the image to be processed;

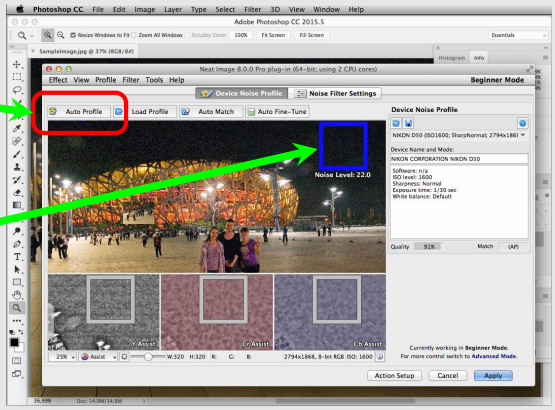
   – use the **Filter** > **Neat Image** > **Reduce Noise v8…** menu item to open Neat Image;



2. Prepare a *device noise profile* - noise analysis necessary to filter the image

   – to build a new profile click the **Auto Profile** button; this will automatically select and analyze a *featureless* (noise–only) image area;

   if you see that automatic selection includes any important image details, then move the selection to an area without details and click the **Auto Profile** button again;



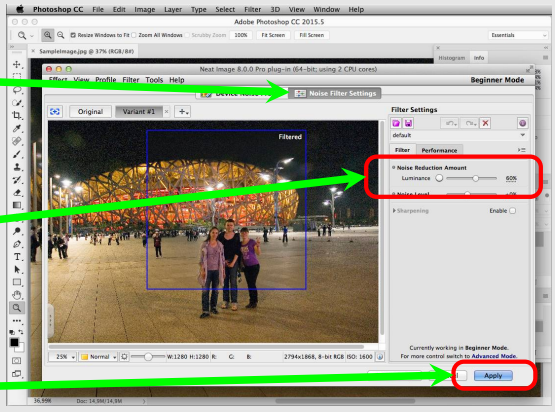
3. Adjust the filter settings

   – switch to the **Noise Filter Settings** tab;

   – adjust the filter settings to achieve desired level of noise reduction:

      – try to vary the setting: **Noise Reduction Amounts: Luminance** and see how the preview changes;

4. When you are happy with preview results, apply the filter to the image: click the **Apply** button.



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4.2. Running Neat Image on a sample image

You can download a test-kit prepared to help you start using Neat Image plug-in via this link: https://ni.neatvideo.com/project/resources/testkit8.zip, 2.5 MB. Please download and unzip it to a new folder on the hard disk.

The test-kit contains a sample image: ***SampleImage.jpg***. This is a typical photo taken with a modern digital camera. The detailed information about the image is available in the ***SampleImageInfo.txt*** file.

Please go through the stages below to see how the image can be improved by Neat Image:

Stage I. Open the image in Photoshop and invoke Neat Image

1. Open the image (***SampleImage.jpg***) in Photoshop;
   You will see that there is some strong noise in the image (zoom in to better see the noise). This is typical noise produced by a digital camera. The task of Neat Image is to reduce this noise.
2. Select the **Filter** >**Neat Image** > **Reduce Noise v8...** menu in Photoshop to open Neat Image.

Stage II. Build a noise profile using Auto Profile

To reduce noise Neat Image generally needs a noise profile describing the noise properties of the image. It is possible to build such a noise profile using the image itself.

To prepare a noise profile please do the following:

1. In the **Device Noise Profile** tab:

   ,
   click

   (the **Auto Profile** button);

   Auto Profile will try to automatically find and analyze a flat featureless image area that contains only noise and no important details.
2. Visually inspect the image area selected by **Auto Profile**. The area should contain **no visible details**, only noise; otherwise the noise profile and subsequent noise reduction may be inaccurate.

   If the selected area does contain any details, move the selection to another area without details or draw a new selection in such an area. Then click the **Auto Profile** button again.

Once processing is completed, the noise profile is ready and Neat Image can apply its noise reduction to the image.

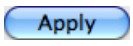
Stage III. Check preview

1. Switch to the **Noise Filter Settings** tab:

   ;
2. Once preview is automatically prepared, visually evaluate the results of noise reduction.

   You can click the image to quickly switch between original and filtered images for comparison. Zoom in to better see details at 100% zoom level.
3. You can also try to adjust the filter settings a bit. For example, try to vary **Noise Reduction Amounts: Luminance** control and see how that affects the preview.

Stage IV. Apply the filter

1. Click 

   in the bottom of the plug-in window and wait until the image processing is completed. That can take a few seconds. Then the filtered image is displayed in Photoshop.

   Zoom in to better see details at 100% zoom level. Notice that the noise has been significantly reduced throughout the image while the image details have been preserved.

You can process your own images in a similar fashion as well. Neat Image can perform similar noise reduction on images captured or acquired by any digital camera (or scanner) working in any mode. To

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be able to do that Neat Image needs a device noise profile describing the properties of noise produced by the corresponding device. Neat Image can build such a profile on the fly using the **Auto Profile** function. Also, you can find ready-made noise profiles for many cameras and scanners in the Profiles section of the Neat Image web page (you will find more details on that later in the document).

The next sections – Filtration process details, page 12, and Device noise profiles, page 31 contain detailed descriptions of the filtration and profiling processes. There are also examples of profiling and filtration in the Neat Image web page: https://ni.neatvideo.com/examples

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5. Filtration process details

The Neat Image plug-in can be used in Photoshop to process one or multiple images. This section describes the key stages of using the Neat Image plug-in to process one image. There is also a way to automatically process many images (see the Using plug-in in actions and smart filters section, page 29).

5.1. Stage I. Invoke the plug-in in Photoshop

In Photoshop, open and select an image to be processed (it will be called “input image” hereafter) and then invoke the Neat Image plug-in using the standard method:

➨ Select the **Filter** >**Neat Image** > **Reduce Noise...** menu item in Photoshop.

The Neat Image plug-in window will open and show the input image.

To scroll and pan the image

- press the middle mouse button and then drag the image using the mouse;
- press the spacebar and the left mouse button and then drag the image using the mouse.

To change zoom level

- use the mouse wheel when the mouse pointer is over the viewer;
- use the zoom control under the viewer;
- use the **Cmd-Plus**, **Cmd-Minus**, **Cmd-0** (zero), **Cmd-Alt-0** (zero) keyboard shortcuts.

5.2. Stage II. Prepare a device noise profile

To filter the input image, Neat Image needs to know the characteristics of noise produced by the image acquisition device (digital camera, scanner, etc.) that the image comes from. The noise characteristics of a device working in a certain mode constitute a *device noise profile*.

There are several ways to prepare a noise profile for the input image:

1. **Auto Profile**: to build a new profile by analyzing the input image itself (or a specially prepared test image);
2. **Auto Match**: to automatically select the most suitable device noise profile from a pre-built set of profiles (when such a set is available);
3. **Smart Profile**: to use both **Auto Profile** and **Auto Match** (with optional **Auto Fine-Tune**) to prepare two candidate profiles and then automatically select the better of two profiles;
4. **Load Profile**: to manually select a suitable profile from a pre-built set of profiles (when such a set is available).

The first option is often the easiest one provided the input image contains uniform featureless areas that include noise but no visible or important details.[1] **Auto Profile** will try to automatically find such image areas and analyze them to build a noise profile. When the image does contain featureless areas, this automatic way of preparing a noise profile is the most accurate and therefore recommended. If the input image includes no such areas, another image with featureless areas can be used to build a profile (provided both images come from the same source and therefore contain the noise with the same properties).

The other options are available once you already have a pre-built set of profiles. You can prepare such a set yourself or find some profile sets built by other users of the same camera or scanner. You can find more information about profiles and profiling in the Device noise profiles section, page 31.

Again, using **Auto Profile** is often the simplest and fastest way to prepare an accurate noise profile, so below this method is described first.

[1] You can see some examples of featureless image areas in the Examples section, page 53.

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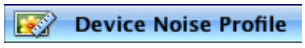
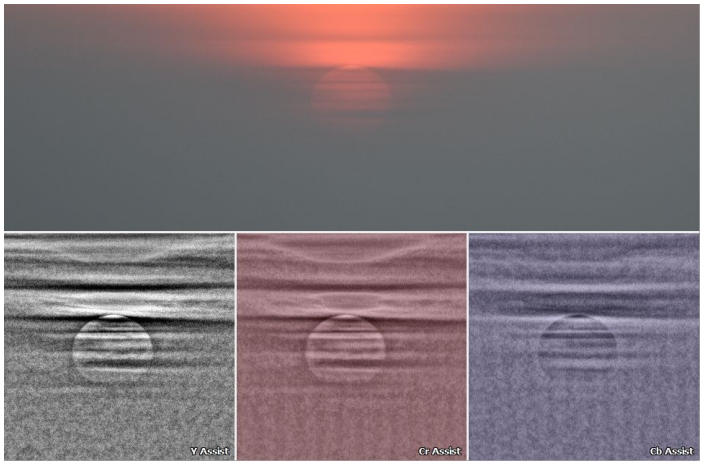
Auto Profile: build a new profile using the input image

- Make sure you have switched to the **Device Noise Profile** tab: 
- Click (the **Auto Profile** button) in the toolbar, or use the **Profile** > **Auto Profile with Regular Image** menu item, or press F2.

  Auto Profile function will find and select an area for main analysis. Neat Image will then automatically analyze the noise in that area to build a new noise profile. It will then analyze the rest of the image as well, but the most important part of the analysis is the area highlighted by the selection. Which is why it is important to visually control that area selected by **Auto Profile**.

  In difficult cases, Neat Image may be not able to find a large enough, uniform enough and featureless enough area in the image. You will then notice that the area selected by **Auto Profile**, for example, contains some important details, not just noise. In such cases, Neat Image also warns you that the area is not very suitable for analysis. It may say that the selected area is not uniform in one or more channels, or is too small, or contains clipping in one or more channels.

  One way to address that is to manually move the selection (or resize, or draw a new one) to an area that does not contain any visible details and then click the same **Auto Profile** button again. To find the most suitable area, use the **Assist** mode of the image viewer to better see weak details that may be present in the candidate image areas. The **Assist** mode emphasizes the weak details present in **Luminance** (**Y**), **Cr**, **Cb** channels, as shown in the example below:



  The top image shows the original picture where details around the sun are barely visible, while the channels in the bottom part display the image data in such a way as to emphasize those weak details. That helps to visually verify that the selected area contains no useful details, which is very important for accurate noise analysis.

  Alternatively, you can just ignore those warnings about possible non-uniformity, clipping or size of the area,, but the quality of the resulting noise profile may be lower than it could in principle be with that image. The filter will still work though.

  After the profile is built, check the **Quality** indicator in the **Device Noise Profile** box. A profile built using a large, uniform and featureless image area will show a high value there. If the profile quality is high (for example, higher than 70%) then you can be sure that the noise profile is accurate. In this case, consider the noise profile ready and proceed to Stage III. Adjust filter settings, page 15.

  If the quality is not high or you clearly see that the area used for analysis contains some details, try to find another uniform image area and use **Auto Profile** again. It is usually best to select the most noisy area for analysis.

  That may not help still, especially if the image contains only a few featureless areas. In this case, consider building a noise profile using an alternative image or a special test image prepared with the Calibration Target. Please see the Device noise profiles section, page 31, to learn how to use the Calibration Target to build noise profiles. You can also try to load some pre-built profile using one of the methods described below.

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Auto Match: select matching noise profile from a pre-built profile set

This option can only be used if you already have a pre-built set of profiles. You can prepare such a set yourself or find some pre-built profile online.

- Click

(the **Auto Match** button) or use the **Profile** > **Auto Match** menu item.

  The **Auto Match** function uses the EXIF data fields of the input image to automatically select and load the device noise profile that matches the device mode of the image. The most matching profile is selected from profiles stored in the **Profile folder**. By default, this folder is in your home folder[1]: ***/Users/< username>/Documents/Neat Image v8 for Photoshop/Profiles/***

  Auto Match will look for matching profiles in that folder as well as all its subfolders (where you can place profiles built by you or downloaded from the Internet).

  After a profile is loaded by **Auto Match**, the degree of match between the current input image and loaded noise profile is displayed in the **Device Noise Profile** box. Higher **Match** values mean better match, leading to more accurate filtration.

Smart Profile: prepare two profiles and select the better one

- Use the **Profile** > **Smart Profile** menu item (or press the F5 key).

  Smart Profile uses both **Auto Profile** and **Auto Match** (with **Auto Fine-Tune**) to prepare two candidate profiles and then selects the better of two profiles. For **Smart Profile** to be fully efficient, the input image must contain flat featureless areas with noise for **Auto Profile** to analyze, and also there must be several pre-built profiles to let **Auto Match** find the most matching noise profile, as described above. You can adjust settings of **Smart Profile** function in **Preferences**.

Load Profile: manually select a noise profile from a pre-built profile set

- Click

(the **Load Profile** button) or use the **Profile** > **Load Profile...** menu item. Then select a profile in the **Load Device Noise Profile** dialog.

  or

- Click (the drop-down button) in the **Device Noise Profile** box to open the popup menu with all available profiles and then select one of the available profiles.

  Please note that you must either build your own profiles or download some pre-built profiles and place them to Neat Image's **Profile folder** to make this drop-down button and popup menu truly work. By default the **Profile folder** is located in your home folder [2] :
  /Users/< username>/Documents/Neat Image v8 for Photoshop/Profiles/

  If you build or download some pre-built profiles, place them to the above folder (unzip the downloaded ZIP archive to that folder). Neat Image will recognize and display those profiles in the popup menu to help you quickly load any of them when needed.

  When manually selecting a profile for an input image, use the profile file names and sub-folder structure to guide your search. See Preparing profile set for different device modes: Stage III. Structuring profile set, page 41, for more information on profile set structuring.

Load Profile: manually select a noise profile from a generic profile set

There may be some cases the images you are working on have no featureless areas suitable for building a noise profile, no pre-built profiles available for particular device and noise characteristics. For such cases Neat Image has a set of generic pre-built noise profiles that can provide a solution when other options are not available. Of course it is better to use the regular solution (Auto Profile, Auto Match, Smart Profile) when possible, because that delivers the most accurate results.

[1] You can check and adjust the location of that folder using the menu **Tools** > **Preferences** > **Matching**.
[2] You can check and adjust the location of the **Profile folder** using the menu **Tools** > **Preferences** > **Folders.**

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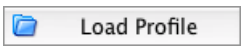
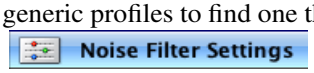
- To use one of the generic profiles click 

(the **Load Profile** button). Then select a profile from the ***Generic Profiles*** folder.
or
Click (the drop-down button) in the **Device Noise Profile** box to open the popup menu showing all profiles (currently available in Neat Image's ***Profile*** folder), click on ***Generic Profiles*** and select one of the available profiles.

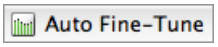
By default, ***Generic Profiles*** are located in your ***Documents*** folder:
/Users/< username>/Documents/Neat Image v8 for Photoshop/Profiles/Generic Profiles

There are seven profiles available in the ***Generic Profiles*** folder: ***Generic-1 (weak noise)***, ***Generic-2 (weak noise)***, ***Generic-3 (medium noise)*** . . . . . and ***Generic-7 (strong noise)***. They have been ranked according to the noise level they have been designed to deal with. ***Generic-1 (weak noise)*** noise profile designed to work with images that do not have much noise, while ***Generic-7 (strong noise)*** noise profile has been created for very noisy images.

Try different generic profiles to find one that delivers the best results in preview in the **Noise Filter Settings** tab: 

To additionally fine-tune the manually loaded or matched profile

You may want to additionally fine-tune the profile after it has been loaded either automatically (using **Auto Match**) or manually (using **Load Profile**). Fine-tuning the profile to the current image usually makes the profile more accurate and better reflecting the image's noise properties. Please note that you do not need to fine-tune a profile if you have just built it using **Auto Profile**. **Auto Profile** automatically applies fine-tuning so you do not need to repeat that operation. However if you load an existing profile instead of building a new one, fine-tuning such a loaded profile can be very useful.

- Click 

(the **Auto Fine-Tune** button) or use the **Profile** > **Auto Fine-Tune** menu item to fine-tune the profile to the current input image.

  There is no need to select any area in the input image because **Auto Fine-Tune** automatically analyzes the whole image.

