



Investigating characteristics of Cortical Activity using Deep Brain Stimulation (DBS)

Daryl Kwan

Introduction

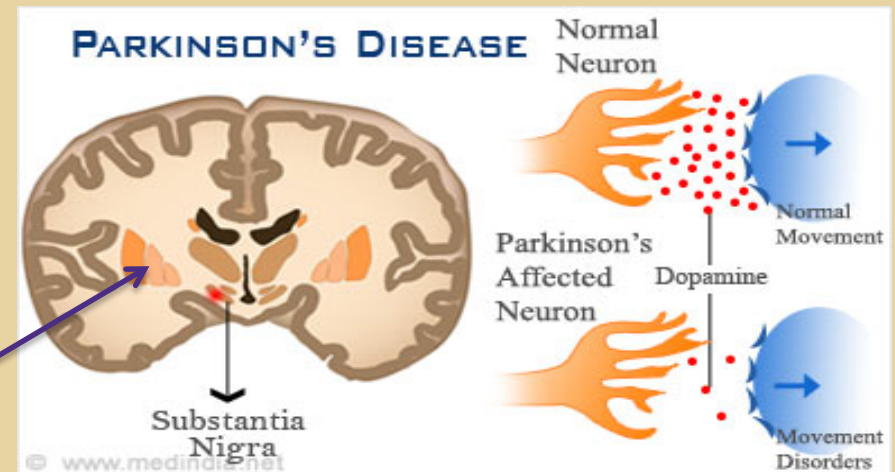
> Parkinson's disease

- Degradation of dopamine producing neurons in Substantia Niagra
- Cause is unknown, Less dopamine is produced
- Symptoms
 - > Loss of smooth movement and postural stability
- 10 million have Parkinson's Disease
- 100,00 treated by DBS

> DBS

- Decrease symptoms
- Negative Side Effects
- Globus Pallidus
- Electrical Stimulation
- Future

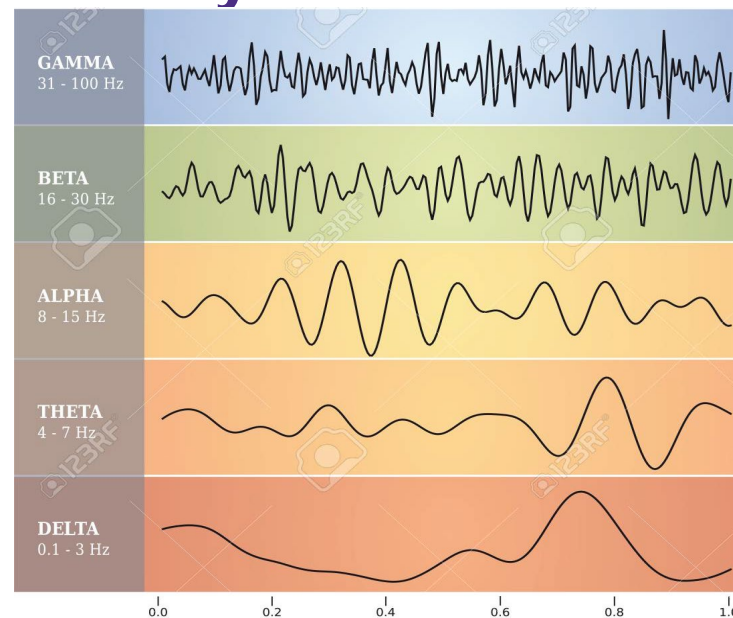
Globus Pallidus





Electrocorticography (ECoG)

- > **Electrode is put on surface of brain**
 - tracks electrical potentials
- > **Brainwaves**
 - Delta, Theta, Alpha, Beta, Gamma
 - 0.25-250 Hz
- > **Goal to clean and analyze data**
- > **Motor Cortex**





How does deep brain stimulation affect the motor cortex?

W

Data collection

- > **Used DBS to stimulate and ECoG to collect data**
- > **DBS placed near the Globus pallidus**
- > **ECoG near motor cortex**
- > **Stimulation protocol**
 - **4 minutes control test**
 - **0.5 seconds stimulation**
 - > **60 pulses total at 144 Hz**
 - **1.5 seconds rest**
 - **1, 2, 3, or 4 mA**
 - **Recorded on ECoG**

