



Convolutional Neural Networks for Digital Signal Processing

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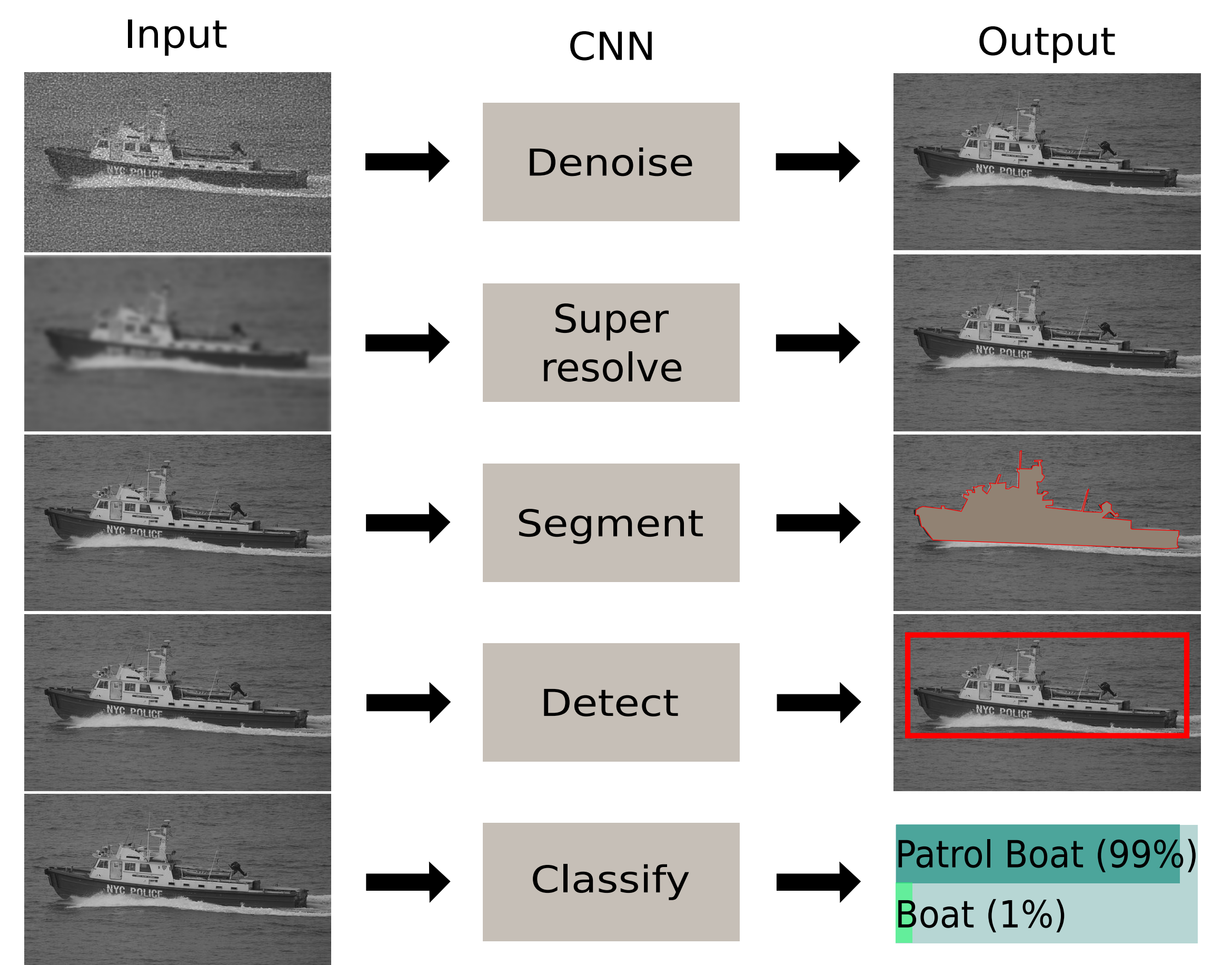
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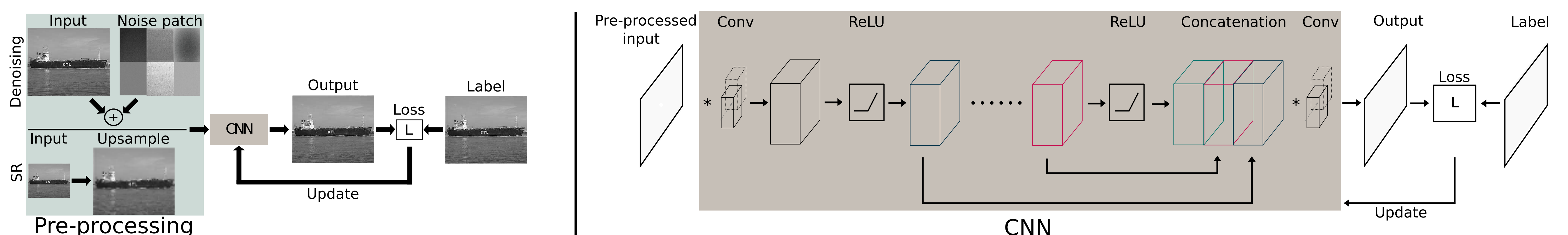
Convolutional Neural Network

