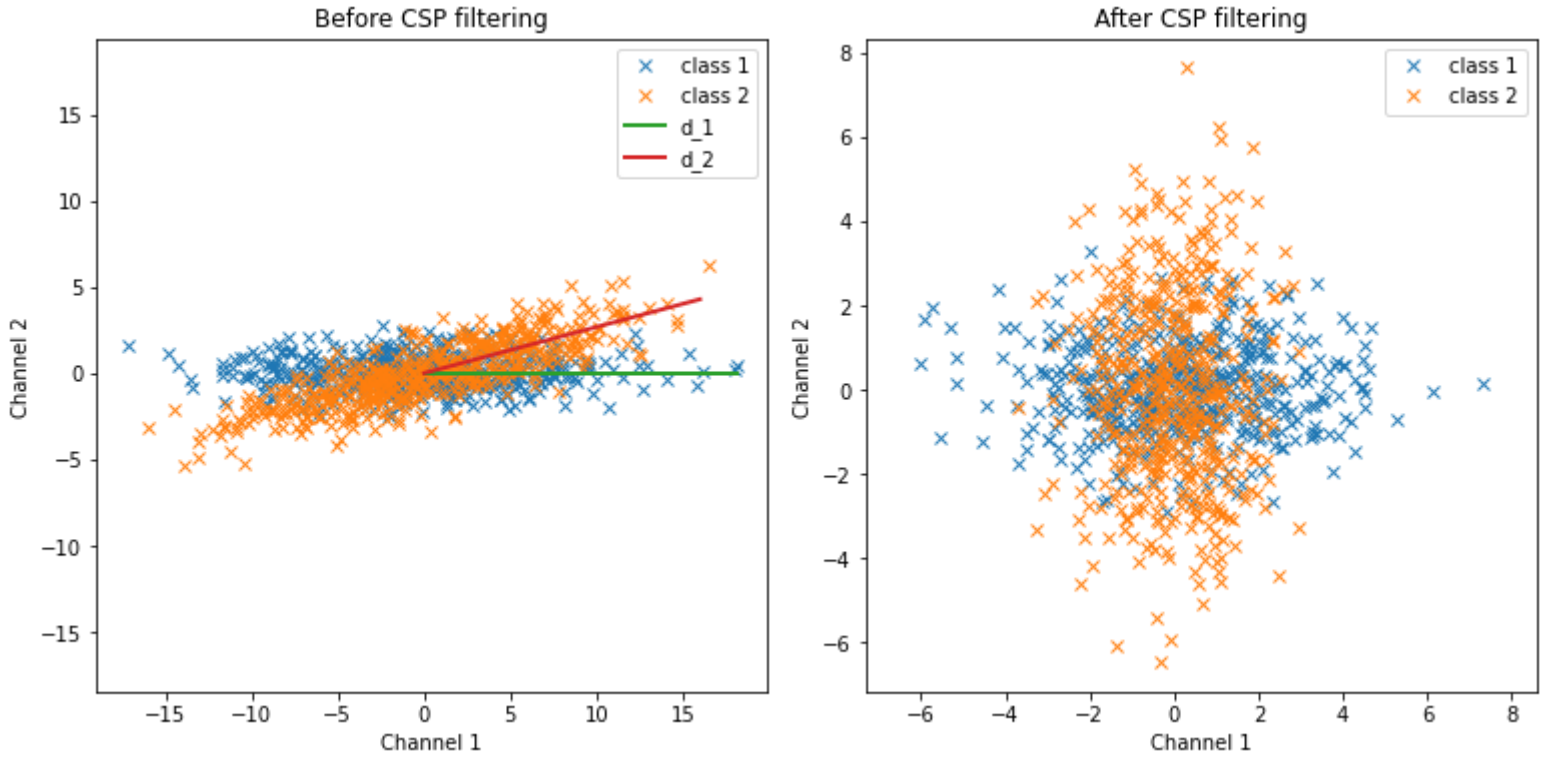
2024년 제 11회 대한뇌파신경생리학회 워크숍

Dec. 6, 2024

Filterbank CSP

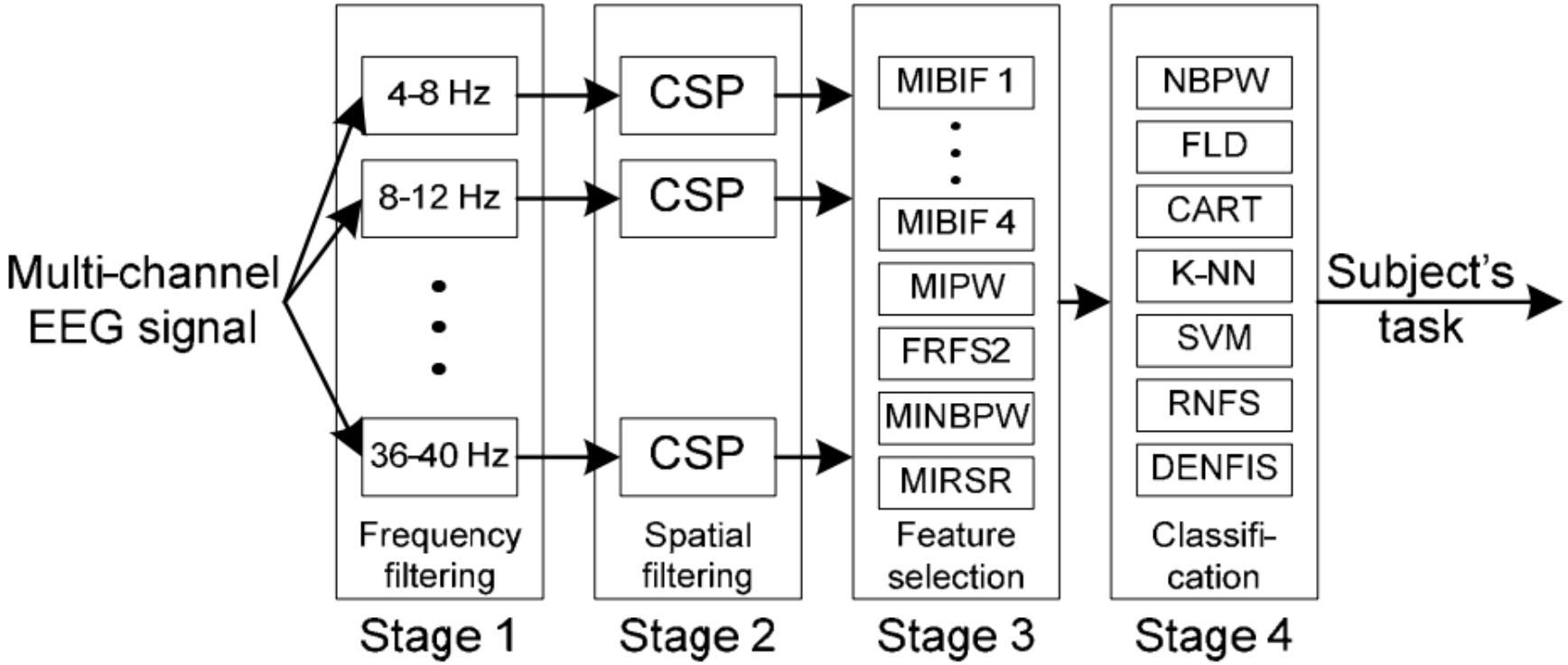
- CSP
  - An algorithm for finding spatial filters that maximize the variance difference between two classes of EEG signals