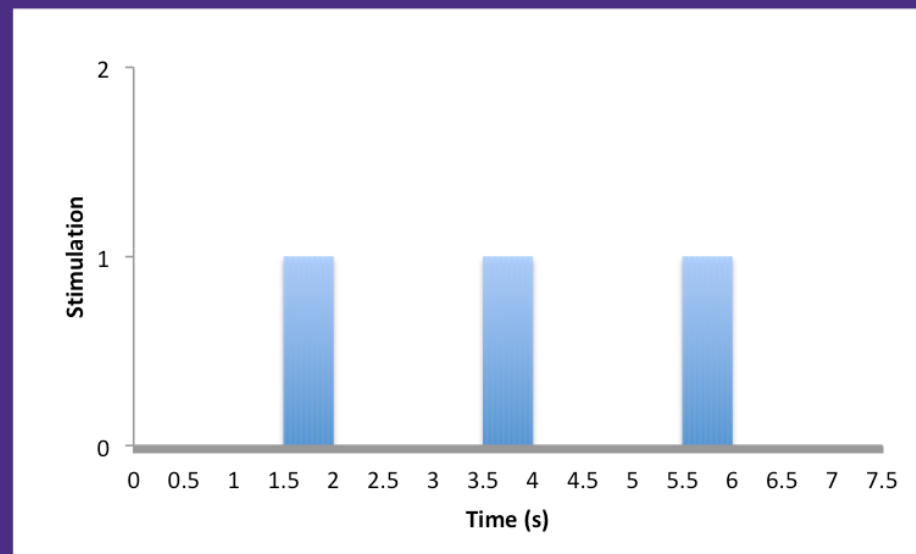
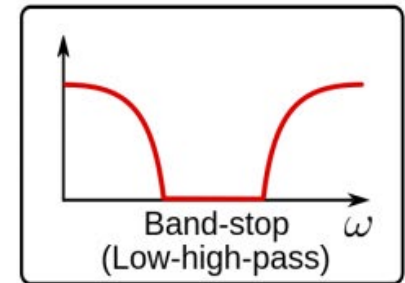
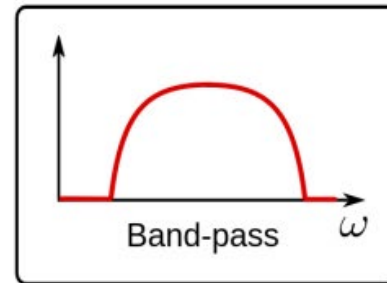
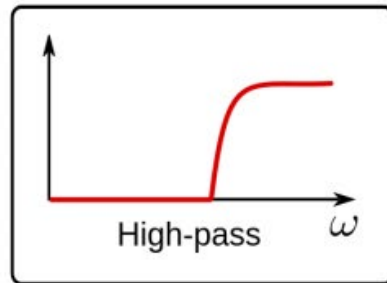
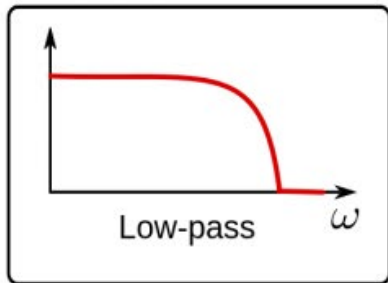


Figure (1) Example of pulse duration

Cleaning Data

> Filters

- Re-referenced
- De-spike
- High Pass, Low Pass (0.5-250 hz)
- Notch Filters (60,120,180 hz)