Once you have loaded the profile that matches the input image or you have just built a new profile specifically for the current input image, proceed to process the image in the Stages III-V below.

5.3. Stage III. Adjust filter settings

As soon as the noise profile is ready you can use the noise and sharpening filters. These filters have several adjustable settings. The default settings usually produce good results (provided the noise profile is accurate). You may want to additionally vary the filter settings to achieve the filtration results that look best to your eyes.

- Switch to the **Noise Filter Settings** tab:

5.3.1. Use preview when adjusting filter settings

The image viewer in the **Noise Filter Settings** tab shows a part of the image processed by the noise and sharpening filters. When you change any filter settings, the preview is automatically updated. You can zoom in and out, drag, scroll and pan the image to see how the filtration affects different parts of the image. If you manually select an area in the image then only that area will be processed for preview. That can also be faster than processing the whole visible area, so if you work on a slower machine, try selecting a smaller area for preview. The simplest way to do that is to double-click the image in the area of interest: Neat Image will then add a selection around that point.

When the preview is ready (the preview area shows "**Filtered**"), you can click inside that preview area to temporarily switch back to the original for comparison.

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5.3.2. Beginner and Advanced modes

Neat Image has two sets of filter controls available in **Beginner mode** and **Advanced mode**. You can select the mode using the **Tools** > **Beginner mode** and **Tools** > **Advanced Mode** menu items or using the dedicated **Beginner mode** and **Advanced Mode** menu in top right corner of the plug-in's window.

The **Beginner mode** provides a simplified control set recommended for beginners who have just started using Neat Image. The **Advanced Mode** provides the most complete control set with the maximum control over the noise profiling and filtration processes. The **Advanced Mode** offers several additional filter options and modes that help to achieve better noise reduction results.

We recommend to start with the simplified control set of the **Beginner mode** and later switch to the **Advanced Mode** to be able to utilize Neat Image to its full potential.

Adjusting filter settings in **Beginner Mode** and **Advanced Mode** is described in two separate sub-sections below.

For **Beginner mode** please follow the sub-section Stage IV (a). Beginner Mode below.

If you want to jump right to the most complete control set in **Advanced Mode** then please instead follow the sub-section Stage IV (b). Advanced Mode, page 18.

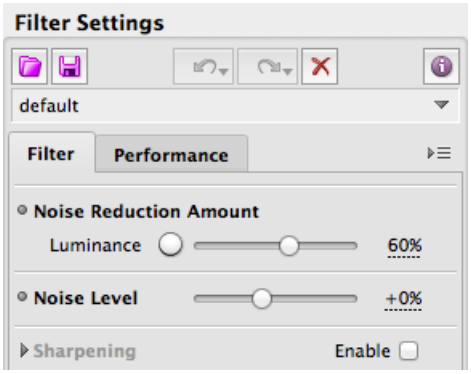
5.4. Stage IV (a). Beginner Mode

Please make sure **Filter Settings** panel is switched to the **Filter** tab.

5.4.1. Beginner Mode: Adjusting filter settings

There are two main filters in Neat Image: noise reduction filter and sharpening filter. These two filters can be used together and each of them can be used independently. You can enable, disable and adjust these filters using the guidelines in the subsections below.

Filter



The noise filter itself has two main settings (when working in **Beginner Mode**): **Noise Level** and **Noise Reduction Amount**.

The **Noise Level** setting is a threshold determining which image elements are considered noise and which elements are considered true details. The **Noise Reduction Amount** setting determines how much reduction is applied to the elements identified as noise.

- Use the **Noise Reduction Amount**: **Luminance** control to adjust the amount of noise reduction applied to the noise in the luminance component of the image data.

  This control is the **most important and most frequently adjusted setting** of the noise filter. The higher this setting, the more of the detected noise is removed in the luminance component. Be careful, setting the noise reduction amount too high may lead to loss of fine details and/or unnaturally looking (over-smooth, plastic-like) results. Too low amounts may be not enough to sufficiently reduce the objectionable part of the noise. The default value of 60% usually provides a good balance between noise removal and preserving natural (not over-processed) appearance of filtered image. Try to adjust the setting up and down to get the results that look best to your eyes.

- Use the **Noise Level** control to adjust the setting (**only when necessary**).

  Please note that if the noise profile is accurate,[1] then it is **not necessary** to adjust this setting. However, if the noise profile is not accurate or it was built for a different image, then the noise filter may need

[1] Use the **Quality** indicator in the **Device Noise Profile** box (in the **Device Noise Profile** tab) to estimate the accuracy of the profile. The indicator shows how accurate and complete is the noise analysis itself. Higher values usually lead to more accurate noise reduction. Also pay attention to the **Match** indicator: it should either show a high value or there should be the **(AP)** sign indicating that the profile has been built by **Auto Profile** using this very image. That ensures that the profile is not only accurate but it also matches the input image.

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an adjusted estimation of the actual noise level to be able to work correctly. By adjusting the **Noise Level** setting, you provide the filter with such an adjusted estimation. Use the preview to visually guide yourself when making such adjustments. The right adjustment will leave no noise elements in the image yet will not destroy the actual details.

It is best to gradually increase the noise level and watch the preview to find the point where most the noise elements are already reduced and the details are still preserved. If you go beyond that point, then some details may be lost too, so make sure you do not set the noise level unnecessarily high.

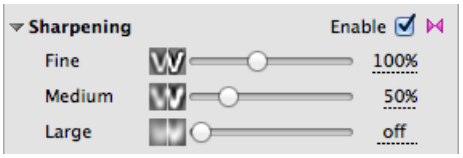
Sharpening (optional)

The sharpening filter in Neat Image increases the sharpness of image details without increasing the noise strength.

The sharpening filter is disabled by default. You can enable it and adjust the sharpening amounts separately for three typical scales of details: fine, medium-sized and large.

Like any sharpening method, try to balance the amount of sharpening to avoid over-sharpening.

- Use the **Sharpening**: **Fine**, **Medium** and **Large** sliders to adjust the amount of sharpening applied to the image details of the corresponding sizes.



It is best to start with adjusting the **Fine** sharpening amount. If sharpening the fine details alone is not sufficient to make the image look sharp, then try to increase the **Medium** and **Large** settings too.

Use preview

While adjusting the settings, use the available preview facilities to evaluate the corresponding changes in the results of Neat Image processing:

- Click inside the preview area to temporarily switch back to the original image for comparison;
- Move the preview area from one part of the image to another to see how the Neat Image processing affects different image content;
- Create several alternative variants of filtration, compare results and select the best variant. For more information on using variants please see the Variants of filtration section, page 45.

5.4.2. Beginner Mode: Optimize performance settings (optional)

Before applying the filter to the image (especially if that is only one of many images in a large batch), you may want to measure the processing speed on that image and potentially improve the speed by optimizing the performance settings of Neat Image. This is entirely optional but in some cases, the optimization can appreciably reduce the time of batch processing.

It is generally a good idea to optimize the performance settings when you run Neat Image on that specific computer for the very first time, to adapt the filter to the current hardware (the CPUs and GPUs available in that machine).

To check the current speed and to optimize the performance settings switch to the **Performance** tab in the **Filter Settings** box.

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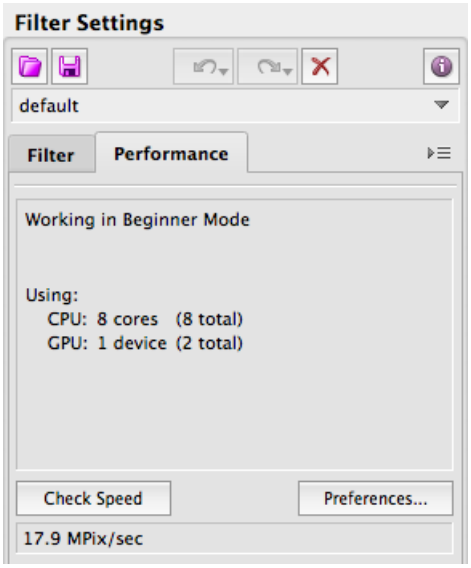
- To measure the filter speed click Check Speed

  Neat Image will run a test and will then display the measured processing speed based on the current filter settings (as shown in the text field in the **Performance** tab).

- To optimize the performance settings click Preferences... to open the **Performance** tab in Neat Image **Preferences**. In that tab, you can inspect the available and current CPU and GPU settings.

  Then click Optimize Settings... to open a specialized dialog designed to measure image processing speeds achieved with different combinations of the CPU and GPU settings. It allows to automatically benchmark all possible combinations of those settings and to identify the best combination (for the current hardware and current filter settings). You can then just click Accept Best Combination to apply the found optimal combination achieving the best performance.



Once you have completed this step, please proceed to the section Stage VIII. Apply filter, page 28.

Or if you want to switch to the **Advanced Mode** and adjust the filters using the most complete set of controls please proceed to the next sub-section dedicated to the **Advanced Mode**.

5.5. Stage IV (b). Advanced Mode

As said in the previous sections, Neat Image has two sets of filter controls, that are available in the **Beginner mode** and **Advanced mode** (you can select the mode using the **Tools** > **Beginner mode** and **Tools** > **Advanced Mode** menu items).

The **Beginner mode** described earlier provides a simplified control set recommended for beginners who have just started using Neat Image. The **Advanced Mode** provides the most complete control set with the maximum control over the noise profiling and filtration processes. The **Advanced Mode** offers several additional filter options and modes that help to achieve better noise reduction results.

It is usually best to start learning Neat Image using the simplified control set of the **Beginner mode** and later switch to the **Advanced Mode** to be able to utilize Neat Image to its full potential.

If you want to use the **Advanced mode** then please follow this sub-section, otherwise skip it and proceed to page 26 for the next stage.

As compared with the **Beginner mode**, the **Advanced mode** offers a more extensive set of filter controls. There are also several quality modes allowing to opt for higher quality of image processing over processing speed or the other way around.

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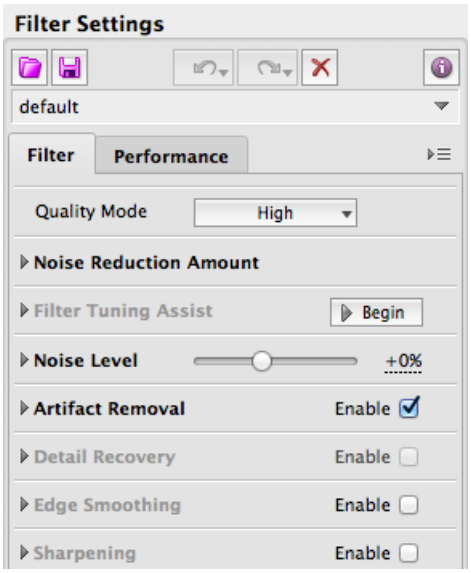
5.5.1. Advanced Mode: Selecting Quality Mode

Please make sure **Filter Settings** panel is switched to the **Filter** tab.

The first setting available in the **Filter** tab is the **Quality Mode**, which is a global setting affecting the way all or most parts of the filter work. **Quality Mode** determines whether Neat Image should generally work more accurately (but somewhat slower) or somewhat less accurately (but significantly faster).

By default, **Quality Mode** is set to **High**, which provides a good balance between processing speed and the visual quality of results. There are also **Highest** (slower) and **Normal** (faster) modes.



➨ Use the **Quality Mode** control to select the preferred processing mode.

While adjusting the **Quality Mode**, observe how the preview progress indicator (the yellow bar at the top of the preview area) is updating to get an idea of expected processing speed in each processing mode. You may not immediately notice the difference in visual quality in preview but the speed difference should be immediately obvious.

If the preview is updating too slowly, you do not necessarily have to decrease the **Quality Mode**. You can simply zoom into the image or manually select a smaller part of the image to limit the preview to that smaller area. Then the preview will update faster.

Preview has to update in many situations: when you change any filter settings, move the selected area to another part of the image, zoom in or out, etc. Therefore it is important to make those updates comfortably fast.

Once you find a comfortable way to evaluate the preview results, proceed to the next steps to adjust the actual filters.

5.5.2. Advanced Mode: Adjusting filter settings

There are several sections in the **Filter** tab. Most of the sections are related to the noise reduction filter and the last section is about sharpening. Most of the sections can be enabled or disabled individually to achieve the desired results in different image processing situations.

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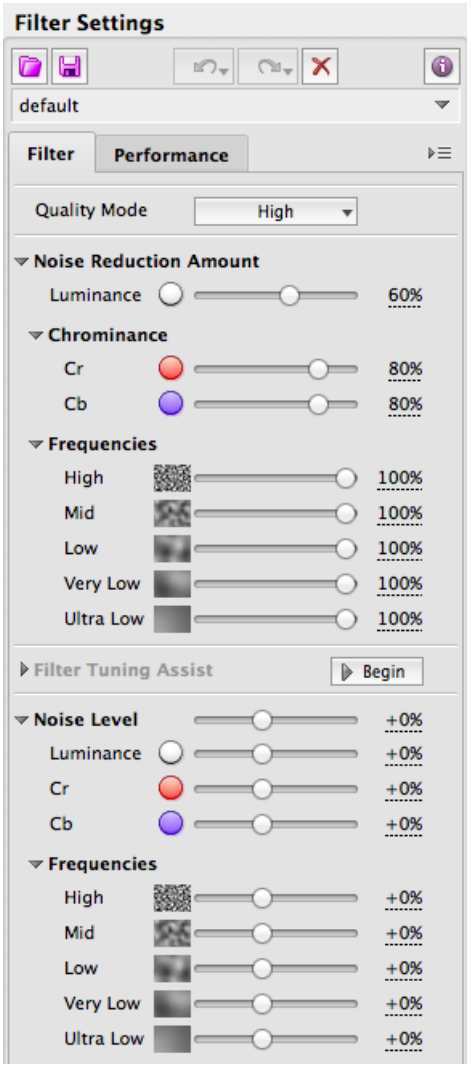
Filter

In **Advanced Mode**, the main noise filter has separate settings for all (spatial) frequency[1] and channel components of the image data. There are pairs of *noise level – noise reduction amount* controls for each of these components. You have access to eight such pairs – three for channel components (**Luminance, Cr, Cb**) and five for spatial frequency components (**High, Mid, Low, Very Low, Ultra Low**) of the image data.



The meaning of each *noise level – noise reduction amount* pair is the following:

- the *noise level* control adjusts the threshold determining which elements of the corresponding image component are considered noise and which elements are considered true details;
- the *noise reduction amount* control determines how much reduction is applied to the elements identified as noise in that component.

Thus, with a *noise level – noise reduction amount* pair of settings you can adjust *what* should be considered noise in a component of the image data and *how much* of that noise should be reduced.

The noise level settings are relative and are based on the noise levels of the current noise profile. Because the noise level controls are relative to the measured levels of the noise profile, the default filter settings usually produce good results as long as the noise profile is accurate.[2]

[1] See "What is frequency" question in page 56.

[2] Use the **Quality** indicator in the **Device Noise Profile** box (in the **Device Noise Profile** tab) to estimate the accuracy of the profile. The indicator shows how accurate and complete is the noise profile itself. Higher values usually lead to more accurate noise reduction. Also pay attention to the **Match** indicator: it should either show a high value or there should be the **(AP)** sign indicating that the profile has been built by **Auto Profile** using this very image. That ensures that the profile is not only accurate but it also matches the input image.

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Noise Reduction Amount[1]

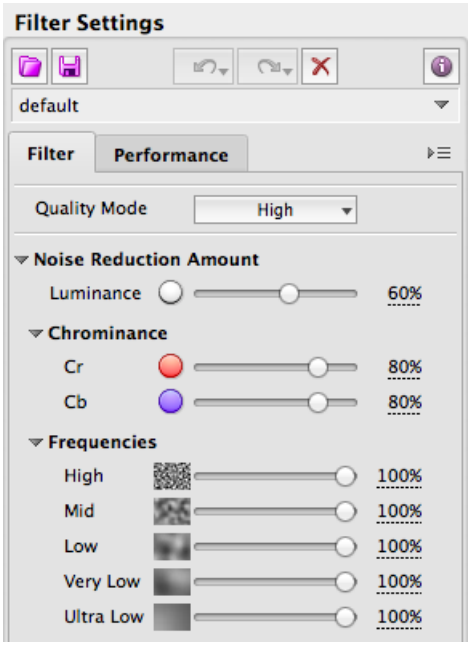
Noise reduction amounts are the **most frequently adjusted settings** of the noise filter.

