2022 DGIST 하계 인턴 중간 발표

BMI_인턴 오정은

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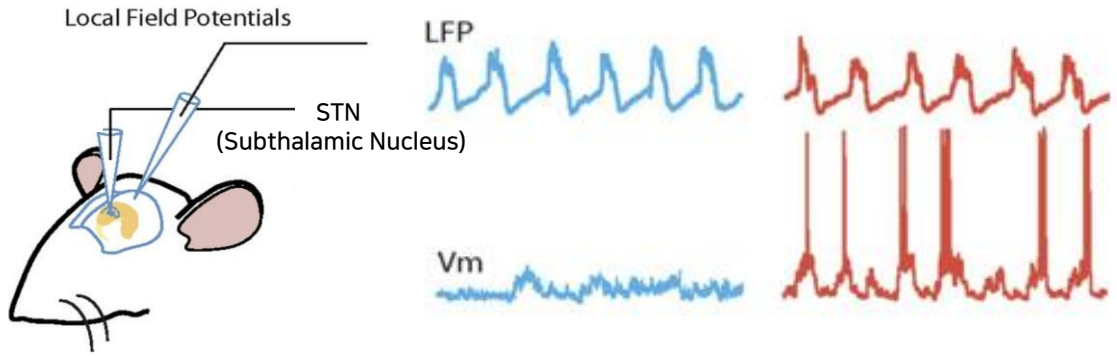
- Next Week
  - PSD Power Spectral Density
  - pwelch 함수 이용한 plotting