Results

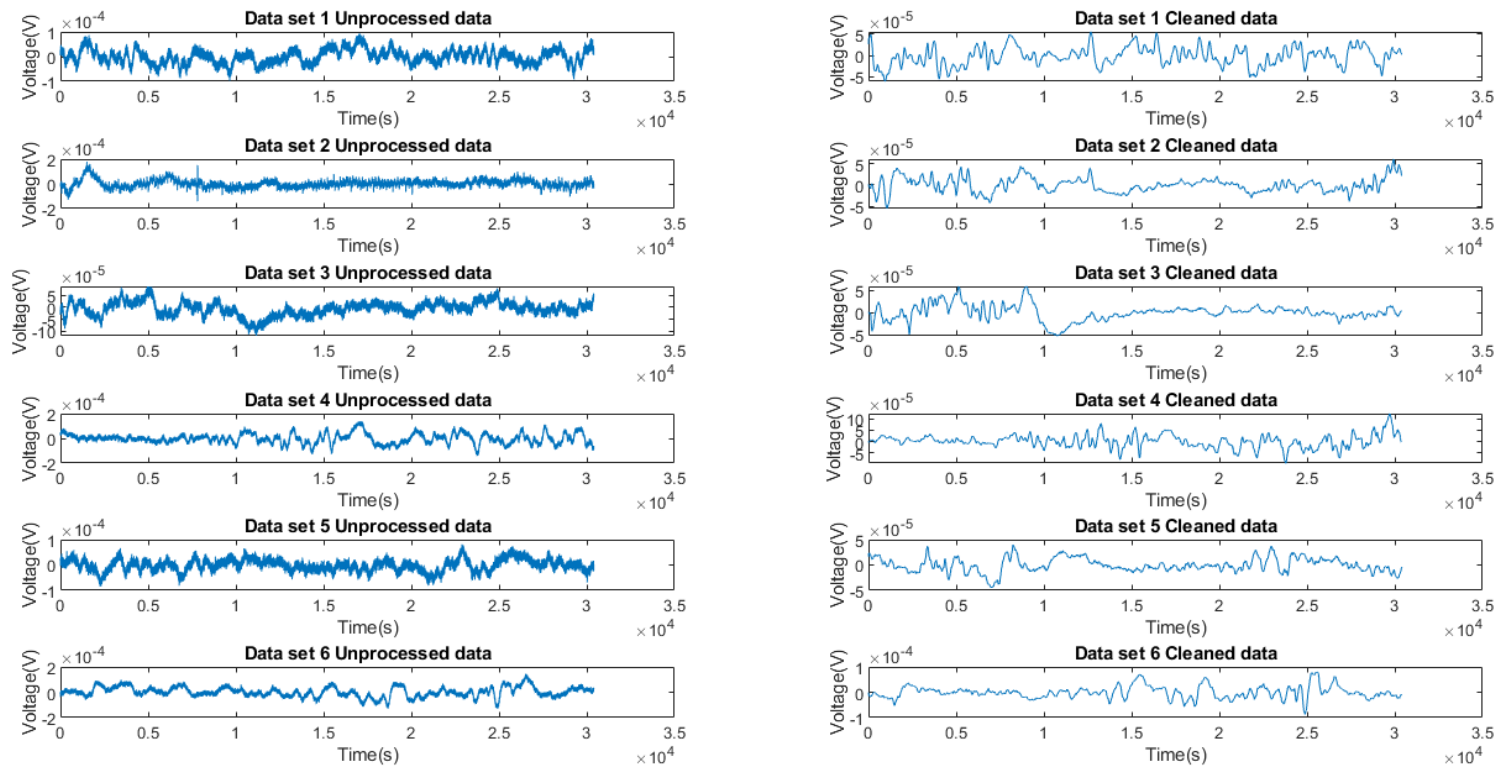


Figure (2) Neural data from channels before and after cleaning





Results

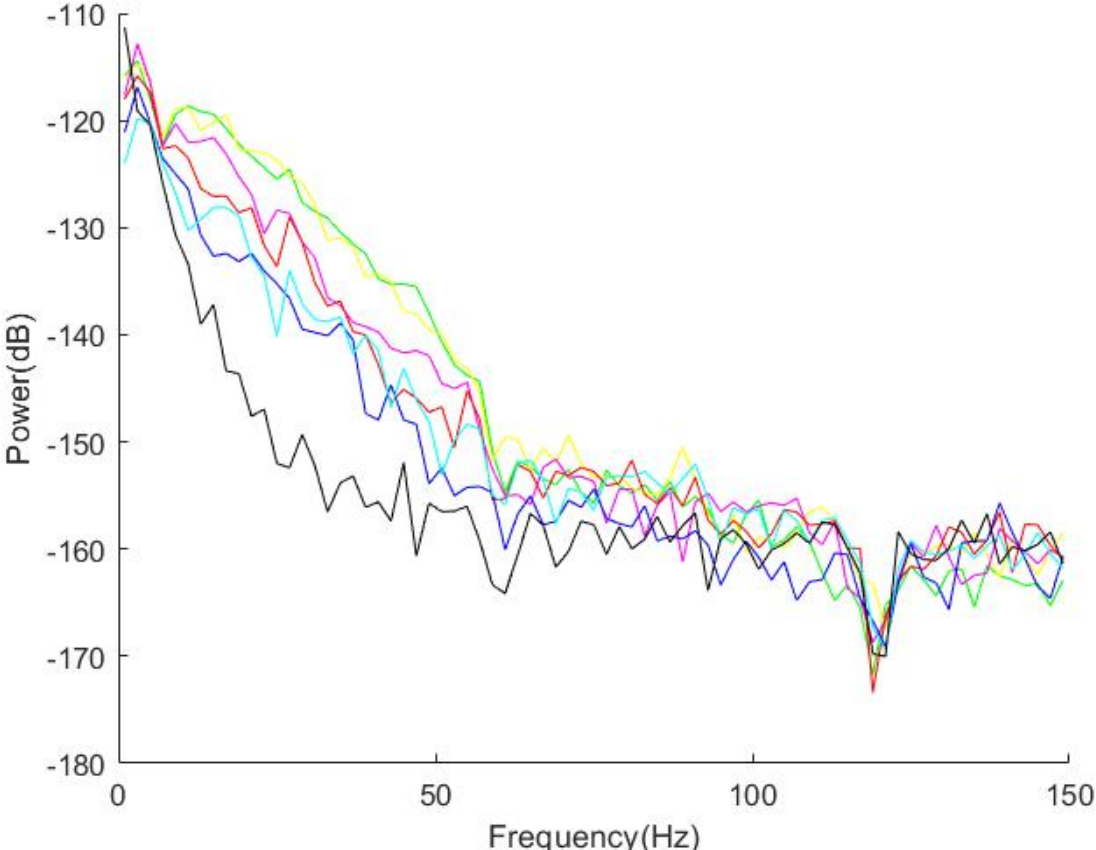


Figure (3) Power Spectrum





Conclusion

- > **What do the results mean?**
 - Increased brain activity in motor cortex
 - Side effects
- > **Future paths**
 - Activity in rest of cortex
 - Precision and decrease side effects
 - Other systems



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