➨ Use the **Noise Reduction Amount** > **Luminance**; and **Noise Reduction Amount** > **Components** > **Cr, Cb; High, Mid, Low, Very Low, Ultra Low** sliders.

You can vary the noise reduction amount for each frequency and channel component of the image data. The higher a certain noise reduction amount is, the more of the detected noise is removed in the corresponding component.

Noise reduction amounts can be in the range from 0% (none of the detected noise is removed) to 100% (all the detected noise is removed). By default, the noise filter removes 60% in the **Luminance** channel and 80% in the **Cr, Cb** channels (you can always change the defaults if necessary[2]).

Be careful: setting the noise reduction amounts too high, especially in the **Luminance** channel, may lead to loss of fine details and/or unnaturally looking (over-smooth, plastic-like) results. Too low amounts may be not enough to sufficiently reduce the objectionable part of the noise. Try to balance the noise reduction amounts (most importantly, the amount of noise reduction in the **Luminance** channel) to get the results that look best to your eyes.



Decreasing the noise reduction amounts can have a positive effect if the image contains some natural noise. For example, when you work with an image showing asphalt, sand, or anything else that contains fine natural noise-like features, it may be helpful to reduce the amounts at least for some of the components (for example, **Luminance**).

As human vision is not very sensitive to variations of colors, strong filtration in the chrominance channels (**Cr, Cb**) does not noticeably distort image, but efficiently reduces color noise.

[1] We recommend disabling the sharpening filter when adjusting the noise filter. This can make the influence of adjustments easier to see in preview.

[2] You can adjust the filter settings and then save them as a new default preset using the menu **Filter** > **Set As Default Preset...** Also see the description of the Default Filter Preset setting in Neat Image Preferences, page 48.

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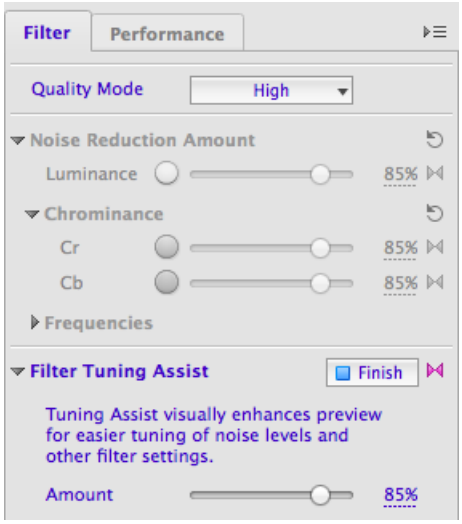
Filter Tuning Assist (optional)



Filter Tuning Assist is a special tool, which facilitates adjustment of other filter settings by helping to better see the influence of other settings in preview. It is not necessary to use this tool, but it may help to speed up the adjustment process as a whole.

When you use **Filter Tuning Assist**, all noise reduction amounts are temporarily increased to a higher **Amount** value (the specific value of that special **Amount** can be adjusted here as well). That makes it easier to see the difference caused by adjustments in other settings such as **Noise Level**, **Artifact Removal**, **Detail Recovery** and other filter settings available in **Advanced Mode** and described further in this section.

- Click **Filter Tuning Assist** > **Begin** for easier tuning of filter settings.

  The preview image may then look unnaturally plastic, but that is just a temporary effect that will go away once tuning is complete.
- Adjust highlighted filter settings so that no noise is visible, but details are still preserved.
- Click **Filter Tuning Assist** > **Finish** button to complete the tuning process.
  Please note that some noise will return to the preview image after that. This is normal. The amount of noise reduction can be adjusted using other filter settings if required.

Noise Level (optional)

Usually it is not necessary to change the noise level settings **if** the noise profile is accurate. You only need to adjust the noise levels if you see in preview that some noise elements are not reduced by the filter even if you increase the noise reduction amounts. Such incomplete reduction is usually caused by an inaccurate noise profile providing inaccurate noise level estimations to the noise filter. This may be compensated by adjusting (increasing) the noise levels in the filter settings.

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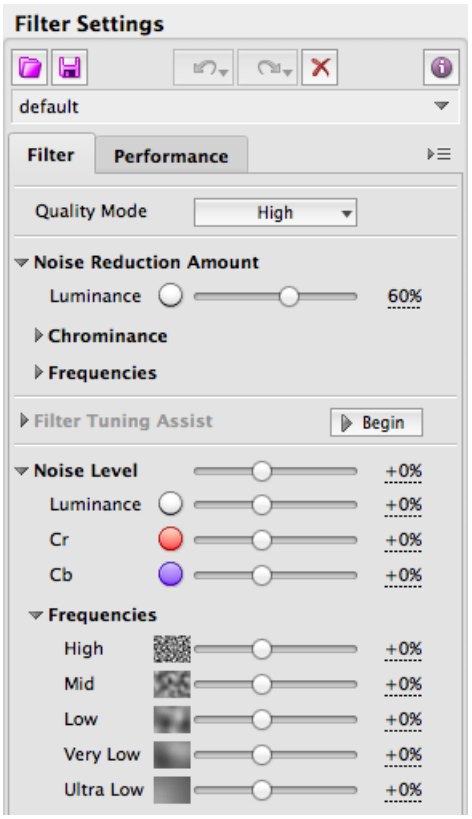
- Use the **Noise Level** > **Luminance, Cr, Cb; High, Mid, Low, Very Low, Ultra Low** sliders.

  The noise filter is applied to the five frequency components and the three channel components of the image data. Corresponding sliders adjust the estimated noise levels for each of these components.

  The higher a certain noise level is, the more elements in the corresponding component are considered noise. Be careful: setting a noise level too high can lead to removal of true details. Setting it too low can lead to incomplete filtration: residual noise and compression artifacts can stay in the filtered image.

  As a rule, if the device noise profile has been built properly, it is not necessary to increase the noise levels by more than 50%. If the image contains strong surges of noise in the high frequency range, it is recommended to increase the high frequency noise level up to +20 to 40% and/or use the artifact filter (see below).

  If the image contains strong color noise, it is recommended to increase the **Cr** and **Cb** noise levels to +30% or more. In some cases, it may be useful to increase these noise levels up to +100%.



If adjusting noise levels still does not help and some noise elements remain in the filtered image, probably the device noise profile is not good at all. Return to Stage V. Prepare a device noise profile, page 12, and additionally fine-tune the noise profile or simply rebuild it from scratch.

Artifact Removal (optional)

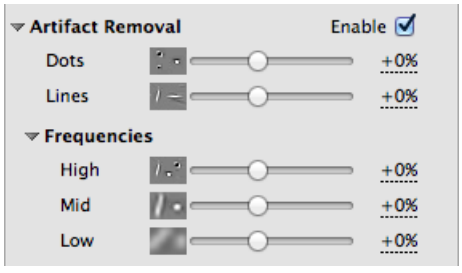
Neat Image has an additional filter to remove residual dot-like and line-like noise elements that may remain in image even after applying Neat Image's regular noise filters. Such residual noise elements / artifacts are typically created by in-camera noise reduction and compression or by other post-processing. Neat Image's noise reduction can make those elements more visible if the noise levels are under-estimated during profiling.

You can see an example of such digital artifacts in the first picture on the right. The second picture shows the results of noise reduction with the **Artifact Removal** filter enabled.

Such artifacts are usually of digital nature. They are typically of very small size yet they are different from the regular random noise, so they require special treatment provided by the **Artifact Removal** filter.

You can enable and adjust this filter using the following controls in the **Filter** > **Artifact Removal** section:

- Use the **Dots** control to adjust the dot removal threshold. Higher values lead to stronger reduction of dot-like artifacts (less attention to details); lower values lead to weaker reduction (more attention to details).
- Use the **Lines** control to adjust the line removal threshold. Higher values lead to stronger reduction of line-like artifacts (less attention to details); lower values lead to weaker reduction (more attention to details).



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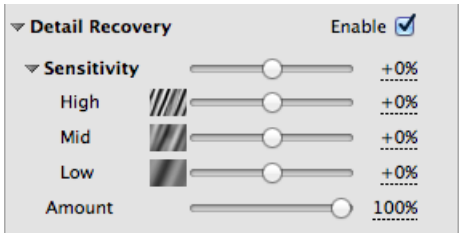
The artifact filter additionally offers separate thresholds for three frequency components (in other words, for three typical size scales) in the **Frequencies** sub-section: high, mid, low.

- Use the **High, Mid** and **Low** controls to adjust the artifact removal thresholds in the corresponding frequency components.
  Higher values lead to stronger reduction of artifacts (less attention to details); lower values lead to weaker reduction (more attention to details).

Detail Recovery (optional)

This option allows to recover some of the fine details which might be weakened or lost due to image editing, compression, noisiness of the original image, using a less accurate noise profile, etc. The **Detail Recovery** function is particularly useful when you need to preserve and recover partially lost repeated patterns such as brick walls, rug patterns, cloth textures, ripples, etc.

This option is available only in the **Highest** quality mode and it makes processing somewhat slower.



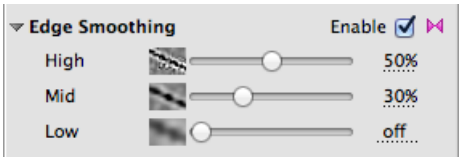
- Enable the **Detail Recovery** section.
- The **Sensitivity** setting is a threshold that determines what should be considerered true details (as compared with noise elements) and therefore recovered by the filter. Positive values of **Sensitivity** make the filter detect and recover more details. Negative values make it more conservative so it recovers fewer image elements.

  You can also use the **High, Mid** and **Low** controls to adjust the sensitivity for the individual frequency components of the image.

  Keep in mind that setting the **Detail Recovery** controls too high can lead to incomplete filtration: residial noise and compression artifacts can stay in the filtered image. Setting these controls too low can lead to insufficient recovery of useful details. Try to find the right balance based on visual inspection of preview.
- Use the **Amount** control to set the strength of **Detail Recovery**. The higher the **Amount** setting the stronger recovery of the detected details. Lower values produce weaker recovery effect.

Edge Smoothing (optional)

This option of the noise filter makes smoother the edges of the objects in the image. This can be useful when edges are significantly degraded by the noise (or by the in-camera noise reduction and sharpening) and it is preferable to restore them.



- Enable the **Edge Smoothing** section to enable this option in general.
- Use the **High, Mid** and **Low** controls to adjust the strength of edge smoothing in the corresponding frequency components of the image. Higher values lead to stronger smoothing of edges; lower values lead to less smoothing.

Sharpening (optional)

The sharpening filter in Neat Image increases sharpness of the details in the image without increasing the noise strength.

The sharpening filter is disabled by default. You can enable it and adjust the sharpening amounts separately for three frequency components (for three typical size scales): **High, Mid, Low**.

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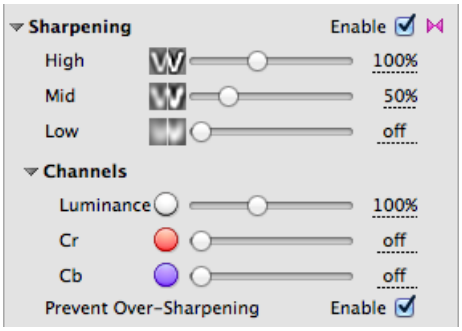
- Use the **Sharpening**: **High**, **Mid** and **Low** sliders to adjust the amount of sharpening applied to the details of the corresponding size.

  0% will not sharpen the component at all. 100% is the normal and 250% is the maximum strength of sharpening in each component.

  It is best to start with adjusting the amount of sharpening applied to the **High** frequency component. If that sharpening alone is not sufficient, try to increase the **Mid** and **Low** settings too.



Like any sharpening method, try to balance the amount of sharpening to avoid over-sharpening.

You can also adjust sharpening amounts separately for three channel components – **Luminance** and **Cr / Cb** (chrominance components):

- Use the **Sharpening** > **Channels** > **Luminance, Cr** and **Cb** sliders to adjust the amount of sharpening applied to the corresponding channel components.

You can also enable the dedicated option that prevents over-sharpening:

- Use the **Sharpening** > **Prevent Over-Sharpening** option to use a higher-quality sharpening method, which tries to prevent over-sharpening and to avoid creating a halo around details.

Use preview

While adjusting the settings, use the available preview facilities to evaluate the corresponding changes in the results of Neat Image filtration:

- Click inside the preview area to temporarily switch back to the original image for comparison;
- Move the preview area from one part of the image to another to see how the Neat Image processing affects different image content;
- Use

(**Viewer mode** button) in the viewer toolbar to switch to different viewer modes and to inspect the individual components of the image. Examine channel and frequency components, check the presence of noise in individual components. Identify those components that do not get enough (or get too much) noise reduction and adjust the corresponding filter settings;
- Create several alternative variants of filtration, compare results and select the best variant. For more information on using variants please see the Variants of filtration section, page 45.

If you enabled **Filter Tuning Mode** to facilitate adjustments of the filter settings, make sure you have disabled that mode now.

5.5.3. Advanced Mode: Optimize performance (optional)

Before applying the filter to the image (especially if that is only one of many images in a large batch), you may want to measure the processing speed on that image and potentially improve the speed by optimizing the performance settings of Neat Image.

It is generally a good idea to optimize the performance settings when you run Neat Image on that specific computer for the very first time, to adapt the filter to the current hardware (the CPUs and GPUs available in that machine).

The processing speed may also depend on the filter settings: enabling more filters makes processing slower because Neat Image has to do more work. Also, if you significantly change the filter settings, then the optimal performance settings (for example, the number of CPU cores and/or GPUs used for processing) may change as well, so it may be useful to optimize those settings before starting a large batch where many images are going to be processed using the same settings. This is entirely optional but in some cases, the optimization can appreciably reduce the time of batch processing.

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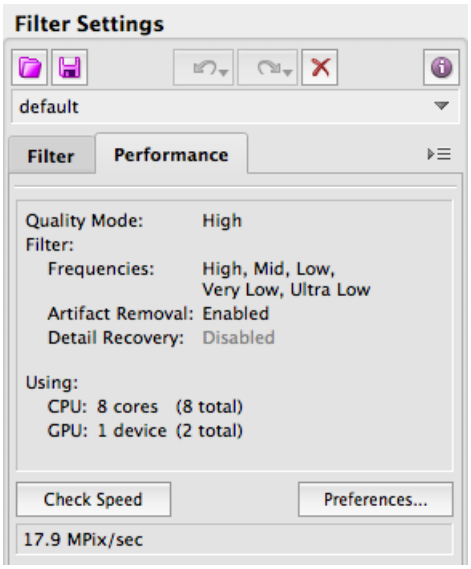
To check the current speed and to optimize the performance settings switch to the **Performance** tab in the **Filter Settings** box.



- To measure the filter speed click Check Speed in the bottom of the **Performance** tab.

  Neat Image will run a test and will then display the measured processing speed based on the current filter settings (as shown in the text field above).

- To optimize the performance settings click Preferences... to open the **Performance** tab in Neat Image **Preferences**. In that tab, you can inspect the available performance options as well as the current CPU and GPU settings.

  Then click Optimize Settings... to open a specialized dialog designed to measure image processing speeds achieved with different combinations of the CPU and GPU settings. It allows to automatically benchmark all possible combinations of settings and to identify the best combination (for the current filter settings).

  You can then just click Accept Best Combination to apply the found optimal combination achieving the best performance.

5.6. Stage V. Save filter settings into a preset (optional)

This sub-section is entirely optional yet you may want to consider saving the current filter settings into a preset on the disk to be able to re-load the same customized filter settings in another image, in the same or another project.

To save the filter settings into a preset

- Click (the **Save current filter settings as a preset...** button) in the **Filter Settings** box or use the **Filter** > **Save Filter Preset...** menu item.

  In the **Save Filter Preset As** dialog box, specify the name of the file to save the preset. The filter presets are stored in ***.nfp*** files.

The saved filter preset includes all settings of Neat Image's noise filter, all its specialized sub-sections and options, as well as the sharpening settings. By re-opening a preset later on, you can reproduce exactly the same filter settings. Together, a pair of device noise profile and filter preset can be used to accurately reproduce the filtration results.

You can also add some text comments to your custom preset using the **Preset Description** dialog:

- Use to open the **Preset Description** dialog and add or edit the description of the preset.

  The text comments are also saved into the preset on the disk when you use .

