Hands-on Exercise 2: Experimenting with Convolution

In this brief hands-on exercise you use the interactive graphical convolution demo.[1]

- Scroll downwards until you see the convolution demo window. The window consists of a 1D (signal) part (left) and a 2D (image) part. For both the 1D and 2D signals the upper panes show the source signals and the bottom panes the signal after convolution. For the 1D signal, the convolution kernel is either predefined or can be specified by selecting “custom” and draw with the mouse on the drawn kernel. By pressing normalize, the kernel coefficients are rescaled to equate the total energy in the source and convolved signals. (Checking animate will show an animation of the convolution operation.)

1D convolution

- Select each of the 5 pre-defined kernels (rect, big rect, gaussian, sharpen, and shift) and examine its effect on the source signal.
- Select the “custom” option and explore how different shapes affect the resulting convolved signal.

2D convolution

- Select each of the 6 pre-defined kernels (rect, big rect, gaussian, sharpen, edges, shift and hand shake), examine the corresponding coefficients, and examine the effect of applying the selected kernel on the source image. Make sure to compare the effects for different images (use select image button).
- Select the “custom” option and explore how different filter coefficients affect the resulting convolved signal. Please note that a convolutional neural network learns the coefficients of its convolutional kernels.

[1] requires Adobe Flash plug-in