- ▷ Layered trainable structure
- ▷ Applied on multi-dimensional data
- ▷ Provides high level features
- ▷ Offers generalized parametric solutions
- ▷ Used in multiple applications

CNN architectures can be tuned to solve many signal processing and computer vision applications including image quality enhancement, object classification, and segmentation. Simple yet versatile networks can be used to solve different application-specific problems. The following section focusses on image enhancement.



Denoising and Superresolution

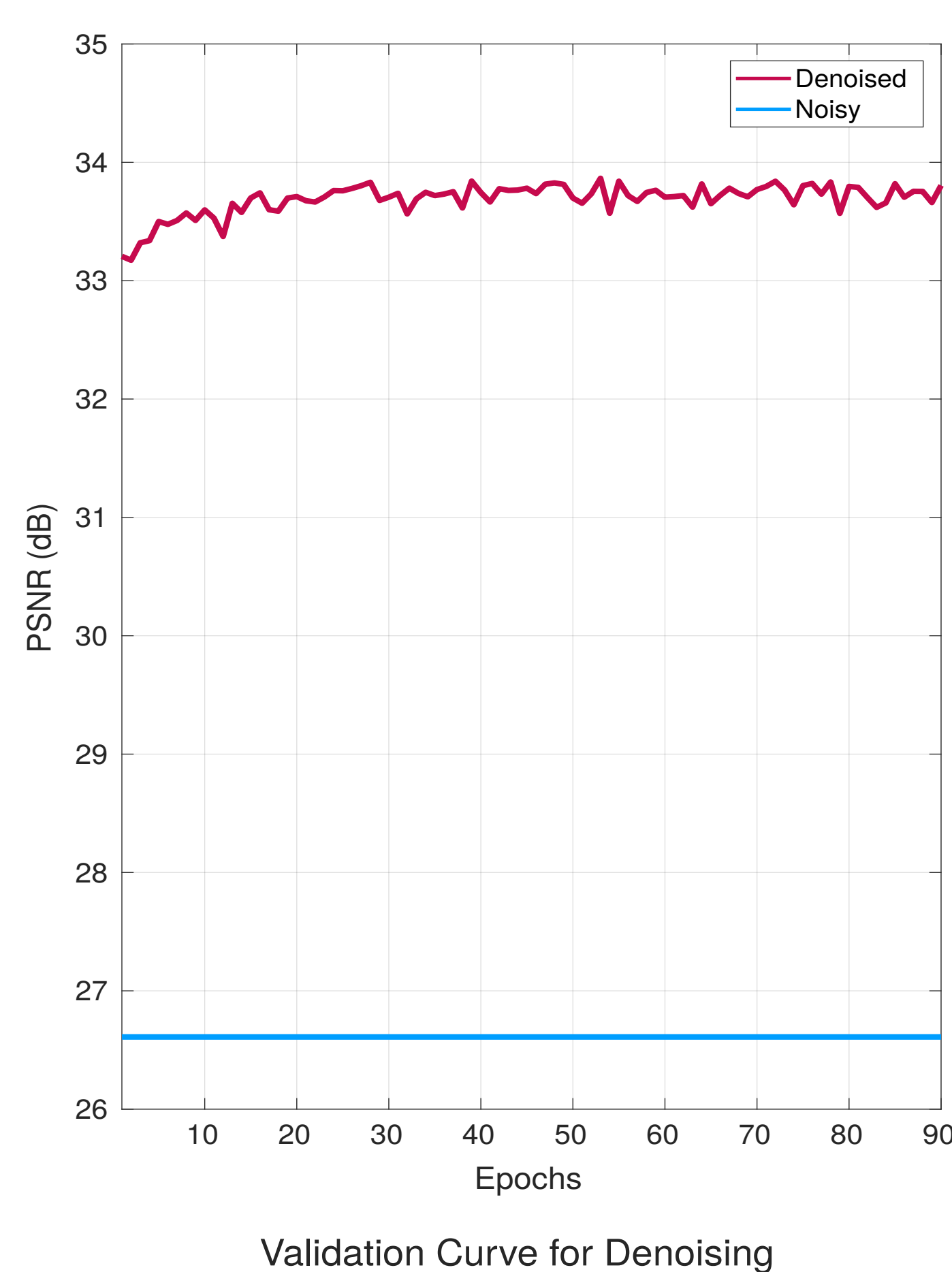


Pre-processing and Training

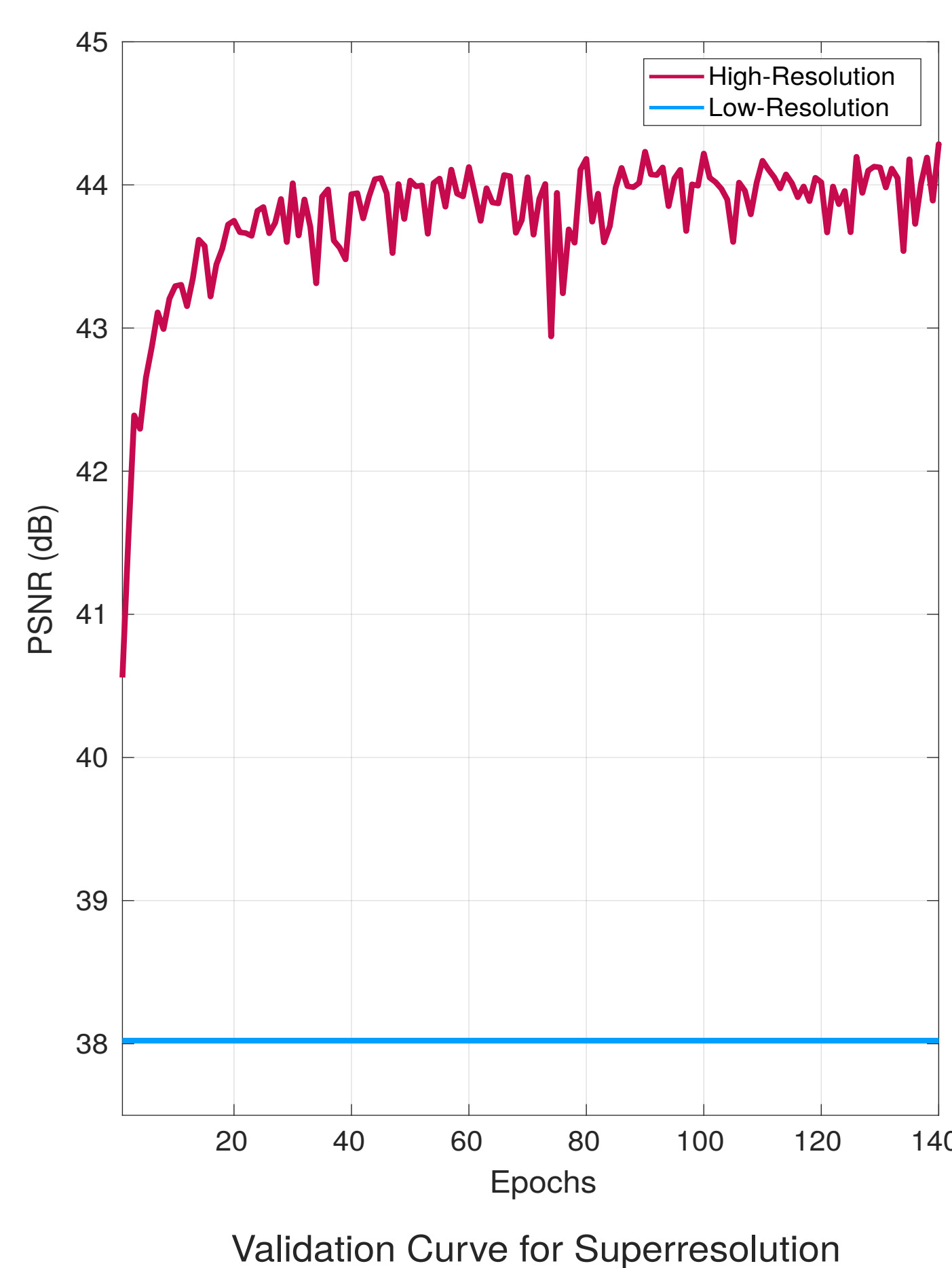
- ▷ Patches are extracted from the noisy images to model additive noise for denoising application.
- ▷ Superresolution and denoising applications are trained separately with residual and non-residual networks of 6 convolutional layers, with patches from less than 400 training images.

Conclusion

- ▷ Shallow networks require less time for training, validation and testing.
- ▷ Improvements are achieved with small training dataset in small number of epochs.
- ▷ Networks are generic and can be scaled to train image representations from other areas of application.



Validation Curve for Denoising



Validation Curve for Superresolution