To load a previously saved filter preset

- Click (the **Load filter settings from a preset...** button) in the **Filter Settings** box or use the **Filter** > **Load Filter Preset...** menu item. In the **Load Filter Preset** dialog box, locate and select the filter preset to be loaded.

  or

- Click (the drop-down button) in the **Filter Settings** box to open the popup menu with all available presets and then select one of them.

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There are several pre-written filter presets in your home folder:[1]
/Users/< username >/Documents/Neat Image v8 for Photoshop/Presets/

Please try to load those pre-written presets to see what combinations of the filter settings and their values can be used to solve typical tasks. The names of the groups of presets and names of presets themselves explain those tasks. Also, when loading any of the pre-written filter presets supplied with Neat Image, the **Preset Description** dialog opens automatically[2] to display the description of the preset being loaded. The description is intended to help you get a better understanding of the purpose, applicability and possible side effects of the preset.

There are two main groups of pre-written presets: **General** and **Advanced**. The presets in the first group can be used in both **Beginner mode** and **Advanced Mode**. The presets in the second group can only be used when Neat Image is in **Advanced Mode**, so loading such a preset will switch Neat Image to **Advanced Mode** (if you currently use Neat Image in **Beginner Mode**).

5.7. Stage VI. Adjust Action settings (optional)[3]

At this point in the workflow, the noise profile is ready, filter settings are adjusted and, therefore, the filter is ready to be applied to the image. However, before applying the filter, you may want to adjust the **Action Setup** settings accessible via the **Action Setup** button:

These settings specify which noise profile and filter preset should be used by the plug-in on startup when you use the plug-in next time. For example, you can have Neat Image automatically build a new noise profile using **Auto Profile** when you open the plug-in.

The following options are available for noise profiles:

- **Use Current Profile**
  Neat Image will use the currently loaded/built profile;
- **Auto Match**
  Neat Image will use **Auto Match** to find and load the best matching profile from the profile set on the disk;
- **Auto Profile**
  Neat Image will use **Auto Profile** to build a profile using the input image;

- **Smart Profile (Auto Profile and Auto Match)**
  Neat Image will use both **Auto Profile** and **Auto Match** to prepare two noise profiles and then will select the better of two resulting profiles. This provides higher overall quality at expense of slightly longer processing time. To be fully efficient, this option also needs a pre-built set of noise profiles (for **Auto Match** to work). You can configure the behavior of the **Smart Profile** function using the **settings** link.
- **Auto Fine-Tune**
  Neat Image will additionally apply **Auto Fine-Tune** to adapt the loaded profile to the input image; this option is available when you use either **Use Current Profile** or **Auto Match** (**Auto Profile** applies **Auto Fine-Tune** automatically).

The plug-in will always use the current filter settings as the default filter preset for the next run.

[1] You can check and adjust the location of the **Preset** folder: use the menu **Tools** > **Preferences** > **Folders** > **Preset folder**.
[2] You can disable displaying that dialog using the checkbox in the bottom of the **Preset Description** dialog (and re-enable it later in Neat Image **Preferences** if necessary).
[3] This subsection applies to Neat Image Pro plug-in only.

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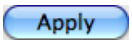
5.8. Stage VII. Apply filter

To apply filter to the image

➡ Click 

(the **Apply** button in the bottom of the plug-in window).

The plug-in window will be closed and filtration will start. Processing may take some time (from seconds to minutes, depending on the speed of your computer's processor and size of the image).

Then the filtered output image is displayed in Photoshop and you can continue your Photoshop workflow.

Neat Image is a processor-intensive image filter, so the processor's speed is the most important. On Core i7 3.8 GHz, processing a 24-megapixel image takes about 3 seconds in Normal quality mode and about 9 seconds in High quality mode (Neat Image v8 plug-in for Photoshop (Mac)). On a computer of typical configuration, the processing time is linear with respect to image size (when measured in megapixels).

After filtration, the Neat Image plug-in will also automatically save the current settings such as device noise profile, filter preset, **Action Setup** settings, which will enable re-applying the plug-in (for example, using the **Cmd+F** shortcut in Photoshop) with the same settings without re-doing the stages II-III. Also, you can open the plug-in manually and continue to work with the last used parameters.

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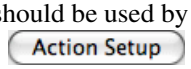
6. Using plug-in in actions and smart filters

6.1. Configuring Neat Image in actions and smart filters

The Neat Image plug-in can be used in Photoshop actions and smart filters along with the built-in Photoshop filters. The plug-in has two parameters when used in an action or smart filter: **Profile** and **Preset**. The **Profile** parameter tells Neat Image which device noise profile should be used, the **Preset** parameter specifies which filter preset should be used.

When you record an action or configure a smart filter that includes the Neat Image plug-in, you can select the source of noise profile and filter preset that should be used by the plug-in. To do that click 

(the **Action Setup** button) in the main plug-in window and then select the corresponding options in the **Action Setup** window. You can later return and check which options are selected in the current action or smart filter using that window.

- To specify how Neat Image should prepare noise profile(s) for the input image(s) processed by this action or smart filter, select one of the following options in the **Device Noise Profile** box:
  - **Use Current Profile**
    The plug-in will use a fixed noise profile that has been created or loaded into plug-in at the time of action recording (configuring the smart filter) and is currently available in the **Device Noise Profile** box in the main plug-in window; the plug-in will record that noise profile into the action or smart filter and will then always use it when the action is played or smart filter is (re-)applied.
  - **Auto Match**[1]
    The plug-in will use **Auto Match** to search and load the best matching profile(s) for input image(s) from the profile set on the disk.
  - **Auto Profile**
    The plug-in will use **Auto Profile** to build new noise profile(s) for the input image(s) when the action is played or smart filter is (re-)applied. The input image(s) must contain enough flat featureless noise-only areas suitable for noise analysis.
  - **Smart Profile (Auto Profile and Auto Match)**
    Neat Image will use both **Auto Profile** and **Auto Match** to prepare two noise profiles and then will select the better of two resulting profiles. This provides higher overall quality at expense of slightly longer processing time. To be fully efficient, this option also needs a pre-built set of noise profiles (for **Auto Match** to work). You can configure the behavior of the **Smart Profile** function using the **settings** link.
  - **Auto Fine-Tune**
    The plug-in will additionally apply **Auto Fine-Tune** to adapt the loaded profile(s) to the input image(s), to make the profile(s) more accurate. This option is available when you select **Use Current Profile** or **Auto Match**.
- The action or smart filter will use the filter preset created or loaded into plug-in at the time of action recording (or configuring the smart filter). This filter preset will be recorded into the action or smart filter and will then always be used when the action is played or smart filter is (re-)applied. When used

[1] For this option to work, several noise profiles should be available on the hard drive. The profiles should be stored in the folder specified in Preferences (you can check and modify its location using the menu **Tools** > **Preferences** > **Matching** > **Profile Matching**). These can be profiles downloaded from the Neat Image online profile library or from other sources. You can also use profiles built by you. The input images as well as profiles in the profile set should contain the EXIF information to make profile-image matching possible. Most noise profiles available in the profile library in Neat Image website do contain the EXIF data. New noise profiles built with the latest versions of Neat Image plug-in will also contain the EXIF data (from the images used for profiling). Profiles built with older versions of Neat Image plug-in may not contain the EXIF data, so it may be useful to re-build them using the latest version.

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in an action, the **Preset** parameter contains the name of that preset. The preset name is also shown in the **Filter Settings** box in the main plug-in window. You can change this preset using the controls in the **Filter Settings** box and then the new or modified preset will be recorded into the action or smart filter.

When you have completed the adjustments in the **Action Setup** window, click the **Apply** button to save the changes into the action or smart filter that you are currently recording or configuring.

6.2. Neat Image in action-based batch processing

The Neat Image plug-in for Photoshop (Mac) can be used to process multiple images using Photoshop's action-based batching facility.

To use this kind of batching you must do the following:

1. Pick one image from the series of images that you want to process and manually apply Neat Image filtration to this image to make sure you get the filtration results that you like. Then undo the changes done to the image.
2. Start recording a new action in Photoshop
   (if necessary consult Photoshop's documentation to check how you can create, record and play actions in your version of Photoshop).
3. While recording the action, repeat the step (1) and before applying the Neat Image plug-in click the **Action Setup** button in Neat Image plug-in window and make sure the settings there correctly describe the way you want Neat Image to prepare noise profile(s) and filter preset when the action will be played. After configuring the **Action Setup** settings, click the **Apply** button in the **Action Setup** window, and then click the **Apply** button in the main plug-in window.
4. Stop recording the action in Photoshop.
   You will now have a ready for use action that includes Neat Image with configured parameters.
5. In Photoshop, go to the menu **File** > **Automate** > **Batch**. This will open the **Batch** window where you can configure a new batch that will process your series of images.
6. In the **Set / Action** fields of the **Batch** window, select the action that you have just recorded.
7. Configure the rest of the **Batch** options according to the Photoshop user guide and then start the batch processing.

Photoshop's **Batch** tool will then process your images using the action that you have prepared. Neat Image is a part of that action, so the **Batch** tool will apply Neat Image filtration to every image in the batch.

Since it is possible that some of the images may not be automatically processed by Neat Image (or other filters that may be used in your action) due to some errors, use the log options to save a log of the batch and then check which image(s) failed. If they failed because Neat Image could not process them, you can find out why that happened by manually running the action on one of those images. Make sure you run the action with GUI/dialog enabled to make Neat Image open its main window and display the error messages that will explain the problem to help you resolve it. After the problem is resolved, run the batch again using the steps 5-7 above or manually process failed images.

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7. Device noise profiles

A *device noise profile* (or *noise profile*, or simply *profile*) describes the properties of noise produced by an imaging device (e.g., digital camera, scanner, etc.) working in a certain mode. Several noise profiles corresponding to different modes of a device constitute a *profile set*. Neat Image can use profiles from such a set to process images produced in any of the modes covered by the set.

You can find some pre-built noise profiles or build your own profiles for your camera or scanner. Learn how to find, build and use device noise profiles in Neat Image in the subsections below.

7.1. Getting ready-made noise profiles

You can find some free profile sets for different cameras and scanners in:

- Profiles section of the Neat Image web page:

  https://ni.neatvideo.com/download/noise-profiles

- Device noise profiles section of the Neat Image community forum:

  http://www.neatimage.net/forum/viewforum.php?f=5

- Other digital imaging forums and web pages where users of Neat Image may publish their profiles.

To use a profile set from one of these sources, download the archive with profiles and unzip all profiles to the following folder [1] and/or its sub-folder(s) in your home folder:
/Users/< username>/Documents/Neat Image v8 for Photoshop/Profiles/

After that you can use individual profiles from this set in Neat Image to process images produced in device modes covered by this profile set.

Please be aware that using ready-made profiles built by other people may produce less than optimal results with your images because of possible slight differences in noise properties of cameras (scanners) as well as due to differences in imaging processing workflows used. Therefore, we advise to use ready-made noise profiles built by others only as a starting point to learn how to use Neat Image. To achieve the best results consider building your own profiles using the procedures described in the subsections below.

7.2. Building a profile for a device mode (standard profiling procedure)

In this subsection, you will find out how to build a single noise profile for an image produced in a certain shooting mode of a camera or a scanning mode of a scanner (such a profile can also be called “a profile for a certain mode of the device”).

Building a new noise profile generally consists of three stages:

Stage I. Building a profile;
Stage II. Documenting the profile;
Stage III. Saving the profile.

The Stage I, building a profile, can be done using a *regular image* (for example, the image that you want to denoise or any other regular image) or using an image of the *Calibration Target* (a special test chart facilitating profiling). These two cases are described as two alternative versions of the Stage I:

Stage I. Case of building a profile using a regular image
Stage I. Case of building a profile using the Calibration Target

You may want to follow the case of building a noise profile using a regular image if you want to build a one-time-use noise profile to process one specific input image. In this case, the input image (or an alternative regular image from the same series, that is produced by the same device working in the same mode) should contain some uniform featureless areas for noise analysis.

A uniform area (with minor brightness variation in all channels of the image) may be overcast sky (without visually distinguishable clouds), clear sky (without clouds and birds), or any other part of the

[1] You can check and adjust the location of the **Profile folder** using the menu **Tools** > **Preferences** > **Folders**.

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image containing no visually perceptible details (except the noise). Neat Image needs uniform featureless areas of around 128x128 pixels or more (up to 512x512 pixels; larger is better), the minimum is 32x32 pixels. You can see some examples of such areas in the Examples section, page 53.

If the input image does not contain such areas and you have no suitable alternative regular image that contains such areas, you can prepare a special test image and follow the case of building a noise profile using the Calibration Target. That is also recommended if you want to prepare a reusable noise profile for a certain mode of your camera or scanner.

7.2.1. Stage I. Case of building a profile using a regular image

To build a noise profile using a regular image you must take 2 steps:

Step 1. Preparing a regular image for noise analysis;
Step 2. Analyzing the image noise.

Step 1. Preparing a regular image for noise analysis

To analyze noise in a regular image, you can use the input image or an alternative regular image that was produced by the same camera (or scanner) in the same or similar shooting (scanning) mode. Using the input image itself usually produces the most accurate noise profile that perfectly matches the noise properties of the input image. However, if there are not enough flat featureless areas in the input image, then you may have to use an alternative regular image.

Case of using the input image

In this case, simply open the input image in the plug-in and proceed to the step 2 below.

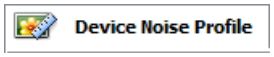
Case of using an alternative image

If there is no large enough uniform featureless areas in the input image, use an alternative image. The alternative image is supposed to be produced by the same device working in the same or similar mode. This can be just another image from the same series; the image should contain at least one large enough uniform featureless area suitable for analysis.

Open an alternative image in Photoshop and then open this image in Neat Image plug-in for analysis below.

Step 2. Analyzing image noise (profiling)

Analyzing noise is the main part of building a noise profile for an imaging device working in a certain mode. The current version of Neat Image plug-in for Photoshop (Mac) offers three ways of conducting the noise analysis (profiling): automatic, semi-automatic and manual one. Using automatic profiling is easier and therefore recommended for beginners. In difficult cases (for example if Neat Image cannot automatically find a uniform featureless area in an analyzed image), automatic profiling may not work well or may produce less than perfect results. You can always override automatics and use semi-automatic or manual profiling.

➨ Make sure you use the **Device Noise Profile** tab: 

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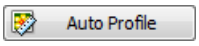
Case of automatic profiling

To analyze noise properties, Neat Image uses uniform image areas that contain noise but no visible or important details. With automatic profiling, Neat Image tries to find one such area automatically and then uses the found area to analyze image noise.

➨ Click 

(the **Auto Profile** button) in the toolbar, or use the **Profile** > **Auto Profile with Regular Image** menu item, or press F2.

Neat Image will try to automatically find image areas suitable for analysis and will analyze them, first the primary area (highlighted using the selection box in the viewer) and then the rest of the image. If the primary area selected in viewer indeed contains no visible details then the resulting noise profile will be accurate.

In difficult cases, Neat Image may be unable to find a sufficiently-large uniform featureless area in the image. You will notice that the selected area, for example, contains some important details. In such a case, use the semi-automatic profiling instead (see below).

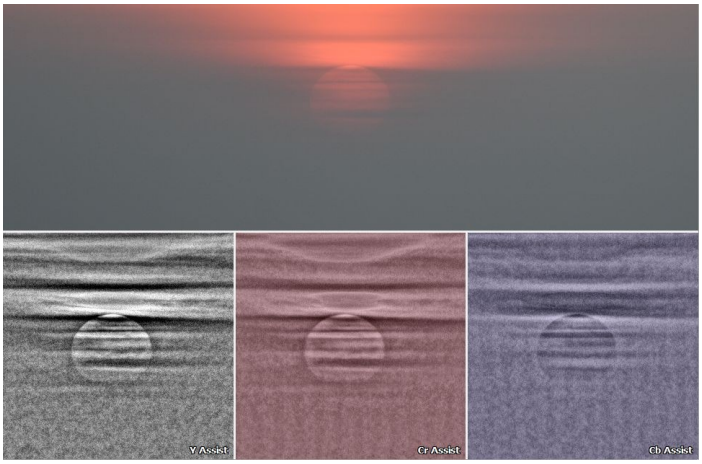
If you see that the area automatically selected for analysis is indeed uniform and featureless, then the resulting noise analysis is accurate. To be sure, check the **Quality** indicator in the **Device Noise Profile** box. A profile built using a uniform and featureless area will usually show a high value there.

