DATA.ML.300 Computer Vision Exercise Template

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1a.

$$x_1 = \begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix}; x_2 = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}; x_3 = \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}; x_4 = \begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix};$$

1b.

$$l_1 = x_1 \times x_2 = \begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix} \times \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} = \begin{pmatrix} 0.1 - 1.(-1) \\ 1.2 - (-1).1 \\ (-1).(-1) - 0.2 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \\ 1 \end{pmatrix}$$

$l_1 : x^{(1)} + 3.x^{(2)} + 1 = 0$ (in Cartesian)

$$l_2 = x_3 \times x_4 = \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix} \times \begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 1.1 - 1.0 \\ 1.2 - 0.1 \\ 0.0 - 1.2 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix}$$

$l_2 : x^{(1)} + 2.x^{(2)} - 2 = 0$ (in Cartesian)

1c.

$$\tilde{x}_{int} = l_1 \times l_2 = \begin{pmatrix} 1 \\ 3 \\ 1 \end{pmatrix} \times \begin{pmatrix} 1 \\ 2 \\ -2 \end{pmatrix} = \begin{pmatrix} 3.(-2) - 1.2 \\ 1.1 - 1.(-2) \\ 1.2 - 3.1 \end{pmatrix} = \begin{pmatrix} -8 \\ 3 \\ -1 \end{pmatrix} = -1. \begin{pmatrix} 8 \\ -3 \\ 1 \end{pmatrix}$$

$x_{int} = (8, -3)$ (in Cartesian)

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Result of exercise 2

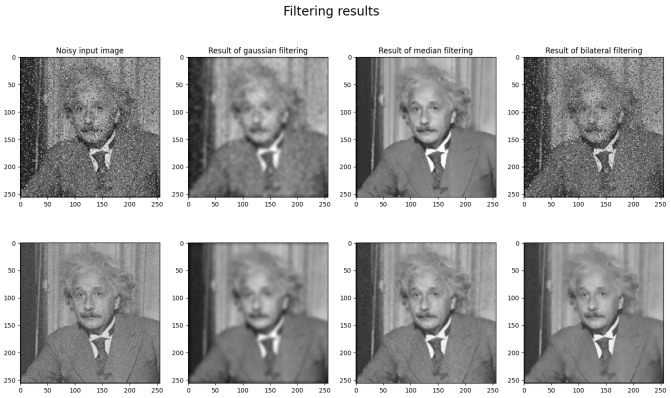

Figure 1: Filtering result for multiple filters

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Result of exercise 3

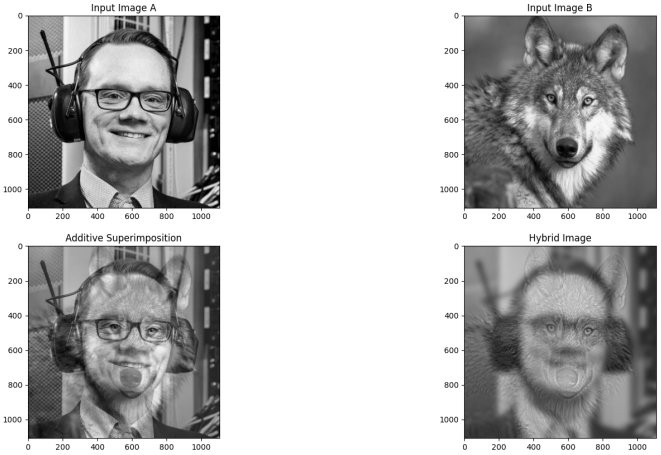

Figure 2: Filtering result for multiple filters

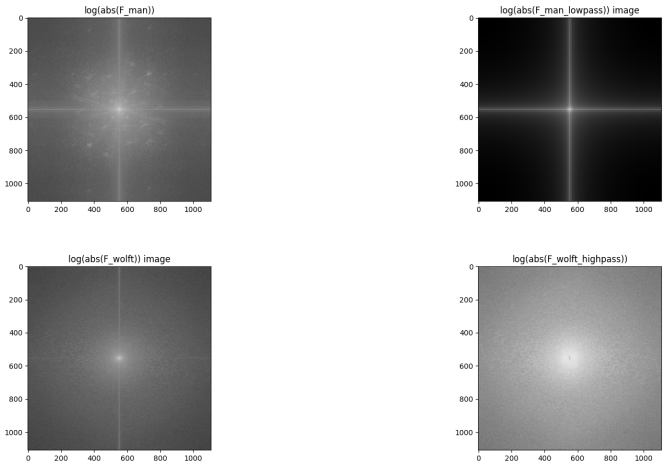

Figure 3: Fourier transform visualization