Wikipedia(https://en.wikipedia.org/wiki/Common_spatial_pattern)

Filterbank CSP

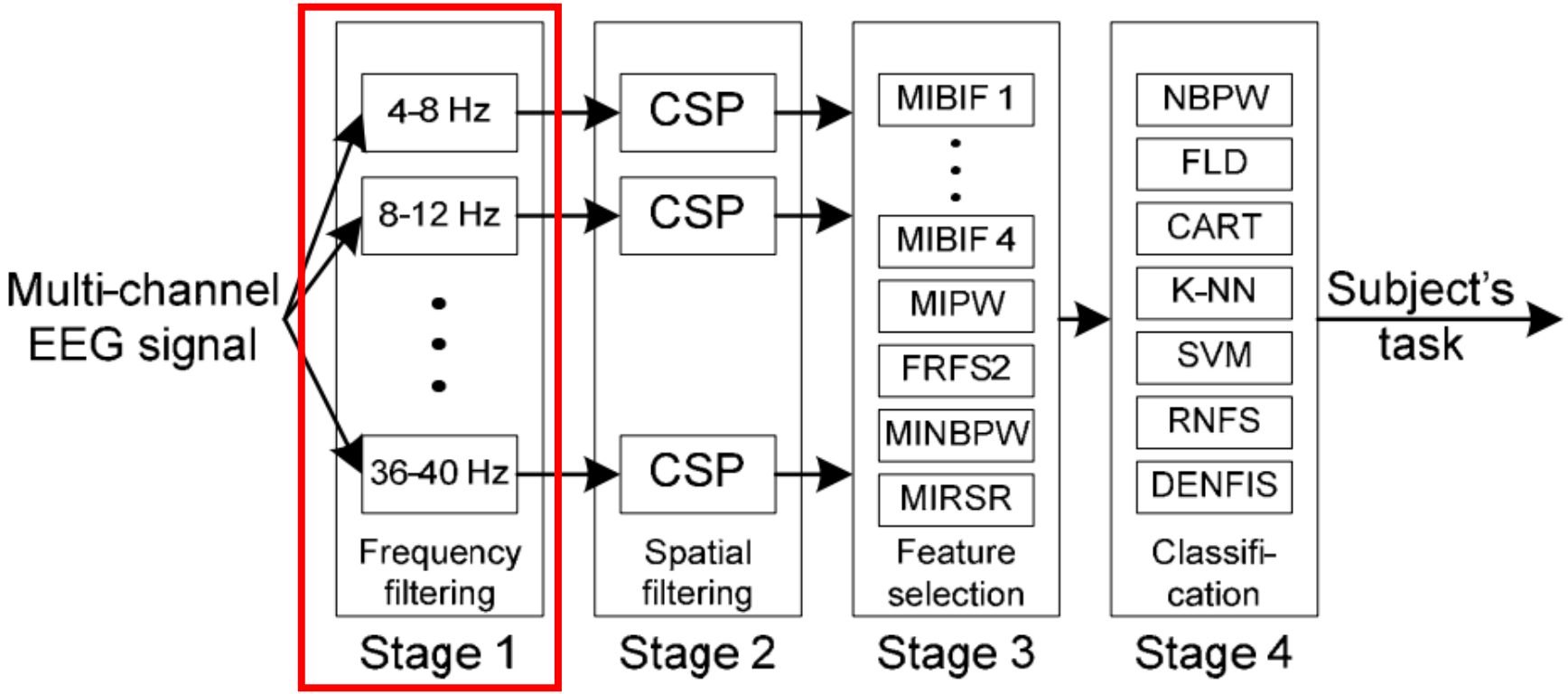
- Filterbank CSP(FBCSP)
  - FBCSP is an advanced algorithm that overcomes CSP's frequency band selection issue, offering better performance.