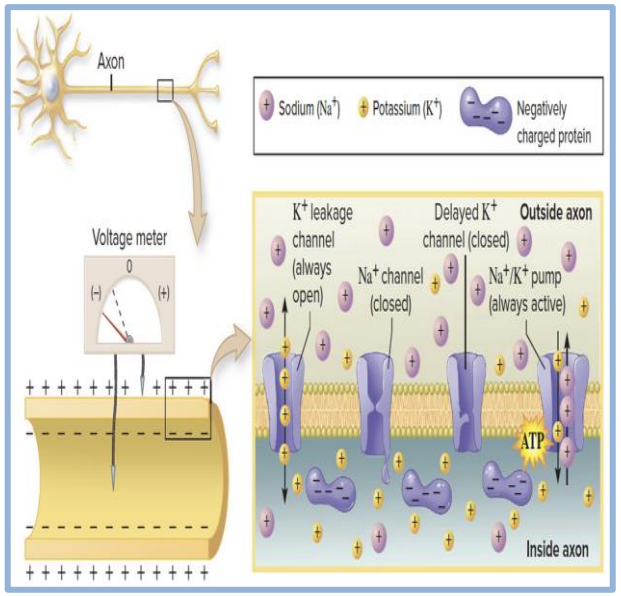
Final Goal & Flow

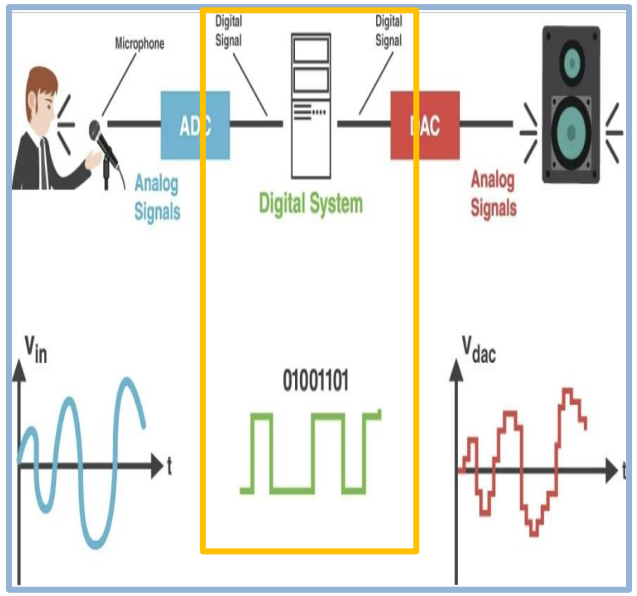
Final Goal & Flow

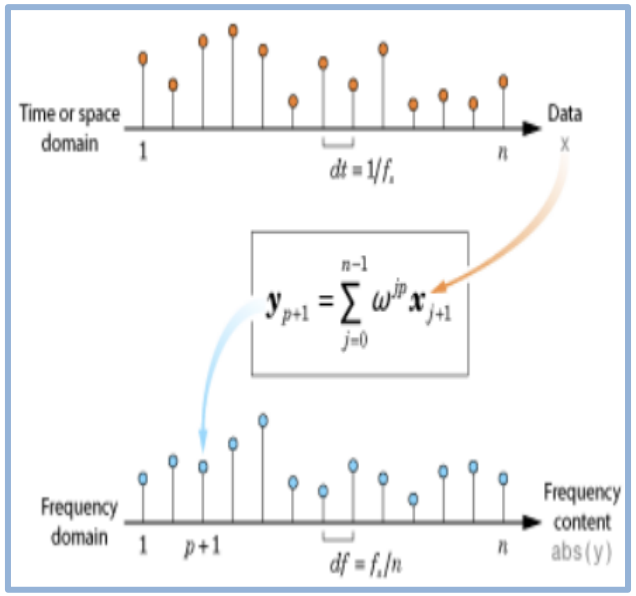
- **PD model vs Normal model**
  - LFP를 PSD로 분석
  - 파킨슨 질병 유발된 쥐와 정상 쥐의 뇌파 비교

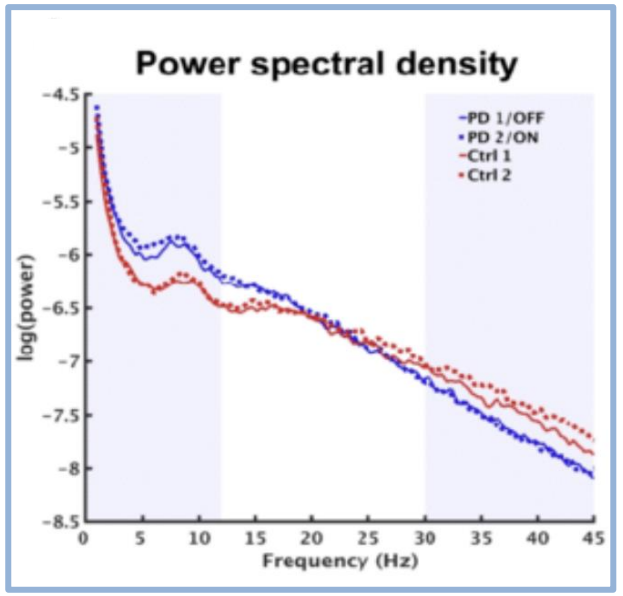


뉴런 막전위 활동 → Digital Signal Processing → Fast Fourier Transform → Power Spectral Density









