Select one project related to spectral analysis, digital filters, and computational intelligence, and describe the selected topic in standard form including introduction, methodology, results, discussion, and references.

1 EEG DATA PROCESSING

Find spectral components of the given EEG signal segment and apply digital filters to remove the frequency component of 50 Hz. Given signal "EEG_19noise.mat" was acquired with the sampling frequency of $f_s = 200\,Hz$. Apply the low-pass ($f_c = 45\,Hz$) and the stop-band filter ($f_{c1} = 45\,Hz\ \ f_{c2} = 55\,Hz$) for

- FIR filtering of selected orders to reject the noise component and compare these results with those by the Butterworth IIR filter of the 4th order,
- frequency domain filtering.

Use one of the following channels and given ranges:

DSP1.1	Channel 3, range 3001-3500	DSP1.7	Channel 8, range 3001-4000
DSP1.2	Channel 8, range 3001-3500	DSP1.8	Channel 16, range 4001-5000
DSP1.3	Channel 16, range 4001-4500	DSP1.9	Channel 17, range 4001-5000
DSP1.4	Channel 17, range 4001-4500	DSP1.10	Channel 19, range 4001-5000
DSP1.5	Channel 19, range 4001-4500	DSP1.11	Channel 17, range 5001-5500
DSP1.6	Channel 3, range 3001-4000	DSP1.12	Channel 19, range 3001-4000

2 MOTION DATA PROCESSING

Analyse accelerometric signals stored in file "WalkingExperiment1.mat" for the left and right legs recorded with the sampling frequency of 100 Hz. Devide both signals into given number M of subwindows and for each one evaluate selected features

- in the time domain (mean and std deviations),
- in the mixed domain (std deviation in the time domain and power in the selected frequency band).

For the mixed domain separation, evaluate mean values of the cluster for the left and right legs and their distance. Find the frequency band with the highest distance of these mean values pointing to the best separability. Select one of the following options:

DSP2.1	Number of subwindows $M = 20$	DSP2.3	Number of subwindows $M = 40$
DSP2.2	Number of subwindows $M = 30$	DSP2.4	Number of subwindows $M = 50$

3 ENERGY DATA PROCESSING

Analyse power data of 14 photovoltaic panels recorded in the "PhotoVoltaic.xlsx" file with time (during 6 days with sampling period of 15 minutes), complete power, and individual panel's power in subsequent columns. Use linear interpolation of time for detection of frequency components and evaluate the ratio of the total power (to estimate symmetry) generated by west (1,2,5,6,11,12,13) and east (3,4,7,8,9,10,14) oriented panels using original and filtered data using median of order $M1$ followed by FIR low-pass filter of order $M2$ and cutoff frequency f_c.

DSP3.1	$M1 = 3, M2 = 20, f_c = 0.1$	DSP3.4	$M1 = 3, M2 = 40, f_c = 0.1$
DSP3.2	$M1 = 5, M2 = 20, f_c = 0.1$	DSP3.5	$M1 = 5, M2 = 40, f_c = 0.1$
DSP3.3	$M1 = 7, M2 = 20, f_c = 0.2$	DSP3.6	$M1 = 7, M2 = 40, f_c = 0.2$