K. K Ang et al., 2008 IEEE

Filterbank CSP

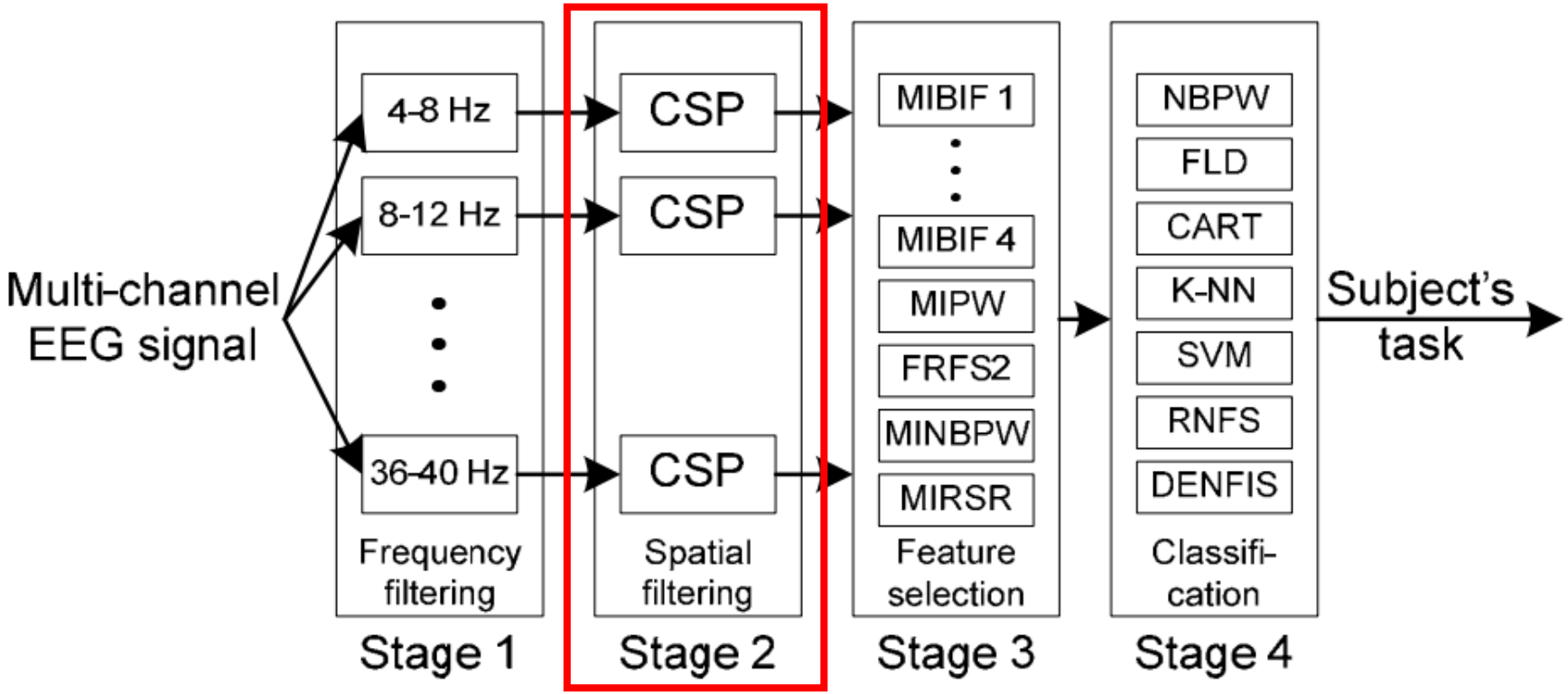
- FBCSP
  - Decomposing EEG signals into multiple frequency bands
    - 4-40 Hz divided into 9 bands with 4 Hz intervals