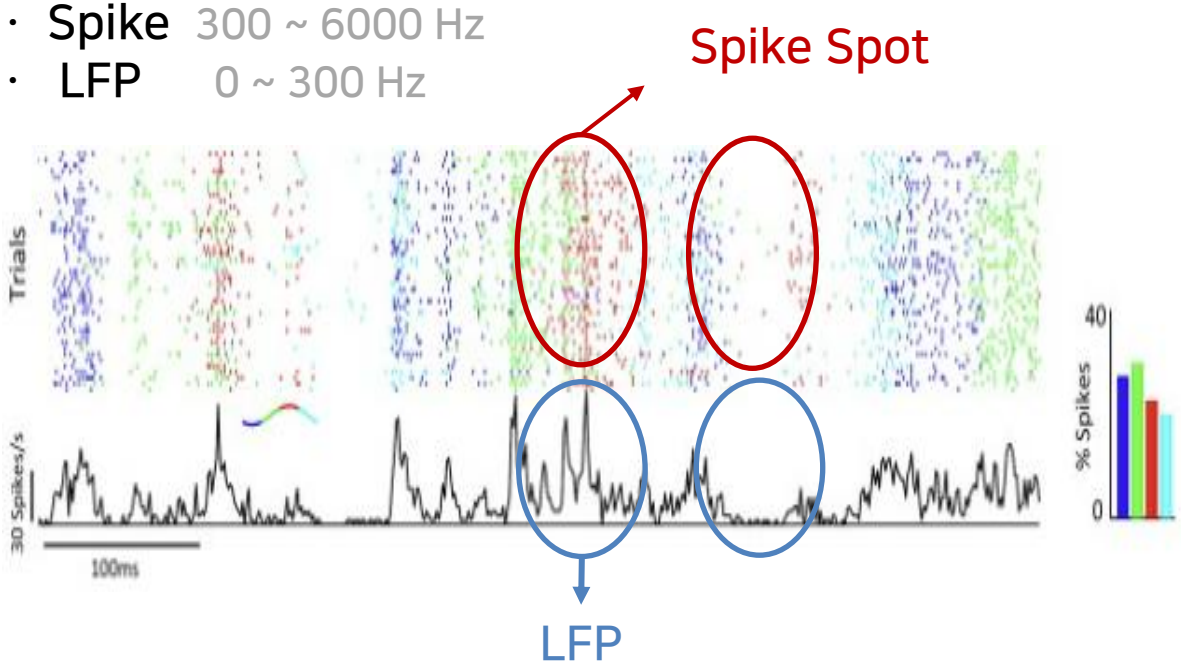
Last Week

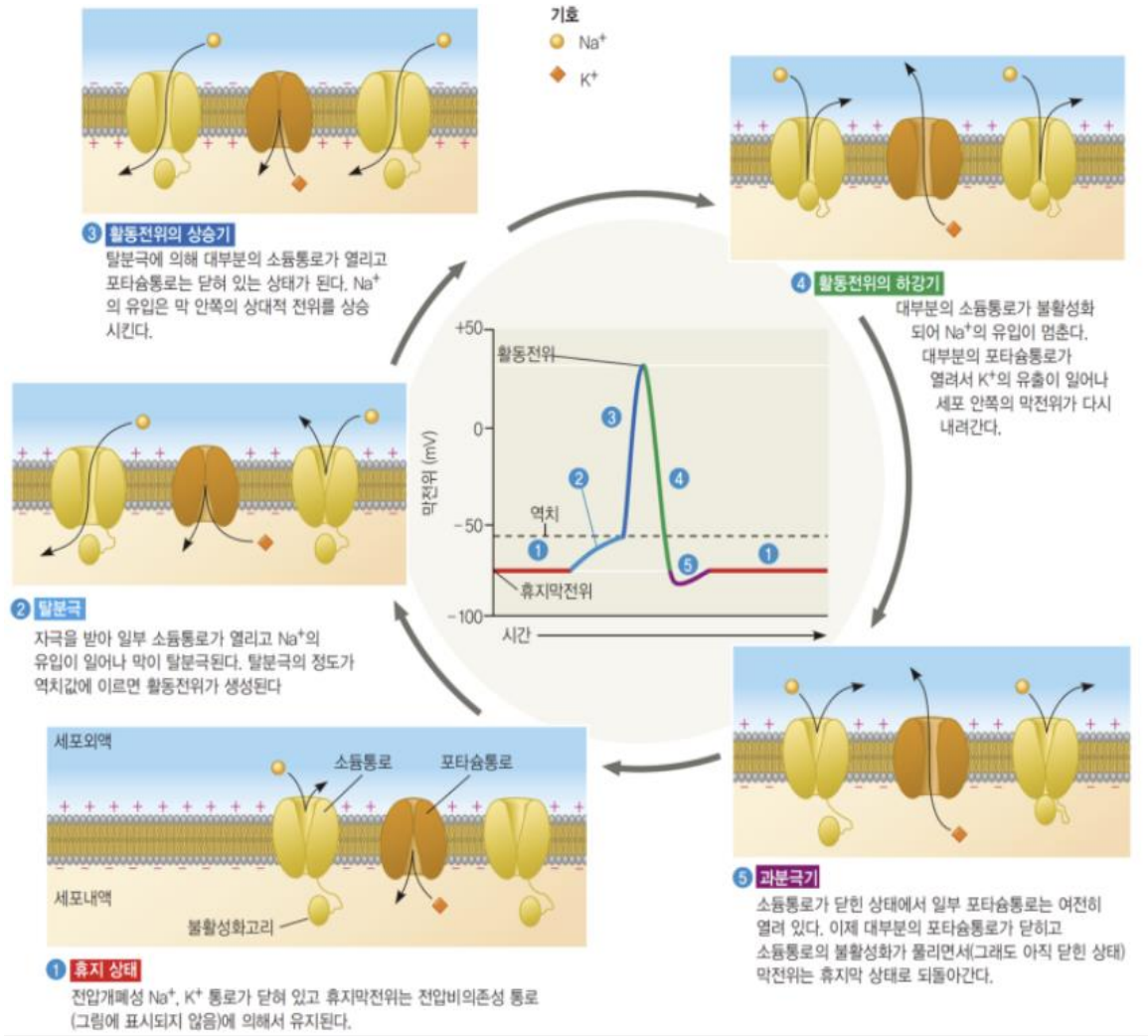
Last Week

▪ 뉴런 막전위 활동

- Spike - 단일 뉴런 단위의 활동 전위
- Local Field Potential – 각 뉴런의 활동을 묶음 단위로 확인