If the profile quality is high (for example, higher than 60%), then you can be sure that the noise profile is accurate. In this case, proceed to Stage II. Documenting noise profile, page 37.

If the quality is not high, try to use the semi-automatic profiling instead (see below).

Besides the **Quality** indicator, Neat Image offers a few more tools to help you build accurate noise profiles.

When you build a noise profile, the viewer is set to the **Assist** mode by default. That mode allows to emphasize the weak details present in **Luminance** (**Y**), **Cr**, **Cb** channels, as shown in the image below:



The top image shows the original picture where details around the sun are barely visible, while the channels in the bottom part display the image data in **Assist** mode allowing to see those weak details much better.

That can help to verify that the selected area contains no useful details, which is very important for accurate noise analysis. If you see that some details are present in the selected area then try to use the semi-automatic profiling instead (see below).

Also, the **Device Noise Profile** box displays a histogram of the measured noise levels of the current profile's frequency components. (In **Beginner Mode**, the histogram is shown in **Profile Viewer** only: menu **Profile** > **Profile Viewer**).

Normally, the histogram bars are shaded in green, which means likely-accurate measurements. Yellow or red shadings are used to indicate likely-inaccurate measurements of the corresponding components.

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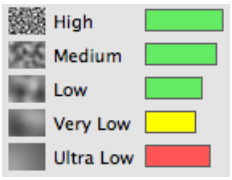
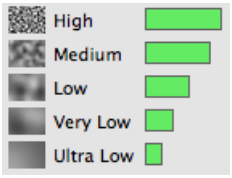


It may happen that the lowest frequencies are measured inaccurately (especially when the analysis area is small). The analysis area may seem featureless, but may actually contain some gradient-like details. Their presence in the analysis area may cause the noise levels to be measured inaccurately: the noise levels may be estimated higher than they really are. An example of such a profile with inaccurate measurements is shown in the top picture on the right.



A more accurate profiling (perhaps using a larger analysis area) could potentially produce a better profile. Such a better profile would show a histogram like one shown in the lower picture on the right.

If a noise profile with inaccurately measured lowest frequencies is used to process an image, then those inaccurate measurements may lead to loss of details in the corresponding frequency components. If you disable processing those frequency components (by setting the **Noise Reduction Amounts** of those frequency components to 0% in the **Filter** > **Components** settings), this profile can be still used to filter the other frequency components.

Case of semi-automatic profiling

1) Find a uniform featureless image area

- Manually find and select an image area that contains no visible details.[1]

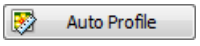
  The area should be as large as possible (up to the maximum of 512x512 pixels). Using a large area is preferred because that allows to more accurately measure the properties of the noise. Using smaller areas is possible too, but the accuracy may be reduced. The absolute minimum size is 32x32 pixels.

  You can resize the selection frame and check the size of the selection using the **W** and **H** indicators in the bottom of the window. Also, Neat Image will indicate which frequency components can be measured using the selected area. For example, **Good (Low Freq)** would mean that all frequency compoments up to **Low** (specifically, **High**, **Medium**, and **Low**) can be measured using the selected area.

  Scroll, pan, zoom the image to find a uniform image area and then select this area. Use the **Assist** mode of the viewer to better see the weak details and choose an area without details.

  If you cannot find a large enough uniform area in the input image, consider using an alternative regular image or use the Calibration Target as described in the section (Stage I. Case of building a profile using the Calibration Target, page 36).

2) Analyze selected image area

- Click 

(the **Auto Profile** button).

  Neat Image will automatically analyze the manually selected image area and then it will also automatically analyze the rest of the image (it will automatically fine-tune the profile using the whole image).

  The profile is now ready. Please proceed to Stage II. Documenting noise profile, page 37.

Case of manual profiling (Advanced Mode only [2])

1) Find a uniform featureless area

- Manually find and select an area that contains no visible details.

  The area should be as large as possible (up to the maximum of 512x512 pixels). Using a large area is preferred because that allows to more accurately measure the properties of the noise. Using smaller areas is possible too, but the accuracy may be reduced. The absolute minimum size is 32x32 pixels.

[1] You can find some examples of uniform featureless image areas in the Examples section, page 53.
[2] You can switch using the **Tools** > **Advanced Mode** menu item.

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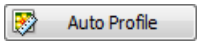
2) Analyze selected area

➨ Click 

(the **Auto Profile** button).

Neat Image will automatically analyze the manually selected area and build a noise profile.

3) Additionally manually fine-tune the profile

Fine-tuning uses additional flat featureless image areas to make the noise profile more accurate. You can manually select and analyze several such areas one after another.

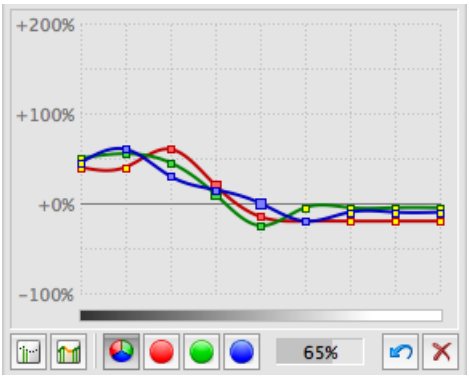
1) Find and select a uniform featureless area

➨ Scroll, pan, zoom the image in the viewer in the **Device Noise Profile** tab to find a new uniform area.

The size of an area may be from 16x16 to 512x512 pixels. Using larger areas makes fine-tuning more accurate. The edges of the selection frame will change their thickness according to the selection size.

2) Analyze the selected area with Manual Fine-Tune

➨ Click (the **Manual Fine-Tune** button) or use the **Profile** > **Fine-Tune Using Selected Area** menu item.



The analysis results will be shown in the noise profile equalizer: the graphs of the equalizer will change some of the values (see the picture on the right) each time you add a new fine-tuning measurement. You can switch from one channel to another in the equalizer to better see a specific channel's graph, or you can select to show them all together.

The goal of manual fine-tuning is to fill the equalizer with measured values (shown as graph-color knots) in all points of the graphs. The previous steps (specifically, the **Auto Profile** function) may have already filled some of the values. Manual fine-tuning can further improve the analysis by filling out the still missing or interpolated values (shown as yellow knots) and/or making some of already measured values more precise.

3) Repeat 1-2 above with other uniform areas of different brightness

To make the device noise profile more accurate, fine-tune it using several uniform image areas. Select areas of different brightness for best results. Try to choose and analyze uniform areas to cover all or most elements of the equalizer in all its color channels. The more elements of profile are analyzed, the higher is the overall quality of the profile.

4) Complete fine-tuning using Auto Complete

➨ Click (the **Auto Complete** button) or use the **Profile** > **Auto Complete** menu item to automatically complete the fine-tuning by adjusting the unmeasured values using interpolation based on the measured data.

At this point the profile is ready. Proceed to Stage II. Documenting noise profile, page 37.

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7.2.2. Stage I. Case of building a profile using the Calibration Target

The Calibration Target is specially designed to enable easy profiling of various imaging devices. It can be used to build a single profile for a certain device mode or a set of profiles for different modes.

Follow the steps below to prepare a single profile using the Calibration Target.

Step 1. Preparing the Calibration Target

To use the Calibration Target, either use the menu **Tools** > **Calibration Target** and then click

(the **Display target...** button), or download the image of the Target from the Neat Image web page: https://ni.neatvideo.com/download/calibration-target

There are two ways of using the Calibration Target: you can open it on the screen and take a shot (with a digital or film camera, depending on your workflow) or you can print it out and shoot the hardcopy.

Shooting the Calibration Target off the screen is faster, especially with a digital camera. However, be careful when shooting it off the screen of a CRT monitor because you may occasionally capture scan bands. These bands may spoil a part of the shot. If you cannot avoid these bands, prepare a printed version of the Calibration Target or shot it off an LCD monitor, which does not produce this effect. Also, try to avoid glares when using a monitor with a glass or glossy screen.

Case of shooting the Calibration Target off the screen

- Open the Calibration Target image on the screen (menu **Tools** > **Calibration Target** and then click the **Display target...** button). Then use the displayed Calibration Target in the Step 2 below.

Case of shooting the printed Calibration Target

- Open the Calibration Target image in an image editor and print out the image on a sheet of white matte paper; make the image fill the whole page. Then use the printed target in the Step 2 below.

Step 2. Preparing a shot or scan of the Calibration Target

Case of digital camera

Use the displayed or printed Calibration Target to prepare a test shot for building a device noise profile for your camera:

1. Set the camera to a certain shooting mode (ISO level, etc.) you want to build a profile for;
2. **Important**: set the focusing system on infinity or in macro mode to get a slightly-out-of-focus image of the target;
3. Make sure the Calibration Target fills the whole frame and make a shot;
4. Open the resulting shot in Neat Image plug-in.

Case of flatbed scanner

Use the printed Calibration Target to prepare a test scan for building a device noise profile for your flatbed scanner:

1. Set the scanner to a certain scanning mode (resolution, light level, etc.) you want to build a profile for;
2. If possible set the scanner slightly out of focus (an out of focus scan is preferred for profiling); a possible way to achieve this is to raise the page over the scanner glass a bit;
3. Scan the printed Calibration Target;
4. Open the resulting scan in Neat Image plug-in.

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Case of slide scanner

Use the displayed or printed Calibration Target to prepare a test scan for building a device noise profile for your film scanner:

1. Set the camera to a certain shooting mode (film type, exposure, etc.) you want to build a profile for;
2. **Important**: set the focusing system on infinity or in macro mode to get a slightly-out-of-focus image of the target;
3. Make sure the Calibration Target fills the whole frame and make a shot;
4. Develop the slide and put it into the scanner;
5. Set the scanner to a certain scanning mode (resolution, light level, etc.) that you want to build a profile for and scan the slide;
6. Open the resulting scan in Neat Image plug-in.

Step 3. Analyzing image noise

Having the shot or scan of the Calibration Target, Neat Image can build a noise profile automatically:

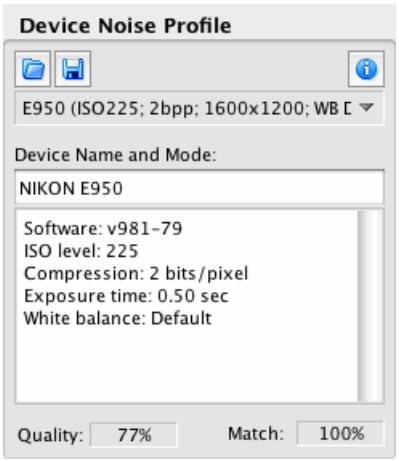
➨ Use the **Profile** > **Auto Profile with Calibration Target** menu item.

After the analysis is completed, proceed to the Stage II below.

7.2.3. Stage II. Documenting noise profile

At this point of building the noise profile for your camera or scanner, the noise analysis is done and all important noise characteristics are gathered in the profile. You may still want to manually document the profile if Neat Image has not done this automatically. With most images from digital cameras, Neat Image is able to automatically extract the crucial information about the camera mode from the EXIF data fields of the analyzed image and put this information to the noise profile (you can see that in the **Device Name and Mode** fields in the **Device Noise Profile** box.

If Neat Image has not automatically placed the required information to the **Device Name and Mode** fields after noise analysis, you can add those details manually.



➨ Use the **Device Name and Mode** fields in the **Device Noise Profile** box. Here, you can specify the model of the image acquisition device and describe the device mode, which can be something like the data in the picture above.

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About the Device name and Mode notes

It is highly recommended to specify these details to keep record of devices, device modes and corresponding device noise profiles that you use.

The noise characteristics of any two devices can be extremely different. Even a single device in different modes can produce significantly different noise. Therefore, it is always better to use separate noise profiles for different devices and device modes to avoid inaccurate filtration and artifacts. Commenting on the device name and device mode parameters helps you keep track of them when you do manual profile matching, i.e., when you manually select a suitable profile to process an image.

Automatic profile matching available in Neat Image uses the EXIF information from the image files and profiles, not the **Device Name and Mode** fields, so filling out these fields may not be necessary for automatic profile matching. However, filling out these fields is highly advisable both for the clarity purposes and for the cases of EXIF-less input images where you have no other choice by to manually select a suitable profile based on the **Device Name and Mode** fields.

See the Preparing profile set for different device modes section below to find out more about camera and scanner parameters that may need to be documented in the **Device Name and Mode** fields.

7.2.4. Stage III. Saving the noise profile

- Use (the **Save Device Noise Profile As...** button) in the **Device Noise Profile** box or use the **Profile** > **Save As...** menu item.

  In the **Save Device Noise Profile As...** dialog box, select the file name to save the profile to. The default name is based on the device name and device mode when these are available from the EXIF data fields of the analyzed image. If the EXIF data are not available then the default profile name is based on the name of analyzed image file. Use the suggested default or change the name of the file to store the device noise profile. Device noise profiles are saved in ***.dnp*** files.

File naming considerations

If you are going to re-use a device noise profile later on, select a good file name explaining the device name and mode so that you could easily recognize this profile by its file name. Alternatively, you can use special folder structuring to keep many device noise profiles arranged according to their device modes.

See Stage III. Structuring profile set, page 41, for additional information.

A saved noise profile includes the complete noise analysis. Therefore, by re-opening the noise profile, you can reproduce exactly the same conditions for image processing later on. Also, you can exchange noise profiles with other Neat Image users.

7.3. Preparing profile set for different device modes

Usually, an imaging device can work in several different modes. Therefore, there should be several device noise profiles corresponding to different modes to enable accurate processing of arbitrary images produced by this device. If a set of profiles covers all modes of the device then any image from this device can be processed by using one of the profiles from the set.

This subsection explains how to prepare a reusable set of profiles for a range of modes of an imaging device.

As an owner of a certain imaging device, for example a digital camera, you are in perfect position to prepare a profile set for that device because you have direct access to the device hardware. Moreover, building and using your own set of profiles makes noise reduction more accurate because such profiles better reflect the specifics of the device as well as the workflow you use.

When building a set of profiles, please follow the guidelines below that will help you structure the profile set in such a way as to make consequent reuse of the set easy for you. And other people if you decide

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to share your results. Please do share because in this way you will help people with the same camera or scanner model. You can submit a set of profiles to the Neat Image team to publish the set in the profile library by using a special form at https://ni.neatvideo.com/contacts/upload-noise-profiles or just share them with other people directly.

7.3.1. Stage I. Selecting device parameters for profile set

To build a set of profiles for particular camera or scanner, you must identify different device parameters that affect the noise characteristics and that you will take into account during profiling. There may be many device parameters but not all of them influence image noise and those that do differ by the strength of their influence. Naturally, you are only interested in those parameters that appreciably affect noise. Different noise profiles should be prepared for different values of the most important parameters, so you should identify those parameters in the first place.

The tables below describe the parameters that appreciably affect noise characteristics (from the most to the less important ones) of digital cameras and scanners:

Digital camera parameters in the order of decreasing importance		
ISO rate	50, 100, 200, 400, etc.; depends on a camera	Higher ISO rate produces more noise.
Camera noise reduction	High, Normal, Low, etc.; depends on a camera	In-camera noise reduction can reduce levels of noise in photos (usually at expense of some details).
Sharpness adjustment	Low, Normal, High, etc.; depends on a camera	Internal sharpness adjustment of a camera makes noise more intensive. Using no internal sharpness adjustment produces least noise.
Compression	1:1 (or Uncompressed), 1:5 (or Fine), 1:10 (or Normal), 1:20 (or Basic), etc. or 2 bits/pixel, 4 bits/pixel, etc. depends on a camera	Strong JPEG compression typically produces more JPEG artifacts and destroys image elements including noise; weaker compression preserves more image elements including noise created by the image sensor. It is preferable to use the lowest amount of compression for the best results.
Resolution	1:1 (original resolution, like 4288x2848), 1:2 (downsized in camera, e.g., 2144x1424), 2:1 (digital zoom, 2x), etc.	In-camera interpolation (both downsizing and upsizing, e.g., that of *digital zoom*) changes many characteristics of noise.
White balance	Sun, Cloudy, Incandescent, Fluorescent, etc.; depends on a camera	White balance adjustment changes characteristics of noise (mainly of color noise) slightly.
Exposure	1/16s, 1.0s, 16s;	Longer exposures produce more hot-pixel noise; also, some cameras switch on the automatic noise reduction when exposure is longer than a certain threshold – this may affect the noise levels.

