

CLAIMS:

1. A system, comprising:
 - an imaging apparatus configured to capture images of a specimen on a background; and
 - a computing system in communication with the imaging apparatus, the computing system comprising one or more processors and a memory, the memory having programming coded thereon, which, when executed by the one or more processors, causes the computing system to perform operations comprising:
 - obtaining, by the computing system, a set of images of the specimen from the imaging apparatus, wherein the set of images includes at least two images of the specimen against the background;
 - denoising, by the computing system, the set of images by inputting the set of images of the specimen into a denoising model, the denoising model configured to output a single denoised image of the specimen; and
 - generating, as output from the denoising model, the single denoised image of the specimen.
2. The system of claim 1, wherein the operations further comprise:
 - generating, by the computing system, a synthetic data set for training the denoising model, the synthetic data set comprising a plurality of synthetic images and, for each synthetic image, a plurality of noisy images derived from the respective synthetic image; and
 - training, by the computing system, the denoising model to denoise a target set of images based on the synthetic data set.
3. The system of claim 2, wherein the operations further comprise:
 - generating, by the computing system, an empirical data set for finetuning the denoising model following the training; and
 - finetuning, by the computing system, the denoising model based on the empirical data set.
4. The system of claim 3, wherein generating, by the computing system, the empirical data set for finetuning the denoising model following the training comprises:
 - generating a plurality of geometric objects to be placed inside a background image for capturing by the imaging apparatus; and

receiving, from the imaging apparatus, a plurality of finetuning images based on the plurality of geometric objects placed inside the background image, the plurality of finetuning images defining the empirical data set.

5. The system of claim 4, wherein the operations further comprise:
introducing shape irregularities to the plurality of geometric objects placed inside the background image.
6. The system of claim 1, wherein the denoising model is a convolutional neural network comprising a downsampling portion followed by an upsampling portion.
7. The system of claim 1, wherein the computing system is a component of the imaging apparatus.
8. A method comprising:
obtaining, by a computing system, a set of images of a specimen from an imaging apparatus, wherein the set of images includes at least two images of the specimen against a background;
denoising, by the computing system, the set of images by inputting the set of images of the specimen into a denoising model, the denoising model configured to output a single denoised image of the specimen; and
generating, as output from the denoising model, the single denoised image of the specimen.
9. The method of claim 8, further comprising:
generating, by the computing system, a synthetic data set for training the denoising model, the synthetic data set comprising a plurality of synthetic images and, for each synthetic image, a plurality of noisy images derived from the respective synthetic image; and
training, by the computing system, the denoising model to denoise a target set of images based on the synthetic data set.
10. The method of claim 9, further comprising:
generating, by the computing system, an empirical data set for finetuning the denoising model following the training; and

finetuning, by the computing system, the denoising model based on the empirical data set.

11. The method of claim 10, wherein generating, by the computing system, the empirical data set for finetuning the denoising model following the training comprises:

generating a plurality of geometric objects to be placed inside a background image for capturing by the imaging apparatus; and

receiving, from the imaging apparatus, a plurality of finetuning images based on the plurality of geometric objects placed inside the background image, the plurality of finetuning images defining the empirical data set.

12. The method of claim 11, further comprising:

introducing shape irregularities to the plurality of geometric objects placed inside the background image.

13. The method of claim 8, wherein the denoising model is a convolutional neural network comprising a downsampling portion followed by an upsampling portion.

14. The method of claim 8, wherein the computing system is a component of the imaging apparatus.

15. A non-transitory computer readable medium comprising one or more sequences of instructions, which, when executed by one or more processors, causes a computing system to perform operations, comprising:

obtaining, by the computing system, a set of images of a specimen from an imaging apparatus, wherein the set of images includes at least two images of the specimen against a background;

denoising, by the computing system, the set of images by inputting the set of images of the specimen into a denoising model, the denoising model configured to output a single denoised image of the specimen; and

generating, as output from the denoising model, the single denoised image of the specimen.

16. The non-transitory computer readable medium of claim 15, further comprising:

generating, by the computing system, a synthetic data set for training the denoising model, the synthetic data set comprising a plurality of synthetic images and, for each synthetic image, a plurality of noisy images derived from the respective synthetic image; and

training, by the computing system, the denoising model to denoise a target set of images based on the synthetic data set.

17. The non-transitory computer readable medium of claim 16, further comprising:

generating, by the computing system, an empirical data set for finetuning the denoising model following the training; and

finetuning, by the computing system, the denoising model based on the empirical data set.

18. The non-transitory computer readable medium of claim 17, wherein generating, by the computing system, the empirical data set for finetuning the denoising model following the training comprises:

generating a plurality of geometric objects to be placed inside a background image for capturing by the imaging apparatus; and

receiving, from the imaging apparatus, a plurality of finetuning images based on the plurality of geometric objects placed inside the background image, the plurality of finetuning images defining the empirical data set.

19. The non-transitory computer readable medium of claim 18, further comprising:

introducing shape irregularities to the plurality of geometric objects placed inside the background image.

20. The non-transitory computer readable medium of claim 15, wherein the denoising model is a convolutional neural network comprising a downsampling portion followed by an upsampling portion.