K. K Ang et al., 2008 IEEE

Filterbank CSP

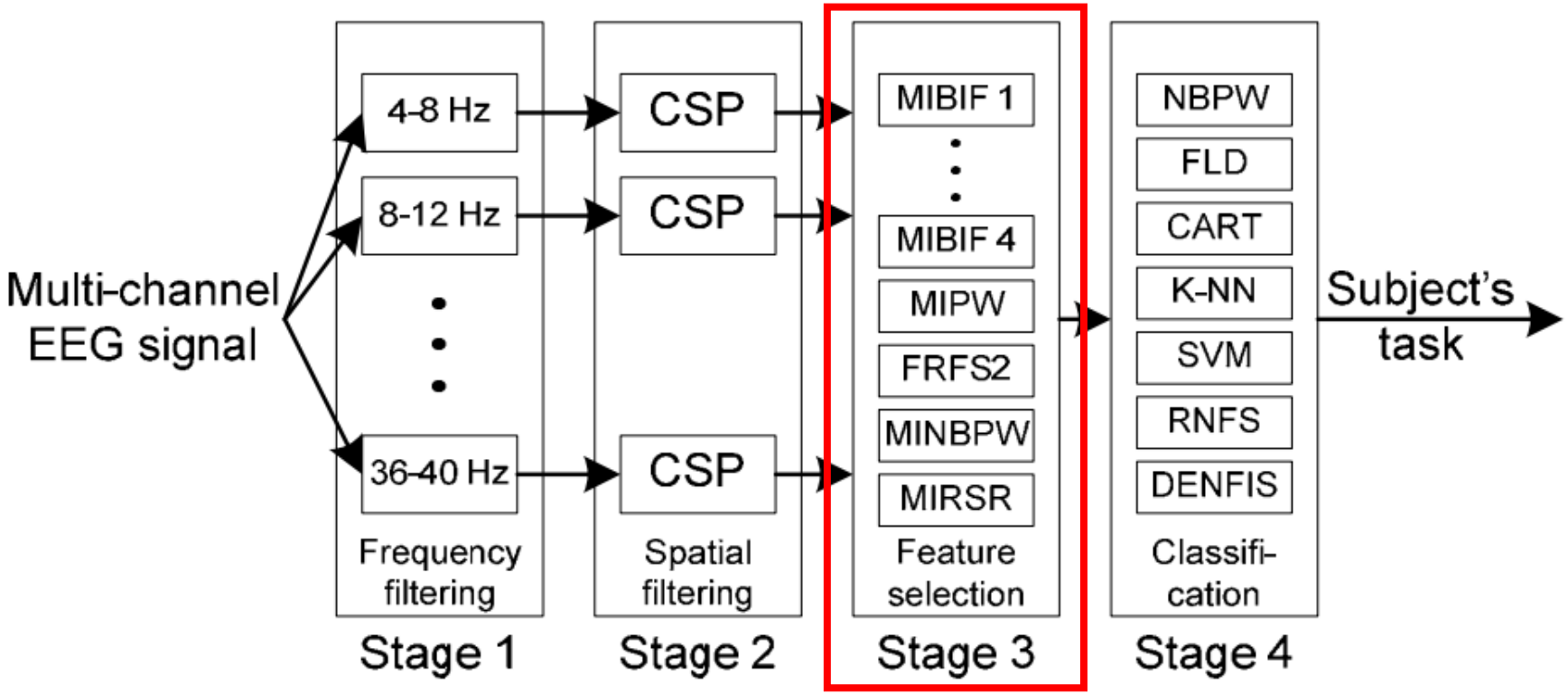
- FBCSP
  - Applying the CSP algorithm to each frequency band