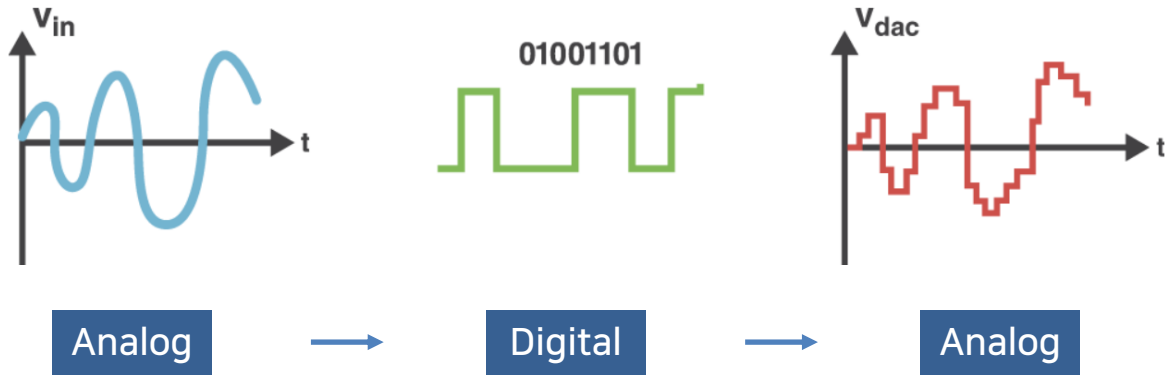
· Spike 300 ~ 6000 Hz
· LFP 0 ~ 300 Hz

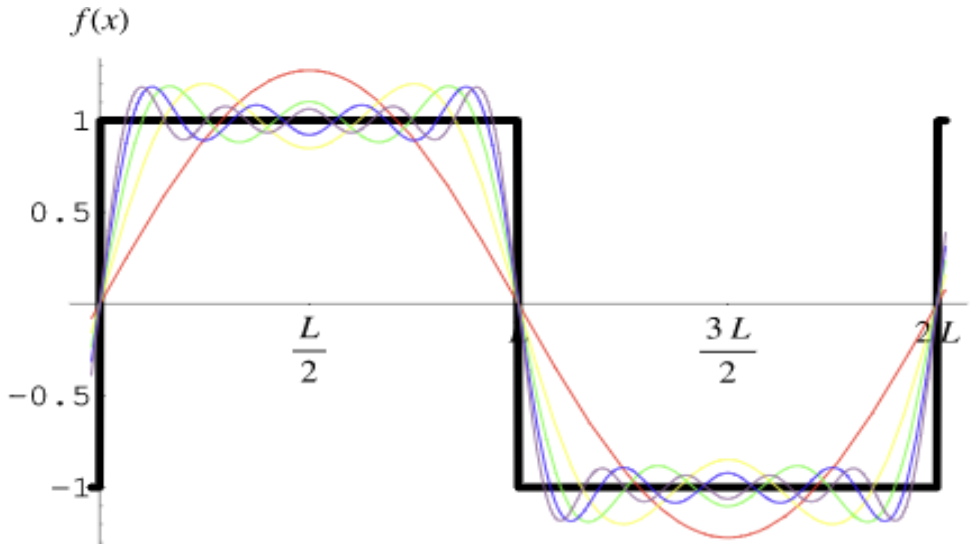


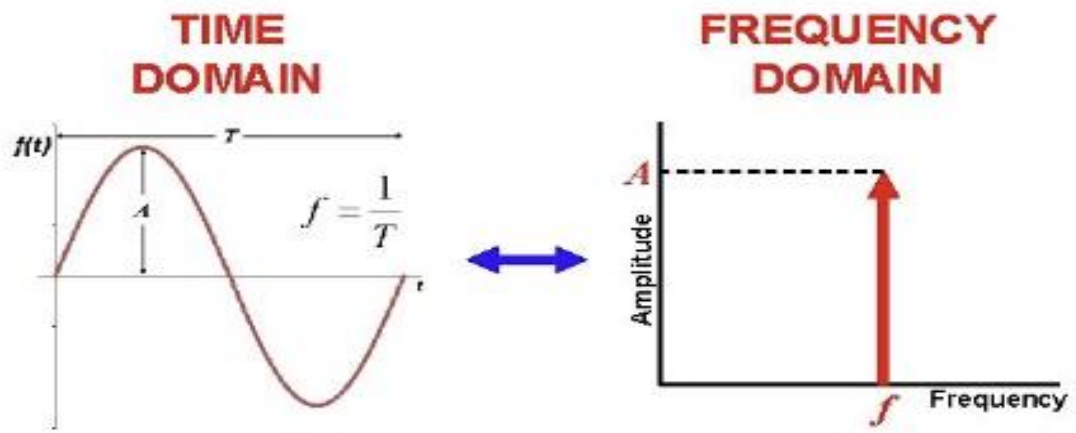


Last Week

- Digital Signal Processing DSP
  - Sampling Theory
  - Nyquist Sampling Frequency
  - Fourier Series & Fourier Transform
    - 주기함수를 사인+코사인 함수의 합 급수로 표현 & 일반화