Scanner / camera parameters in the order of decreasing importance		
Film type	For example, Kodak Tmax 400, Kodak Tri-X Professional 320, Fuji Superia 200, etc.	Every film type produces a specific grain pattern, which depends on the film material. Strength of the grain depends on ASA/ISO rate of the film.
Scanning resolution	For example, 300 dpi, 3200 dpi, 4000 dpi, etc.	Higher scanning resolution emphasizes film grain and makes it more evident in scanned images.
Number of scan passes	Single pass, 2x pass, 4x pass, etc.	Multi-pass scanning can potentially produce less grainy images.

If two images were captured in the same or similar conditions (most of the above device mode parameters are the same) then the noise of these two images should be very similar. If you have built a device noise profile using one of these images, you can use this profile to filter both images with good results. If the shooting or scanning conditions were different then the noise in two images could be significantly

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different. In this case, cross-use of one noise profile is not recommended. Instead, two different profiles should be built and used to filter these two images.

Based on these considerations and tables above, identify the device mode parameters of your camera or scanner that (1) are important from the noise standpoint and (2) are changed in your imaging tasks. For example, if you never change the sharpness adjustment of your digital camera then there is no need to build profiles for different values of the sharpness adjustment parameter. On the other hand, if you do shoot with different ISO rates then you should build profiles for every ISO rate you use. Some parameters are less important (for example, the White Balance or Exposure) and you may simply choose to ignore the slight differences of the noise characteristics caused by changes of those device mode parameters.

Identify and make a list of the device mode parameters that are important for your imaging tasks. For example, you could include two parameters of your digital camera: the ISO rate (ISO 100, 200, 400) and JPEG compression level (HQ, SHQ). Then it is straightforward to write down all combinations of the selected parameters:

JPEG HQ, ISO 100
JPEG HQ, ISO 200
JPEG HQ, ISO 400
JPEG SHQ, ISO 100
JPEG SHQ, ISO 200
JPEG SHQ, ISO 400

Then prepare an individual profile for each combination from this list. Please proceed to the Stage II to build profiles for all combinations.

7.3.2. Stage II. Building individual profiles

To build individual profiles for the profile set, you can either use the standard profiling procedure described earlier, or employ a special built-in tool – the **Batch Profiler**.

Using standard profiling procedure

To build individual profiles using the standard profiling procedure, follow the guidelines of the Building a profile for a device mode (standard profiling procedure) section, page 31. Using those guidelines, build a new profile for every combination of the device mode parameters included in your list (prepared in the Stage I above). The resulting set of noise profiles (several ***.dnp*** files on the disk) can then be structured as recommended in the Stage III below.

Using Batch Profiler

The **Batch Profiler** is a dedicated tool that can automatically build several noise profiles using shots or scans of the Calibration Target (please note that the **Batch Profiler** is **not** for regular images). To use this tool, you must prepare several shots (scans) of the Calibration Target and then analyze them all at once using the **Batch Profiler**.

1. Preparing set of images of the Calibration Target

To prepare shot or scan of the Calibration Target for every combination of device mode parameters, please follow the two initial steps of Stage I. Case of building a profile using the Calibration Target:

Step 1. Preparing the Calibration Target, see page 36.

Step 2. Preparing a shot or scan of the Calibration Target, see page 36.

Do the Step 2 for every combination of device parameters in your list. Then place all resulting image files (***.jpg, *.tiff, *.png***) to a new folder (and its subfolders if necessary) on the hard drive, for example: ***/Users/< username >/Target Images/***

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2. Preparing profiles

To prepare profiles using the images of the Calibration Target:

1. Select the **Tools** > **Batch Profiler...** menu item to open the **Batch Profiler** window.
2. In the **Batch Profiler** window, specify the folder with images of the Calibration Target and the folder where the **Batch Profiler** should save the prepared device noise profiles.
3. Click the **Start** button to initiate the profiling process.
   When profiling is finished, new noise profiles are saved in the selected target folder.
4. Click the **Close** button to close the **Batch Profiler** window.

As the result, you have a set of noise profiles (several ***.dnp*** files on the hard drive) that can be structured as described below.

7.3.3. Stage III. Structuring profile set

In the Stage II, you have prepared a set of profiles on the disk. You have assigned names to these profiles that reflect the device modes they correspond to.

For example, profiles for Olympus Stylus SH-2 could be named like the following:

Olympus SH-2 SH-2 (ISO125; JPEG Normal; SharpNormal; 3200x2400).dnp SH-2 (ISO125; JPEG Normal; SharpNormal; 4608x3506).dnp SH-2 (ISO125; JPEG Fine; SharpNormal; 3200x2400).dnp SH-2 (ISO125; JPEG Fine; SharpNormal; 4608x3506).dnp SH-2 (ISO200; JPEG Normal; SharpNormal; 3200x2400).dnp SH-2 (ISO200; JPEG Normal; SharpNormal; 4608x3506).dnp SH-2 (ISO200; JPEG Fine; SharpNormal; 3200x2400).dnp SH-2 (ISO200; JPEG Fine; SharpNormal; 4608x3506).dnp SH-2 (ISO400; JPEG Normal; SharpNormal; 3200x2400).dnp SH-2 (ISO400; JPEG Normal; SharpNormal; 4608x3506).dnp SH-2 (ISO400; JPEG Fine; SharpNormal; 3200x2400).dnp SH-2 (ISO400; JPEG Fine; SharpNormal; 4608x3506).dnp SH-2 (ISO800; JPEG Normal; SharpNormal; 3200x2400).dnp SH-2 (ISO800; JPEG Normal; SharpNormal; 4608x3506).dnp SH-2 (ISO800; JPEG Fine; SharpNormal; 3200x2400).dnp SH-2 (ISO800; JPEG Fine; SharpNormal; 4608x3506).dnp SH-2 (ISO1600; JPEG Fine; SharpNormal; 3200x2400).dnp SH-2 (ISO1600; JPEG Fine; SharpNormal; 4608x3506).dnp SH-2 (ISO3200; JPEG Fine; SharpNormal; 3200x2400).dnp SH-2 (ISO3200; JPEG Fine; SharpNormal; 4608x3506).dnp SH-2 (ISO6400; JPEG Fine; SharpNormal; 3200x2400).dnp SH-2 (ISO6400; JPEG Fine; SharpNormal; 4608x3506).dnp SH-2 (ISO125; TIFF; SharpNormal; 4608x3506).dnp SH-2 (ISO200; TIFF; SharpNormal; 4608x3506).dnp SH-2 (ISO400; TIFF; SharpNormal; 4608x3506).dnp SH-2 (ISO800; TIFF; SharpNormal; 4608x3506).dnp SH-2 (ISO1600; TIFF; SharpNormal; 4608x3506).dnp SH-2 (ISO3200; TIFF; SharpNormal; 4608x3506).dnp SH-2 (ISO6400; TIFF; SharpNormal; 4608x3506).dnp	- disk folder **SH-2** – camera name **ISO###** – ISO rate of camera mode **JPEG Normal / JPEG Fine / TIFF** – file format and compression level **Sharp#####** – sharpness adjustment **####x####** – image size

When the profiles are named like this, manual selection of a suitable profile is simple. You can check the device mode of the input image in Photoshop or Neat Image (using using button in the bottom of the image viewer) and then select and load a profile that matches that device mode.

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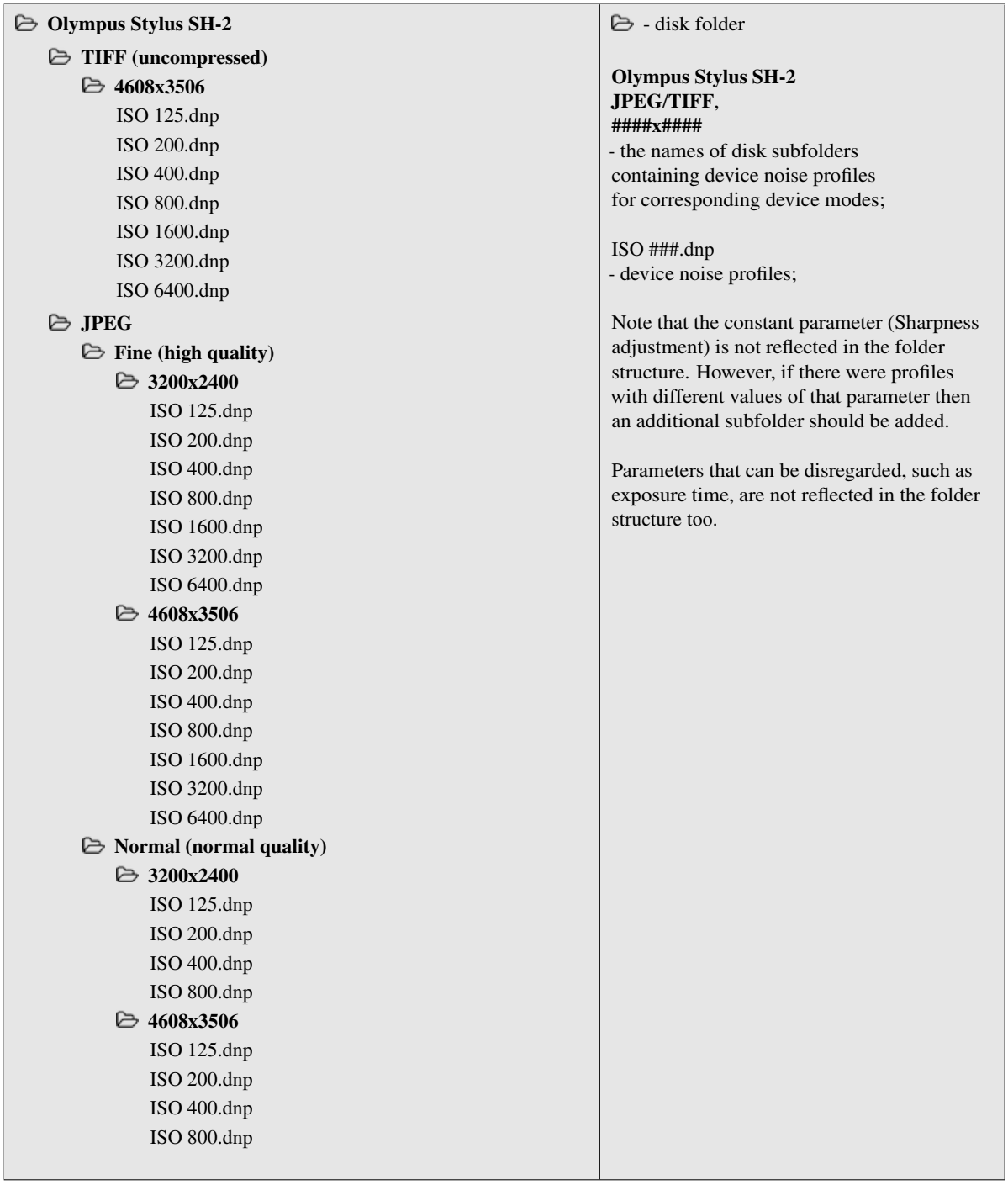
There is another way to select profile for an image, based on structuring the profile set using the disk folders. For example, the above Olympus Stylus SH-2 profile set could be structured like this:



In this case, the folder tree stores device noise profiles in a structured way, which helps to select one profile from the set given the device mode of the input image.

Note that the automatic profile matching provided by Neat Image does work well in both cases: you can keep the whole set of profiles as a flat list of files in one folder, or you can structure the files into subfolders. This choice only affects the convenience of manual selection of profiles, while automatic profile matching can handle both cases equally well.

If the automatic profile matching is not available (for example, if the images or profiles contain no EXIF information or the available EXIF details are incomplete) then you have to select profiles manually. Therefore, we recommend to structure profiles according to one of the methods above to make your manual work easier.

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7.3.4. Stage IV. Documenting profile set

Along with the text comments inside individual noise profiles and their file names, we advise to document the whole profile set with a plain text file explaining the following points:

- Author of the profile set and profiling date
- Device name, firmware version
- Device modes that have been profiled in this set
  - Device mode parameters that change within the profile set
  - Device mode parameters that are constant for all profiles in the set
- Post-processing applied (after receiving an image from the imaging device and before opening it in Neat Image)

An example of such a description is below:

> Olympus Stylus SH-2 noise profiles
> by John Smith, June 19, 2015
>
> A set of profiles for Olympus Stylus SH-2 TIFF and JPEG files. The profiles were built using shots of the Calibration Target for the following file formats and image sizes:
>
> TIFF: 4608x3506
>
> JPEG Fine / Normal: 3200x2400 / 4608x3506
>
> For each file format and image size above, shots with different ISO rates (125, 200, 400, 800, 1600 3200, and 6400) were made and used to build profiles.
> For Normal quality JPEG images ISO rates from 1600 to 6400 were not taken.
> Default camera settings were used for Sharpness, Contrast, and Saturation. In-camera noise reduction was switched off. The white balance was set to daylight.
> No post processing was applied; the calibration target shots directly from the camera were opened in Neat Image to build profiles.

Such kind of summary will later help you understand any set of profiles prepared by yourself and will let other people understand your results if you decide to share your profiles.

7.4. Using noise profiles

When you have a set of profiles for your camera or scanner, you can directly use these profiles to process images in Neat Image. Usually there is only one profile that is most suitable to process a given input image. Therefore it is very important to select the right profile, which would provide the best match between profile and image. Profiles in a set usually correspond to different modes of the imaging device. To make a perfect match between a profile and image, the device mode of a profile should be the same or very close to the device mode used to capture the image.

There are two ways to select a device noise profile that matches the input image:

- To automatically select the most suitable profile from a pre-built set of profiles using **Auto Match** (see page 14 to learn how to use **Auto Match**);
- To manually select the most suitable profile from a pre-built profile set based on device mode comments (see page 14 for details).

When you select and load a profile in either way, Neat Image shows the degree of match between the profile and input image. This degree is shown by the **Match** indicator in the **Device Noise Profile** box. The match degree is calculated on the basis of the image and profile's metadata (such as the EXIF data fields in images produced by digital cameras). If the profile's device mode is exactly the same as the device mode used to capture the image then the match is 100%. There is always a 100% match between an image and profile built using this very image (Neat Image displays that using the note "(**AP**)" in the **Match** indicator). If the device modes of a profile and image are very close then the match degree is close to 100%. The more different the device modes of profile and image are, the lower the match degree is.

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Use the match degree as an indication of match accuracy. If the match degree is low then it is likely that building a new profile (using the current input image or a shot of the Calibration Target taken in current device mode) would produce better noise reduction results.

Obviously it is preferable to build a new noise profile for each new input image (unless the image does not allow building a quality profile because it contains no large uniform areas for analysis), because such a profile would perfectly match the noise of that image. Nevertheless, any noise profile can, with some degree of accuracy, be used to process other images captured by the same device working in the same or similar mode. This is less accurate than building a profile for each image but saves time because building a new quality profile can take more time than re-using a pre-built one. This is especially important if one profile is re-used many times, for example to process a series of images produced in one device mode. Also, it may not always be possible to build an accurate profile using input image when it contains no flat featureless areas.

When using pre-built profiles, you may also want to pay attention to the **Quality** indicator in the **Device Noise Profile** box. A properly-built and fine-tuned profile will show a high value in that indicator. If the profile quality is high (for example, higher than 70%) then you can be sure that the profile is accurate.

Both **Quality** and **Match** indicators should usually show high values for the noise reduction of the current input image using the current noise profile to be accurate.

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8. Additional tools

8.1. Variants of filtration

When adjusting the Neat Image filter settings, you may want to compare different adjustments and select one that delivers the best visual results. You can of course manually make the adjustments and check preview after each adjustment, but it would be easier if you could prepare several variants of such adjustments and then quickly switch between their corresponding previews. Then it would be much simpler to visually evaluate and compare the results.

That is exactly what *variants of filtration* do in Neat Image. You can create up to four variants, each with its own set of filters settings, and quickly switch between them to evaluate their previews.

Here is how you can use variants of filtration (make sure the **Noise Filter Settings** tab is open):

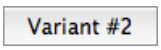
1 To create a new variant press and hold the button in the toolbar and select one of the available choices:

   a **Duplicate**
   a new variant will be a copy of the current variant (the current filter settings);
   you can then modify this new variant by adjusting the filter settings however you like, potentially making the new variant very different than the original one;

   b **Default Preset**
   a new variant will be based on the filter settings obtained via the **Default Filter Preset** setting in Neat Image **Preferences**;

   c **Select Preset** >
   a new variant will be based on the filter preset you select from the presets available on the disk (you select one of them using the context menu);

   d **Load Preset...**
   a new variant will be based on the filter preset you select from the presets available on the disk (you select one of them using the regular preset loading dialog).