K. K Ang et al., 2008 IEEE

Filterbank CSP

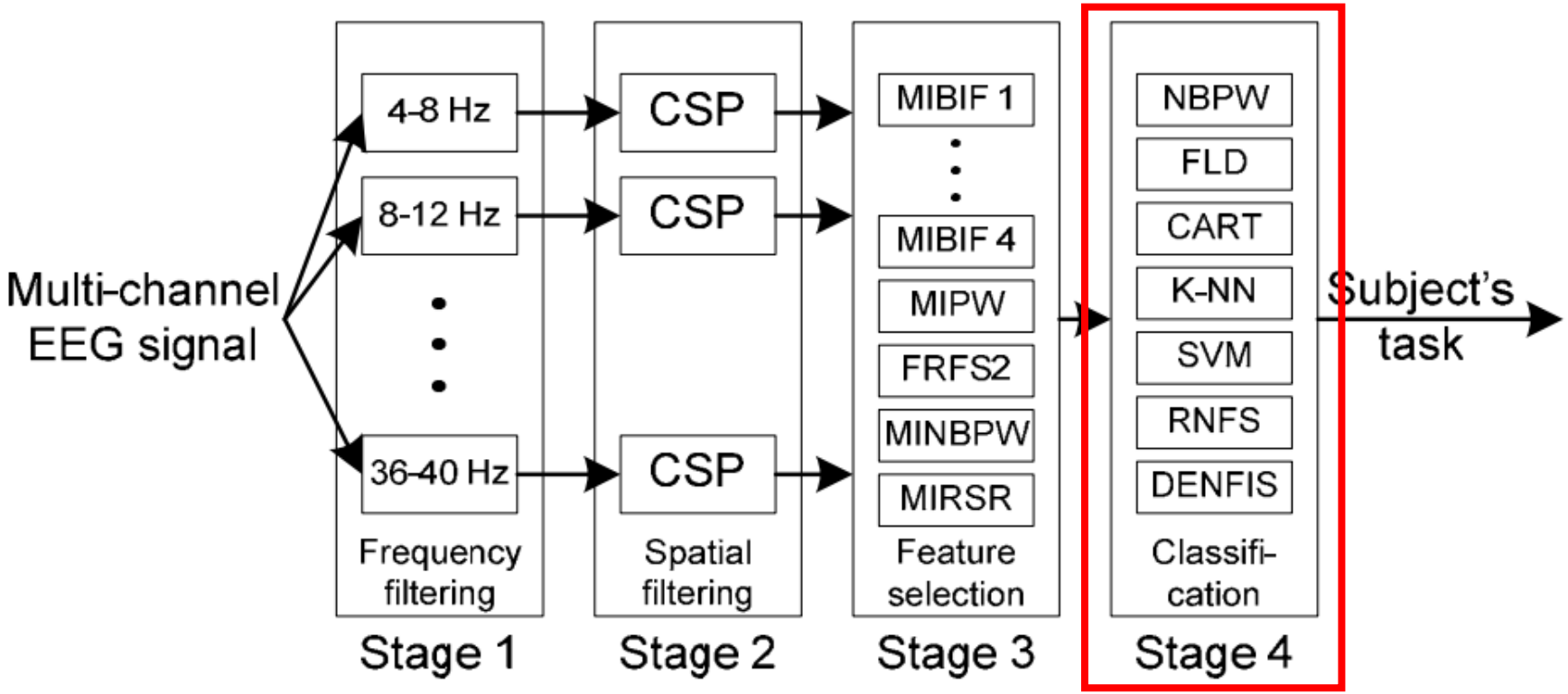
- FBCSP
  - Selecting discriminative CSP features using a feature selection algorithm



K. K Ang et al., 2008 IEEE

Filterbank CSP

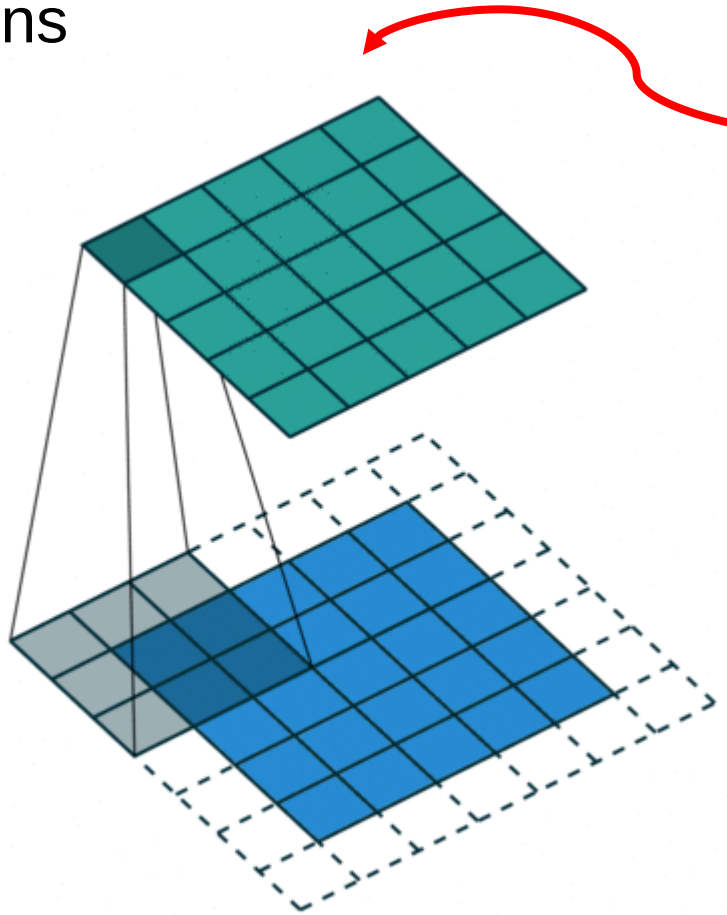
- FBCSP
  - Feeding the selected features into a classifier for final classification



K. K Ang et al., 2008 IEEE

EEGNet

- Convolution
  - Sliding a filter (kernel) over the input data while performing dot product calculations