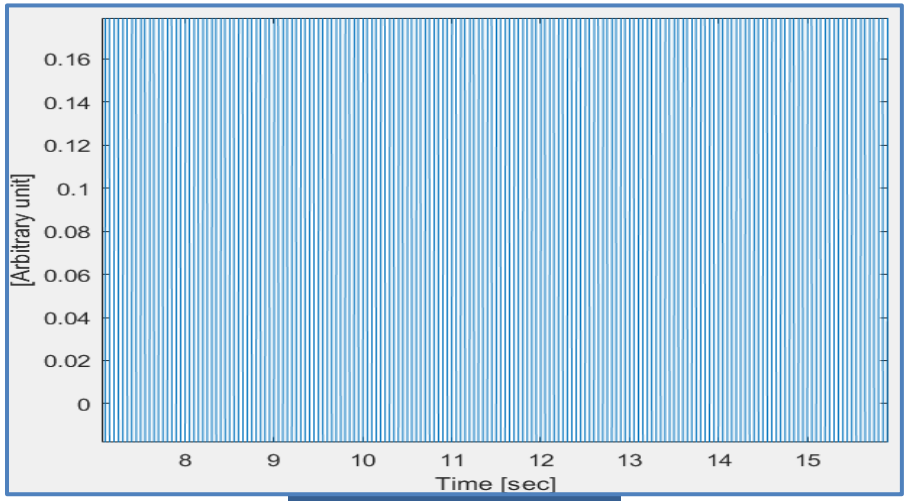




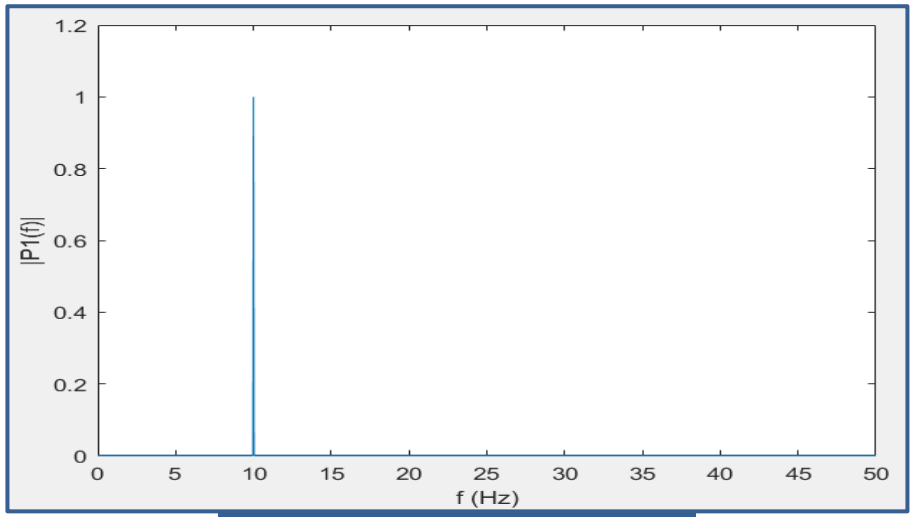
Last Week

```
%% Parameters
fs = 100;                       % [Hz]; sampling rate
t_length = 30;                  % [sec]; total time length (Length of signal)
time = 0:1/fs:t_length-1/fs;    % time vector
N = numel(time);                % number of data points
%% Generate 10 Hz sine waves
s1 = sin(2*pi*10*time);

figure();
plot(time, s1)
xlabel('Time [sec]')
ylabel('[Arbitrary unit]')
hold on
%% Obtain power spectral densities using fft
s1_fft = fft(s1);               % Fast Fourier transform

P2 = abs(s1_fft/N);             % symmetry spectrum cal
P1 = P2(1:(N/2+1));             % spectrum cal
P1(2:end-1) = 2*P1(2:end-1);

f1 = fs*(0:(N/2))/N;
figure()
plot(f1, P1)
xlabel('f (Hz)')
ylabel('|P1(f)|')
```