   The new variant is added to the toolbar as a new button with the corresponding name, for example  .

   The new variant automatically becomes current: it receives a special shading on its button.

   When you make any adjustments to the filter settings, they are applied and kept within the current variant. So if you want to change filter settings in any other variant, then you need to select that variant first and only then make any adjustments of the filters.

2 To select one of the existing variants (to make it current) click the corresponding variant's button in the toolbar (or press the corresponding number button on the keyboard: **1**, **2**, ...). This will change the filter settings and preview to the selected variant.

   If you now change any filter settings, then the changes will be applied to the current variant.

3 To compare two variants (their previews) you can simply click their buttons to select them alternatively.

   There is also an easier and quicker way. If you **right-click** another (not the current) variant's button instead of doing a regular left-click, then the clicked variant is only temporarily selected and the selection returns to the previous variant once you release the right mouse button. This can be used to quickly switch between any two variants (the current one and an alternative one) for comparison purposes: the preview will change from one variant to another and you can easily compare them to decide which one is better.

4 To delete an unneeded variant use its corresponding remove button ( ).

5 When you are happy with one specific variant simply keep it current and it will then be used by Neat Image for actual processing.

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8.2. Alternative modes of image viewer

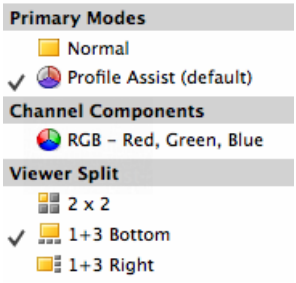
The image viewer in Neat Image can show the working image in several alternative modes to enable detailed examination of both channel and frequency components. Examining the components helps to find flat featureless image areas for noise analysis. Also, that allows to visually compare the original and filtered version of each component and to find optimum filter settings for the corresponding component easier and faster.

- Use

(**Viewer mode** button) in the viewer toolbar to select the desired viewer mode.

  The viewer mode will change accordingly and will display the image components separately or as one composite image.

  Examine individual channel and frequency components of the image, check the presence of noise in individual components. Working in the **Noise Filter Settings** tab, you can use the separately displayed components to identify those components that do not receive enough (or receive too much) noise reduction and adjust the corresponding filter settings.



You can also adjust the brightness of the viewer to easier see image details and noise in very dark or very bright areas of the image:

- Use (the viewer brightness controls) in the viewer toolbar to adjust and/or reset the viewer brightness to better see the noise and details in very dark or very bright areas of the image.

  Please note that this adjustment does not change the underlying image data in any way. The adjustment only affects the image viewer, i.e., the way the image is displayed in it.

8.3. Navigator

The image viewer has an additional **Navigator** panel, which offers an easy way to locate and navigate to an area of interest in a large image that does not entirely fit into the viewer, for example when you zoom into the image to see its fine details. When using **Navigator** you do not need to zoom out and then again zoom in (though such an approach to locating an area of interest can be used as well).

- Use (the **Navigator** button in top-left corner of the viewer), the **Tools** > **Navigator** menu item or press F8 to open or close the Navigator panel.
- Use the mouse pointer to drag the visible area frame (the red rectangle) to the desired part of the image within the **Navigator** panel. This will make the main viewer navigate to the same position in the image.

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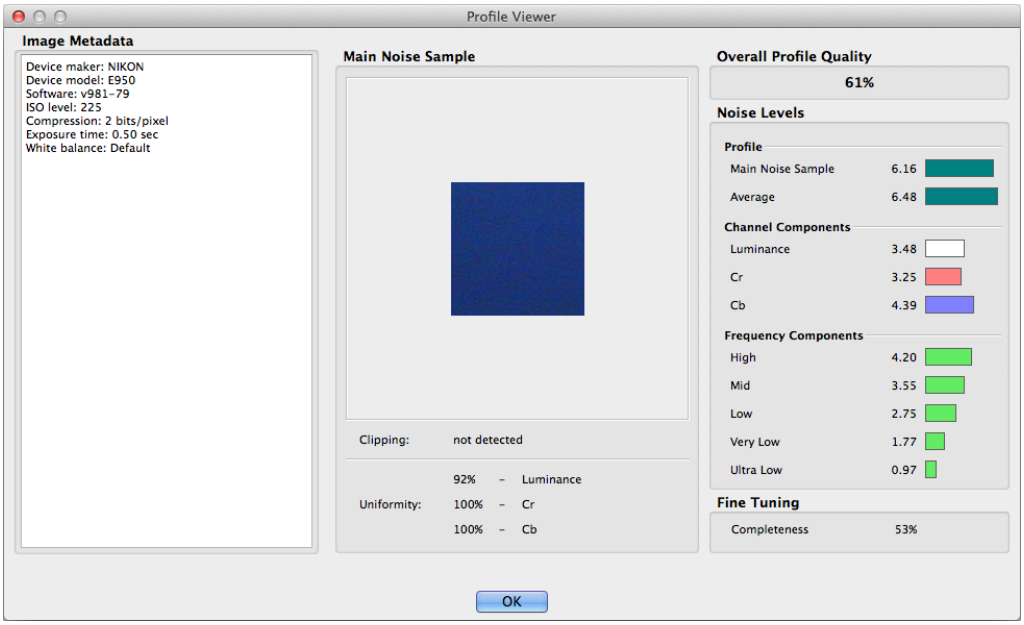
8.4. Profile Viewer

The **Profile Viewer** provides detailed information about the current noise profile.

➨ Use (the **Profile viewer** button) in the **Device Noise Profile** box in the **Device Noise Profile** tab to open the **Profile Viewer** window.



The **Profile Viewer** provides the following details:

- **Image Metadata** – this box contains the metadata (such as the EXIF information) associated with the image used to build this profile. This information is used by **Auto Match** to find a profile that matches an input image.
- **Main Noise Sample** – this is a noise sample (a crop from the image used to build this profile). The noise sample allows to visually evaluate the noise described by this profile. Also, you can easily see whether any details are present in this area, which would make the profile less accurate (only flat featureless areas without any details should be used for profiling, so the sample should normally contain no visible details).
- **Clipping** – this indicator tells whether there is any clipping in the analyzed image area. Clipping occurs when the sample contains pixels that are very close to or in fact are entirely white, entirely black or have exactly the same color/tone. Clipping reduces the overall profile quality.
- **Uniformity** – these values show how uniform the noise sample is in all color channels. The uniformity is low when any details are present in the area. Low uniformity reduces the overall profile quality.
- **Overall Profile Quality** – this is an estimation of the overall quality of the noise analysis contained in this profile. The higher this value the better this profile seems to be. A quality profile is necessary for quality noise reduction.
- **Noise Levels** – these figures show the actual noise levels measured during profiling. There are the noise level of the main sample, average noise level of the whole profile and noise levels of the channel and frequency components. These figures are a good indication of how noisy the image acquisition device is.
- **Fine-Tuning Completeness** – this indicator tells how well this profile is fine-tuned. Fine-tuning is a part of profiling process (both automatic and manual) and the more complete and accurate the fine-tuning the higher the overall profiling quality. If you work with Neat Image in **Advanced mode** then you can see that the more equalizer values are filled in with measured data the higher the overall profile quality is. You can improve the profile quality by additional fine-tuning.

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9. Preferences

There are several preferences that adjust the behavior of Neat Image plug-in for Photoshop (Mac).

Use the **Tools** > **Preferences...** menu item to open the **Preferences** dialog box.

9.1. General preferences

Auto zoom to fit on image open

Check this option to make the image viewer automatically adjust zoom level to fit the image into the window.

Show hints over interface controls

This option switches on/off the hints. The hints are displayed when the mouse pointer is placed over any control in the Neat Image interface.

Color Theme

Normal brightness

Neat Image will display its interface elements using the current color theme of the OS.

Reduced brightness

Select this option to switch Neat Image to a custom color theme with reduced brightness.

Updates

Periodically check for software updates

Neat Image can automatically access the Internet to check whether an updated version of the software is available on the webpage of Neat Image.

Unless this option is disabled, Neat Image will automatically look for updates every few days.

You can also manually run such a check using the **Check Now** button available there.

Neat Image will display the currently installed version of the software as well as the latest available version of the product that can be downloaded. When a newer version is available you can use the provided download link to visit the download area to download and install the updated version.

9.2. Defaults

Default Filter Preset

When you manually reset one or all filter settings using the reset buttons in the **Noise Filter Settings** panel, the settings are reset either to the default values pre-programmed in Neat Image or to the values provided by a user-defined filter preset.

- **Program's default settings**
  If this variant is selected, then Neat Image resets filter settings to its pre-programmed default settings.
- **Specified custom preset**
  If this variant is selected and a valid filter preset is specified, then the filter settings are reset to the values provided by the custom preset from the disk.

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9.3. Profiling preferences

Save noise samples in profiles

Enable this option to make Neat Image save a noise sample from the analyzed image area into device noise profile (***.dnp** file). This will increase the size of the ***.dnp** file, but will also improve the compatibility with the future versions of the software (Neat Image will be able to re-build the profile using the saved noise sample).

Show warnings about selected image area

Enable this option to let Neat Image display possible warnings about the selected image area during profiling. For example, Neat Image may warn you about clipping or non-uniformity detected in the selected area, thus helping you select a better area for profiling.

Smart Profile

Smart Profile is one of the possible ways to prepare a noise profile for an image filtration task. **Smart Profile** uses both **Auto Profile** and **Auto Match** (with **Auto Fine-Tune**) to prepare two candidate profiles and then selects the better one of two profiles.

Use the settings in the **Smart Profile** box to configure the behavior of the **Smart Profile** function.

Automatically select the best profile

Use this option to let Neat Image automatically decide which noise profile to use.

Prefer profile prepared by Auto Profile

Let Neat Image preferably select the profile prepared by **Auto Profile** when it can find a good area for analysis in the input image. When the area is not very good then Neat Image will use the profile prepared by **Auto Match** with **Auto Fine-Tune**.

Prefer profile prepared by Auto Match and Auto Fine-Tune

Let Neat Image preferably select the profile prepared by **Auto Match** when it can find a matching profile among the pre-built noise profiles, even when **Auto Profile** provides a good profile as well.

9.4. Matching preferences

9.4.1. Profile Matching

Use profile matching preferences to adjust the way Neat Image matches noise profiles to input images.

Look for noise profiles in the following folder

If you select this option then Neat Image will look for matching noise profiles in the specified folder. If you have several sub-folders with profiles, select the topmost folder of all those subfolders to let Neat Image search in all of them.

By default, the folder used to store profiles (see the **Folders** > **Profile** folder setting in the same **Preferences** window) is used for matching. You can use any other (sub-)folder for profile matching as well.

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Matching parameter priorities

To automatically match profiles for the input image, Neat Image compares the device parameters of the input image and candidate profiles selected from the folder specified by the above options. Different parameters usually have to be matched with different priorities. Using **Matching parameters priorities** controls, you can select the priorities of such parameters as **Input device, ISO rate, Compression, Resolution, Sharpness, Exposure**:

- **Match** - the parameter should match exactly;
- **High** - it is highly important that the parameter is very close or matches exactly;
- **Low** - it is preferable that the parameter is close or matches exactly;
- **Ignore** - the parameter is not important at all.

9.5. Preview preferences

Preview

Limit preview size

This option allows to limit the maximum size of the automatic preview area (the preview area selected by Neat Image itself when you do not select any area manually). Limiting the preview size can be useful because updating a smaller area is faster than updating preview for the whole image. Also, preparing a larger preview requires more memory resources, which may be a significant factor on machines with small amounts of memory resources.

By default, this option is enabled, so if you work with a large image, then the preview is limited to a part of the image. That limitation only affects the preview, while the final image is processed fully. You can always adjust the limit upwards or downwards, depending on your needs.

If you disable this option completely, then there will be no limit at all and the whole image will be processed for preview.

9.6. Performance preferences

The first group of settings in this tab selects the computing devices to be used for image processing. This group of settings is optional, it is shown only if at least one supported GPU (graphics processing unit) is available along with the regular CPU (central processing unit, or processor). This group includes the following items:

Use CPU only

This option makes Neat Image perform all image processing using only CPU.

Use GPU only

This option makes Neat Image perform all image processing using only GPU when possible.

Use CPU and GPU

If you select this option then Neat Image will process images using both CPU and GPU.

Depending on individual performance of each computing device (CPU and GPU), each of the above options may be the most efficient. You can try different settings and measure the resulting speed using the **Benchmark** tool below.

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CPU

Number of used cores

This option adjusts the number of CPU cores used by Neat Image for processing. The number of used cores can go up to the total number of cores in all CPUs in your computer (like 4 cores in Core i3 with enabled hyperthreading, 8 cores in a desktop version of Core i7, etc.). If the computer includes two physical CPUs then the number of cores is correspondingly higher. Ideally, using all cores should provide the best overall performance. In some cases however, the best processing speed may be achieved if fewer cores are used (especially on CPUs with hyperthreading). For example, using fewer than all 8 virtual cores in a Core i7 is in some cases faster, so you may want to test different values of this setting.

GPU

In this box, you can specify which of the available computation-capable GPU devices (CUDA-capable NVIDIA cards and/or supported OpenCL-capable AMD/ATI cards) should be used for image processing (in addition to CPU or instead of CPU). When you have one or more GPUs, you can allow Neat Image to use it and specify how much GPU memory may be used for Neat Image's image processing. When you also run other software that uses the GPU, you may want to allow Neat Image to use only a part of the available GPU memory and leave some part of it free for the other software. When you are not sure, try different values and see which setting gives the best overall results in terms of performance.

Check Speed

Use the **Check Speed** button to measure the image processing speed with the current settings specified in the CPU and GPU boxes.

Optimize Settings

Use the **Optimize Settings...** button to open a specialized dialog designed to measure image processing speeds achieved with different combinations of the CPU and GPU settings. It allows to automatically benchmark all possible combinations of settings and to identify the best combination. This is the easiest way to optimize the performance of Neat Image for specific CPU and GPU hardware.

GPU Troubleshooting

Use the **GPU Troubleshooting...** button to open a specialized dialog designed to check the GPU detection details and if necessary disable all use of the NVIDIA CUDA and/or AMD/ATI OpenCL GPU by Neat Image. Disabling all use of GPU by Neat Image may be useful if the GPU driver is faulty or unstable or if using the GPU by Neat Image causes any other problems.

9.7. Folder preferences

Profile Folder

Select the folder where Neat Image must look for device noise profiles. This should be the topmost folder of all the (sub)folders with device noise profiles. Neat Image will display all profiles (stored in all subfolders of the specified folder) in the popup menu in the **Device noise profile** panel of the plug-in window and in other parts of Neat Image.

By default, the **Profile folder** is located in your home folder:
/Users/<username>/Documents/Neat Image v8 for Photoshop/Profiles/

You can select another location to store and use your Neat Image profiles if you prefer.

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Preset Folder

Select the folder where Neat Image must look for filter presets. This should be the topmost folder of all the (sub)folders with filter presets. Neat Image will display all presets (stored in all subfolders of the specified folder) in the popup menu in the **Filter Settings** panel of the plug-in window and in other parts of Neat Image.

By default, the **Preset folder** is located in your home folder:
/Users/< username>/Documents/Neat Image v8 for Photoshop/Presets/

You can select another location to store and use your Neat Image presets if you prefer.

Show preset description on load

Enable this option to make Neat Image show the description of the filter preset when you load it from the disk. The descriptions available in some presets (for example, in presets supplied with Neat Image) is intended to help you get a better understanding of the purpose, applicability and possible side effects of the preset.

Folder History

Use independent load and save folders

Enable this option to make Neat Image use independent folders in its file open and save dialogs. If disabled (the default setting), a save dialog will show the folder where the object (for example, a noise profile) was loaded from.

Use independent folders for profiles and presets

Enable this option to make Neat Image use independent folders in its file dialogs for different types of objects: noise profiles and filter presets. If disabled, Neat Image's file dialogs will open the same folder when working with different types of objects. By default, this option is enabled.