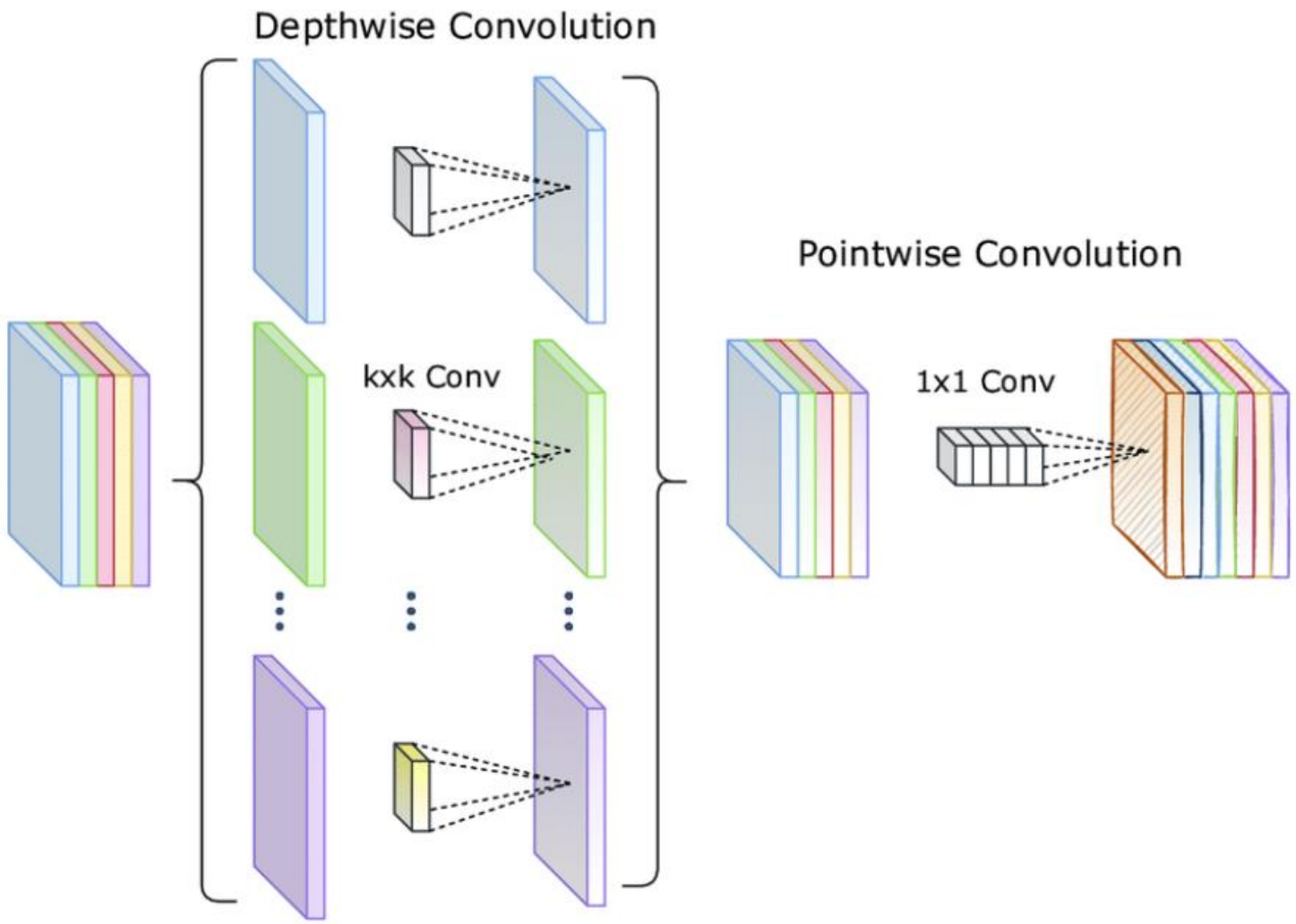
Padding = 1, Stride = 1

Hochschule Der Medien

EEGNet

- Depthwise Conv.
  - Performing convolution independently for each input channel
- Pointwise Conv.
  - Learning channel combinations using a 1x1 filter
- Separable Conv.
  - A combination of the above two convolutions