Code



Time Domain

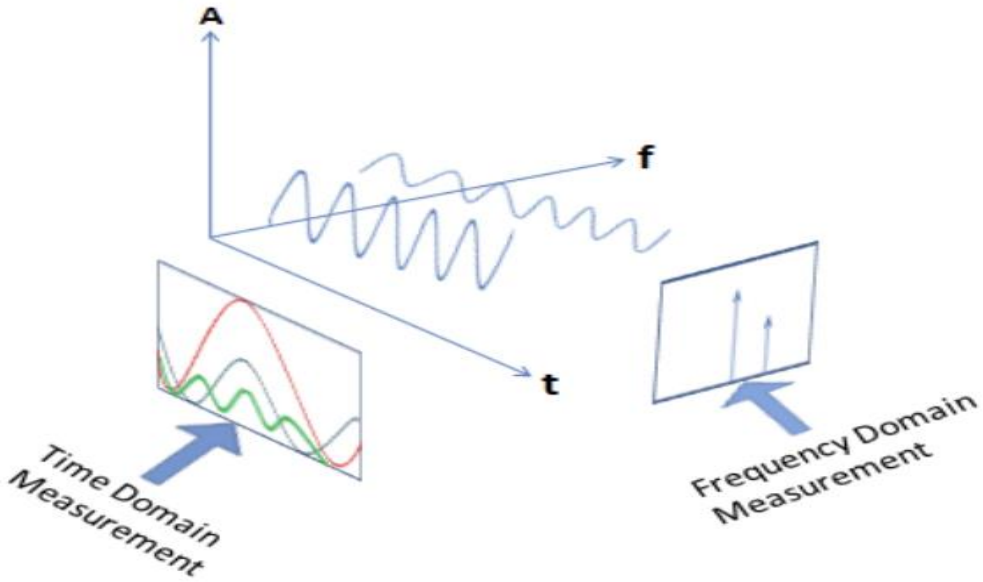


Frequency Domain

This Week & Next Week

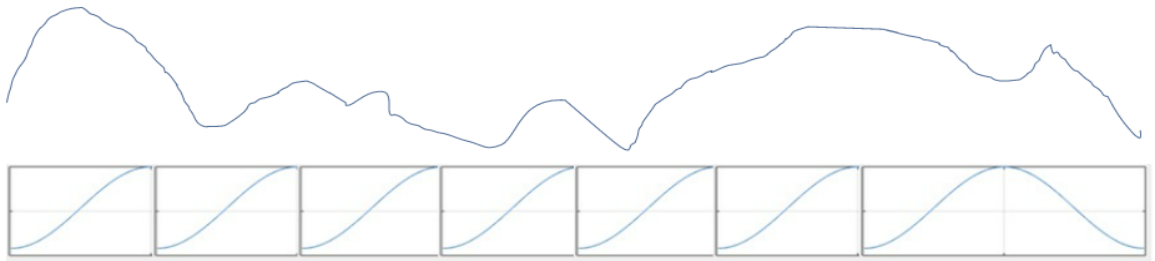
This Week

- Local Field Potential LFP
  - Time domain
  - Frequency domain



- Welch's Method
  - 주파수 power의 수치를 추정하기 위해서 사용하는 방법

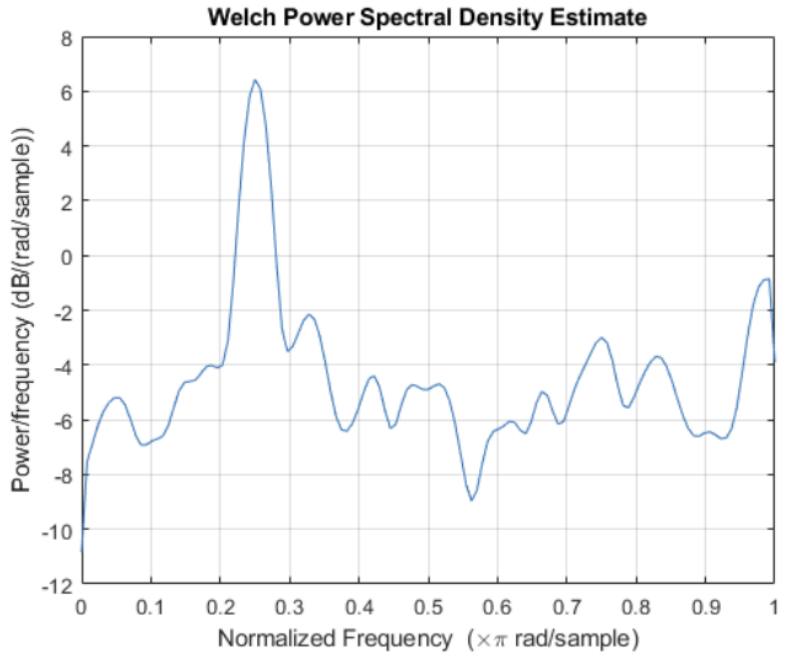
• Average the squared FFT over multiple windows



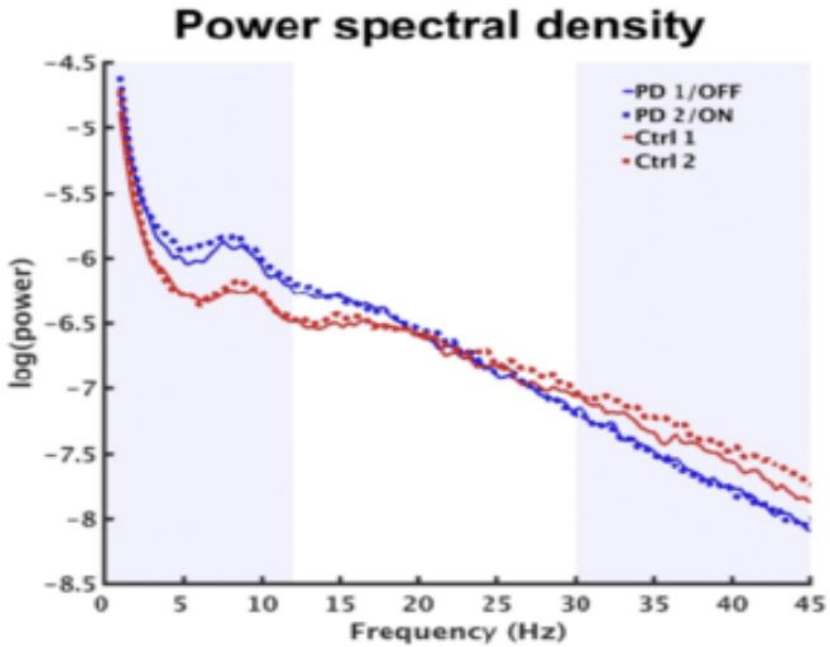
• Simplest method, use when you have a long signal

Next Week

- Power Spectral Density PSD
  - 매트랩 실습 - `pwelch(x)`
  - PD model 적용



- PD model vs Normal model
  - PD model & Normal model
  - Beta Frequency Comparison



Q&A

Thank you