**SRCNN**

* Dong et al. first proposed a super-resolution convolutional neural network, which models a nonlinear mapping from LR images to HR images in an end-to-end manner.
* Their method does not require any specialized knowledge and shows good results.
* Since then, many methods based on deep learning have been developed.
* Dong et al. first proposed a preprocessed method by interpolating the input image.
* However, it results in increasing computation cost because all convolution operations are computed on the high-resolution space.
* And the interpolation operation does not introduce new information.
* Different from the conventional learning-based methods, SRCNN directly learns an end-to-end mapping between LR and HR images, leading to a fast and accurate inference.
* SRCNN aims at learning an end-to-end mapping function F between the bicubic interpolated LR image Y and the HR image X.
* The network contains all convolution layers, thus the size of the output is the same as that of the input image.
* The overall structure consists of three parts that are analogous to the main steps of the sparse-coding-based methods [1].
* The patch extraction and representation part refers to the ﬁrst layer, which extracts patches from the input and represents each patch as a high-dimensional feature vector.
* The non-linear mapping part refers to the middle layer, which maps the feature vectors non-linearly to another set of feature vectors, or namely HR features.
* Then the last reconstruction part aggregates these features to form the ﬁnal output image.

**DISADVANTAGES OF SRCNN**

* Its limitations in three aspects: ﬁrst, it relies on the context of small image regions.
* Second, training converges too slowly.
* Third, the network only works for a single scale.
* Dong et al. attempted to prepare deeper models, but failed to observe superior performance after a week of training. In some cases, deeper models gave inferior performance. They conclude that deeper networks do not result in better performance (Figure 9).
* One possibility to improve SRCNN is to simply stack more weight layers as many times as possible. However, this significantly increases the number of parameters and requires more data to prevent overfitting.