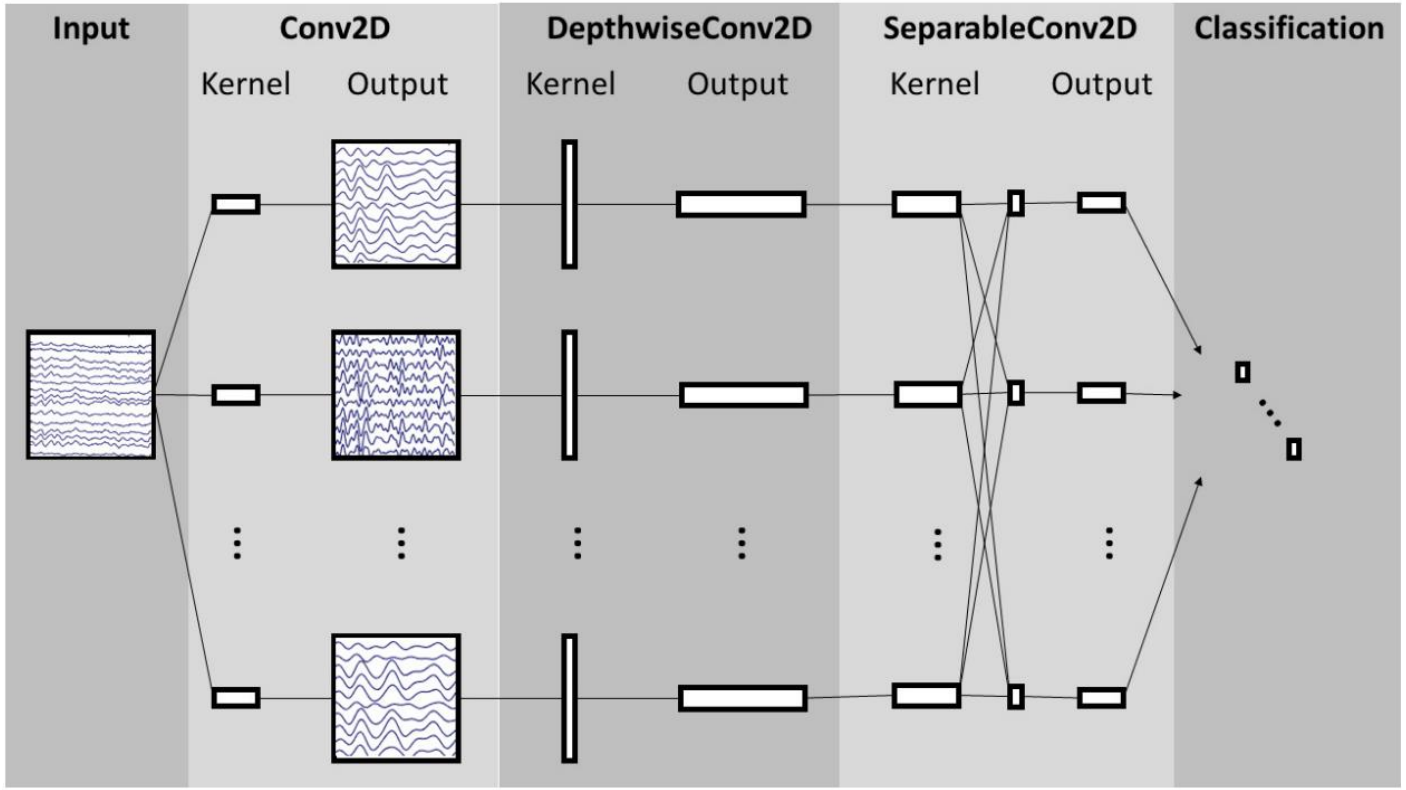
Separable Convolution



F. Sultonov et al., 2022 Appl. Sci.

EEGNet

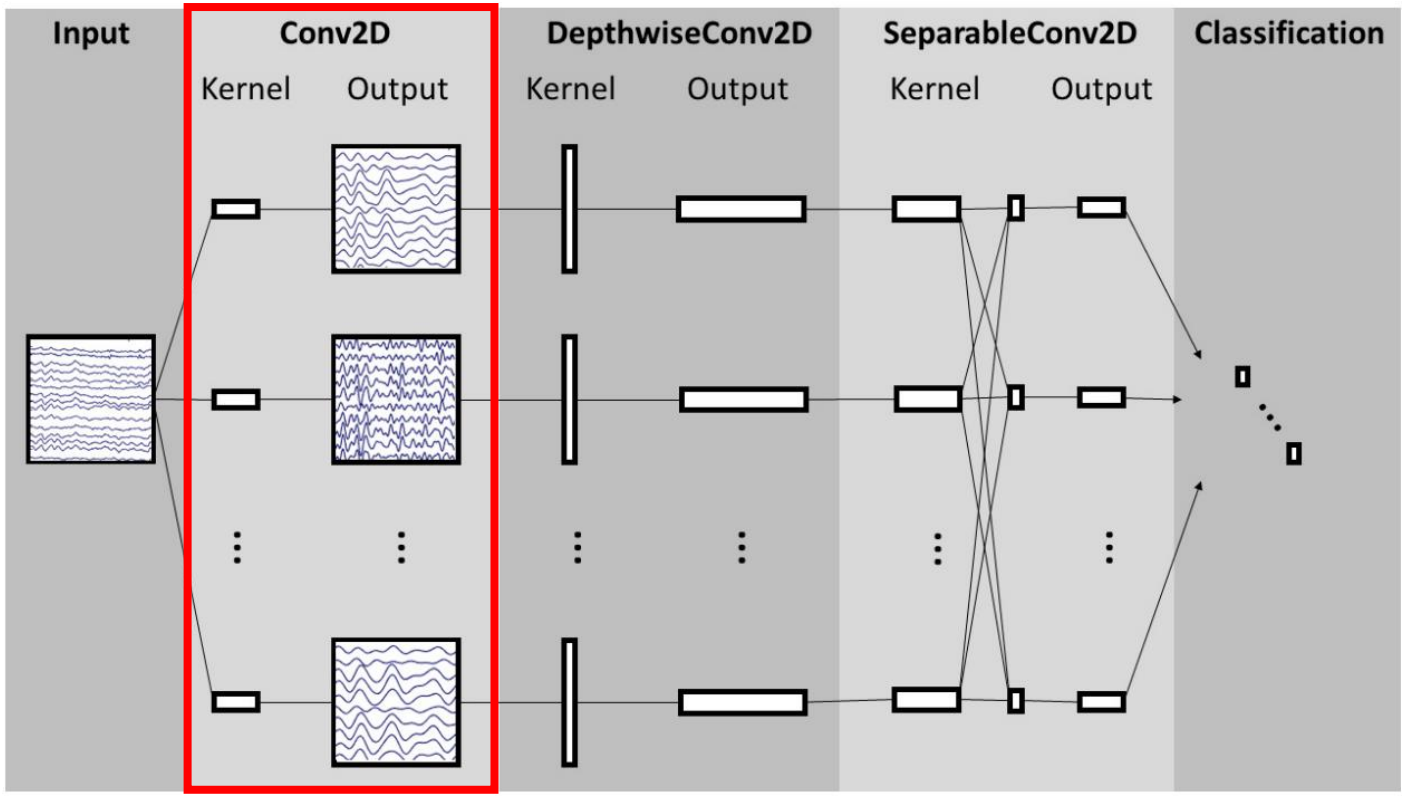
- EEGNet
  - A model implementing the FBCSP process in a deep learning architecture