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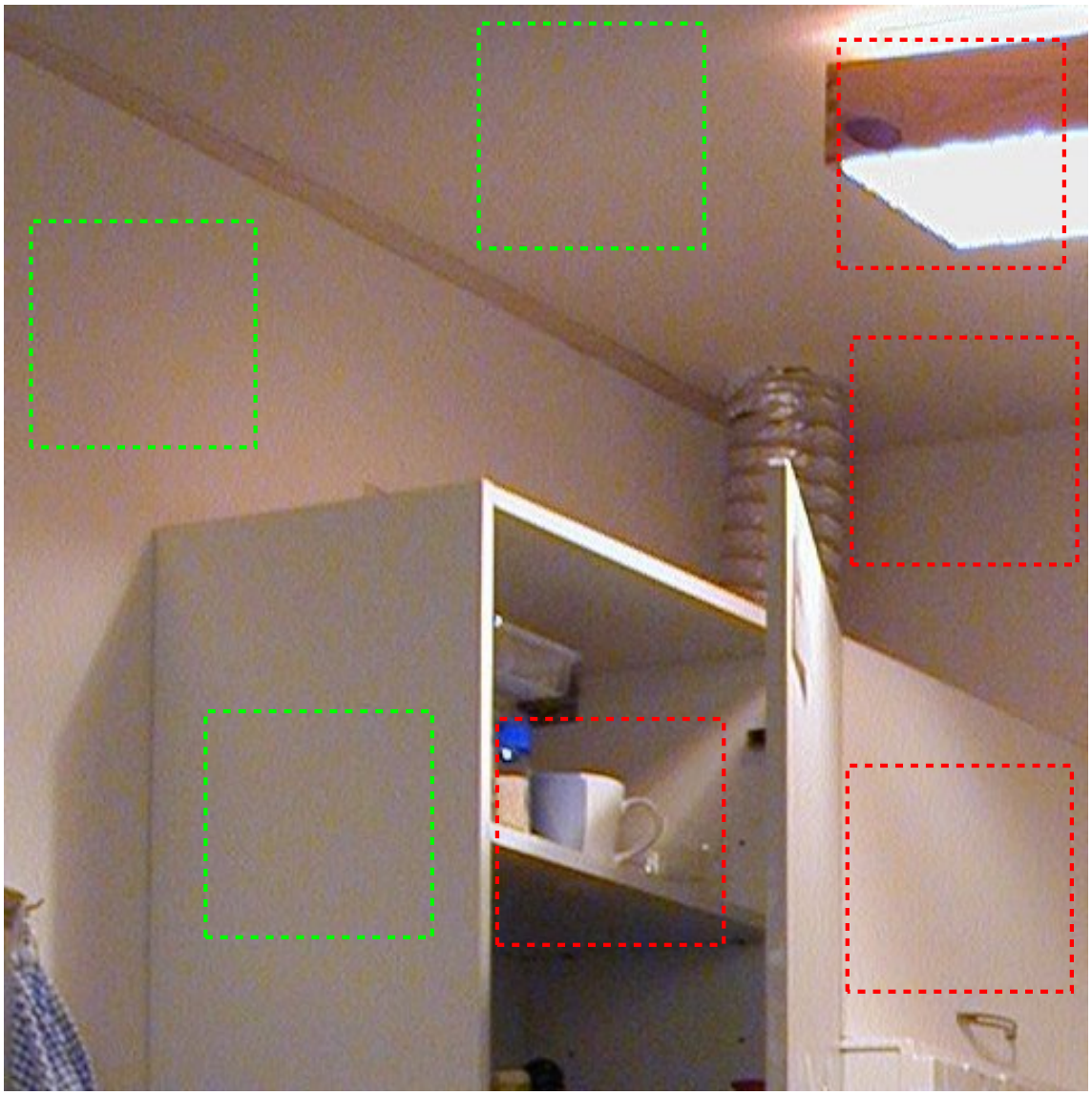
10. Examples

10.1. Images to build a noise profile

The image below contains examples of areas that are “good” and “bad” from the standpoint of profiling. Here, ”good” image areas are highlighted in green, these should be at least 32x32 pixels large, preferably more than 128x128 pixels; “bad” ones are highlighted in red. If the input image you have does contain similar “good” flat featureless noise-only areas as shown in the example then you can be sure that **Auto Profile** will produce an accurate noise profile. However, if there are no such flat featureless areas in the input image, then **Auto Profile** will not work well because building a profile using an area containing details produces an inaccurate profile that will then lead to very inaccurate filtration. In such a case, you can build a noise profile using an alternative image containing flat featureless areas or you can use a shot of the Calibration Target taken by the same camera working in the same mode.



Additional comments regarding the “good” and “bad” areas in this example are available in the next page.

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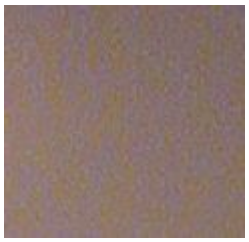
These image areas are good to build device noise profiles, as they contain no visible details



— **GOOD**, because this area contains no important details

— **GOOD**, no important details (this area is from another image)

Examples of “bad” areas that contain visible details:

— **BAD**, because this area contains a detail: corner – junction of wall and ceiling

— **UNACCEPTABLE**, because this area contains many details

— **BAD**, because this area contains some details: some gradients caused by differences in illumination of the area

See more examples of building noise profiles on the Neat Image web page:
https://ni.neatvideo.com/support/how-to-use/device-noise-profiling

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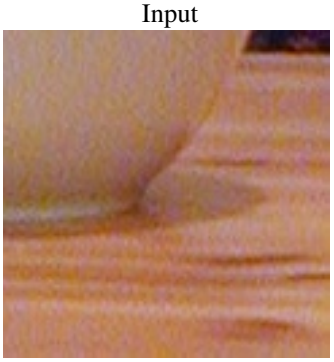
10.2. Filtration results

Here are some examples of Neat Image performance.

Input

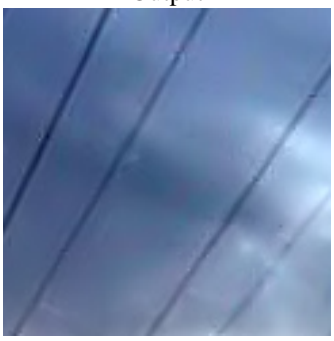


Output

This is a small portion of a digital photo taken with a compact digital camera. The original image contains easily visible noise. In this case, the source of noise is the camera's image sensor (CCD) working in high ISO mode.

Input

Output



This image was also taken with a different digital camera. Along with the strong high ISO noise, there is an image degradation caused by the JPEG compression. Even though Neat Image tries to do its best to clean up such images, please avoid using strong JPEG compression.

See more filtration examples in the Neat Image web page: https://ni.neatvideo.com/examples

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11. Questions and answers

11.1. General questions

Q **What is the difference between Neat Image Demo, Home and Pro editions of Neat Image?**

A Different editions have different functional capabilities and limitations as described by the Detailed feature map, page 59.

Q **Should I uninstall Demo edition prior to installing the Home / Pro edition?**

A This is not necessary. You can install the Home / Pro edition over the Demo edition. Please make sure Neat Image is completely closed when you install the Home / Pro edition.

Q **Should I uninstall the older version of Neat Image prior to installing a newer one?**

A This is not necessary. You can simply install a newer version of Neat Image. It will either replace the old one or will be available along with the old one (depending on the version).

Q **I think I have found a bug. How can I submit a bug report?**

A Please use the online bug report form: https://ni.neatvideo.com/support/report-bug
Please fill it out to let us know all the details necessary to reproduce the problem.

See more information about bugs in the **Known issues** section in Neat Image webpage (https://ni.neatvideo.com/support/known-issues) and about bug fixes in the ***WhatsNew.txt*** file supplied with the software (also see the history section on the web page for the most up to date information: https://ni.neatvideo.com/features/version-history/ni8ps?os-tab=osx).

11.2. Filtration-related questions

Q **Why do I receive some crystal-like artifacts in the filtered image?**

A The crystal-like artifacts (usually these are the residual compression artifacts or residual noise) look like thin lines in the filtered image. They can be eliminated by increasing the (high frequency) noise level in the filter settings or by using the dedicated **Artifact Removal** filter described in page 23.

Note: presence of many residual artifacts may be caused by using a poorly built, inaccurate noise profile or a profile built for another device and/or device mode. Therefore the solution could be re-building the noise profile.

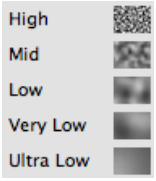
Q **Filtered image looks 'plastic'. Why?**

A The reason is that too much filtration has been applied. Let Neat Image keep some noise to produce more natural-looking results. Adjust the noise reduction amounts; for example, set the **Noise Reduction Amount**: **Luminance** control to 30-50%. Also, make sure the device noise profile does match the input image processed. Using an incorrectly chosen or poorly built noise profile can either produce plastic-looking results or leave residual artifacts (see the previous question).

Q **What is frequency?**

A The term (spatial) *frequency* is used in Neat Image to denote elements of an image (both important details and noise/grain) of certain size.

High frequency corresponds to elements of smallest size. *Medium (mid) frequency* corresponds to elements of medium size. *Low, Very Low and Ultra Low frequency* correspond to elements of correspondingly larger sizes.



For reference, see the noise samples of different frequencies in the **Noise Filter Settings** tab of the **Neat Image** window.

Q **The filtration process is not very fast, is this normal?**

A This is normal, because the Neat Image noise reduction algorithms are quite complex. We work on further optimization to provide better performance.

Q **How to filter only the color noise (not the luminance noise)?**

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A Set the **Noise Reduction Amount**: **Luminance** control to 0%. This will disable the noise filter in the luminance (brightness) channel.

Q What is YCrCb?

A YCrCb is the name of a family of color spaces widely used in digital imaging, television, video, etc. In 'YCrCb' , 'Y' corresponds to the luminance channel , 'Cr' – to the Cr chrominance channel covering the red to blue-green color range, 'Cb' – to the Cb chrominance channel covering the blue to yellow color range. Because this space separates the luminance and chrominance information, it is used for noise reduction where different processing is required in the luminance and chrominance channels.

Q Is processing via Neat Image best done before or after any other processing (i.e. tonal/color correction)?

A Such operations as tonal/color correction are quite conservative from the standpoint of noise, that is they do not significantly change the noise characteristics of the image. Therefore, reducing noise before or after makes little difference – as long as the noise profile is built and applied at the same stage of your workflow. For example, do not use a noise profile built with an unprocessed (the color correction is not yet applied) image to filter the same image after the color correction has been applied.

On the other hand, certain effects, like sharpening or resampling, applied to a noisy image may considerably change its noise properties. In this sense, it is generally better to use Neat Image noise reduction before applying such effects.

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12. Tips and tricks

12.1. Preventing banding

In some cases, the banding effect may appear when applying the noise filter to images with faint brightness gradients. This effect is quite rare for normal images.

To avoid banding, try to reduce the noise reduction amount for the high frequency component to 50% or lower to preserve some high frequency noise in the image.

Another option is to process the image in higher bitdepth.

12.2. Filtration of shadow areas

In some situations, it is preferable to filter only the shadow areas of images leaving bright areas intact. You can do this by using the noise profile equalizer (available in the **Device Noise Profile** panel when working in **Advanced Mode**) to limit or stop filtration of bright image areas.

The graph nodes in the noise profile equalizer correspond to particular ranges of brightness (individually for each color channel) of the RGB color space. The vertical position of each node reflects the noise level in the corresponding range of brightness. So, the lower a node is, the less filtration will eventually be applied to image elements that belong to the corresponding range of brightness.

Therefore, to filter only shadows you can manually move all the 'bright' nodes down (refer to the gradients in the bottom of the noise profile equalizer to see which brightness level they correspond to). For example, move down all but the three 'darkest' nodes in each RGB channel.

Using this method, you can effectively prevent filtration of the bright image areas.

12.3. Partial filtration

Some images contain both noisy and clean areas and it may be preferable to filter only noisy areas. This can be manually done by combining two images – original and filtered one – in an image editor. For example, the following steps can be used:

1. Open the input image in your image editor;
2. Copy the input image in a new layer on top of the original image;
3. Apply Neat Image noise reduction to the top layer;
4. Adjust the transparency of the top layer so that noisy areas look fine;
5. Select and delete the areas of the top layer where filtration is not necessary or excessive (you may want to use the eraser tool with adjustable transparency and shape).

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13. Information

13.1. Issues and bugs

Please report any bugs or issues you encounter while working with Neat Image. Use the online bug report form: https://ni.neatvideo.com/support/report-bug.

Your feedback will greatly help us to improve the software and provide you with newer and better versions of Neat Image.

13.2. Plans

The current version of Neat Image is the result of our ongoing research on noise filtration. We continue to work on the core noise reduction algorithms to improve the quality and speed of noise reduction.

Please let us know if you have ideas that can make Neat Image better. Please participate in the discussions taking place in the Neat Image forum: http://www.neatimage.net/forum/

Express your opinion, make suggestions and ask questions.

13.3. Detailed feature map

Features		**Neat Image**		
		Demo plug-in	**Home plug-in**	**Pro plug-in**
Use for commercial purposes		not allowed	not allowed	allowed
Image processing	8 bit/channel (24-bit RGB, 8-bit Grayscale)	+ [1]	+	+
	16 bit/channel (48-bit RGB, 16-bit Grayscale)	–	–	+
	32 bit/channel (96-bit RGB, 32-bit Grayscale)	–	–	+
Workflow	Support for Photoshop actions and smart filters	–	–	+
	File formats supported	all formats supported by plug-in host		
Device noise profiles	Automatic and semi-automatic profiling	+		
	Manual profiling of any imaging devices	+		
	Automatic matching profiles to input images	+		
Noise reduction	Channel components (Luminance, Cr, Cb)	+		
	Frequency components (High, Mid, Low, Very low, Ultra Low)	+		
Smart sharpening	Channel components (Luminance, Cr, Cb)	+		
	Frequency components (High, Mid, Low)	+		
Filter presets (reusable filter settings)		+		

13.4. Contacts

We really appreciate your opinion of Neat Image. Please let us know what you think about the software. Feel free to ask questions regarding Neat Image. You can contact us using the following means:

E-mails

info@neatimage.com	for general inquiries about Neat Image
photoshop-mac@neatimage.com	for technical questions regarding Neat Image plug-in for Photoshop (Mac)
sales@neatimage.com	for inquiries regarding purchase and licensing of Neat Image

[1] A limited part of the input image is processed if the image is larger than 1600x1600 pixels.

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Forum

Register in the Neat Image community forum (http://www.neatimage.net/forum/) and participate in discussions related to the use and development of Neat Image. The discussions there cover such topics as:

- announcements of new and updated version of the software;
- questions about use of Neat Image;
- examples of using Neat Image with comments and suggestions;
- feedback from the users: suggestions of new features and improvements;
- general comments;
- backup contacts.

Web page

https://ni.neatvideo.com

13.5. Legal information

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13.6. Registration

To become a registered user and to get a fully functional copy of Neat Image Home or Pro edition you need to purchase a license (a single- or multi-user license). Please find the detailed information in the Purchase section of the Neat Image web page: https://ni.neatvideo.com/purchase

After purchasing a license, you receive an e-mail from the Neat Image team with detailed download and registration instructions. Using those you will be able to download, install and register the software on your computer.

By becoming a registered user of Neat Image Home or Pro edition you will:

- Encourage the authors to further improve the software and make it better suited for your needs;
- Get access to all functions of Neat Image Home or Pro edition (see the Detailed feature map, page 59);
- Pro edition only: be able to use Neat Image for commercial purposes;
- Get free updates of the software (minor modifications with the same major version number, for example, updates from the version v8.0 to any v8.x);
- Enjoy reduced upgrade prices for new major versions of Neat Image, for example when upgrading from v7 to v8;
- Receive the primary attention of Neat Image support group;
- Receive the primary attention of Neat Image development group (tell us what you want to see in the next update or new version).

Message from Neat Image team

By purchasing our product you are helping us to further develop and improve the software.

Become a registered user and we will make Neat Image better for YOU!

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13.7. Acknowledgments

Neat Image utilizes the IJG JPEG library developed by the Independent JPEG Group. Neat Image utilizes the openTIFF library developed by George Sotak. Neat Image utilizes the zlib library developed by Jean-loup Gailly and Mark Adler. Neat Image utilizes the libpng library developed by Glenn Randers-Pehrson.

Thank you to all the users who contribute by proposing improvements and new features. Thanks to all the people who help us to find bugs in Neat Image. Thank you to all the users who stimulate the development of Neat Image by their word and deed. It wouldn't be Neat without all of you!

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