Lawhern, V. J et al., 2018 Journal of Neural Engineering

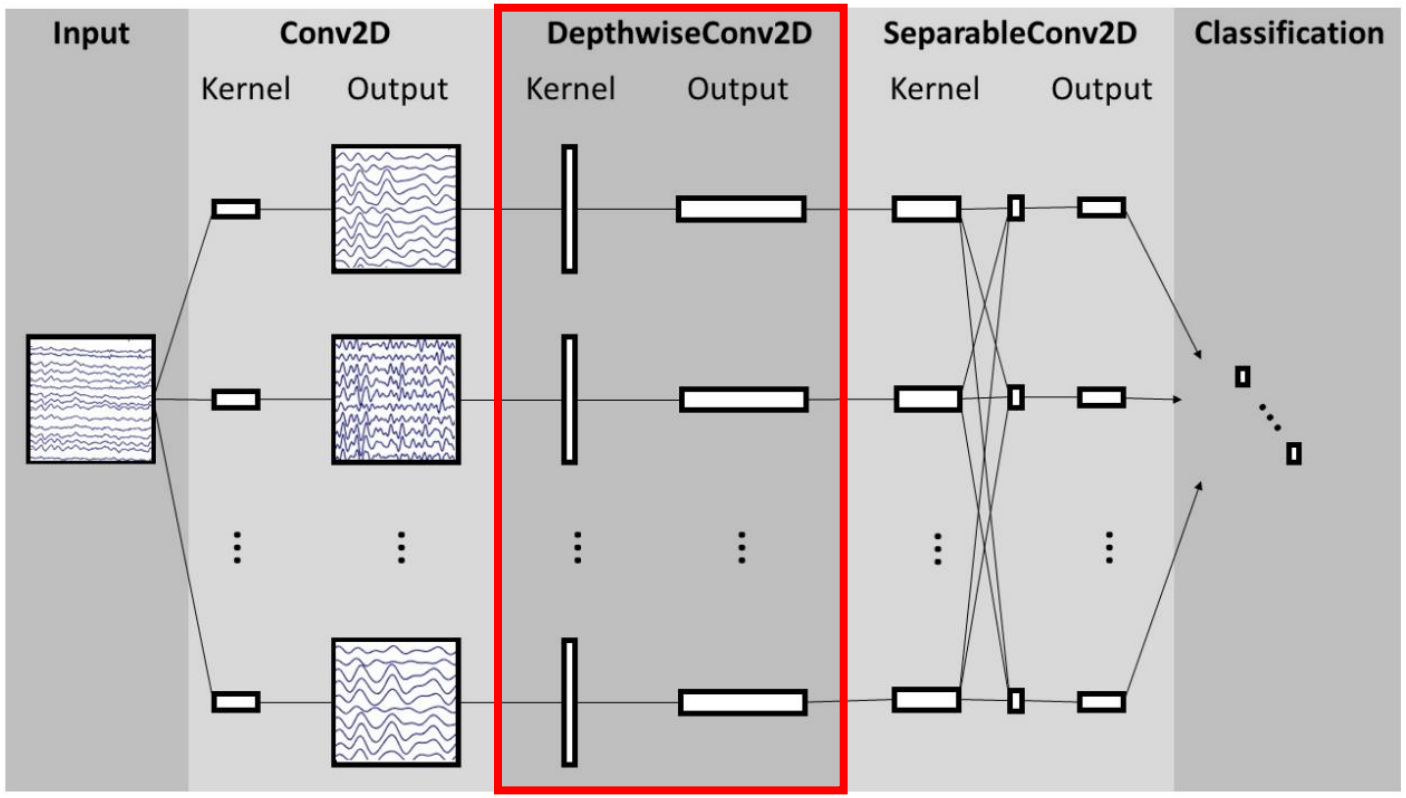
EEGNet

- EEGNet
  - Temporal Conv.
    - Serves as frequency filtering in FBCSP



EEGNet

- EEGNet
  - Depthwise Conv.
    - Performs spatial filtering, similar to CSP



EEGNet

- EEGNet
  - Separable Conv.
    - Temporal summarization of each feature map / Optimal combination of feature maps