Brain control of complex arm movement

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GRID Lab
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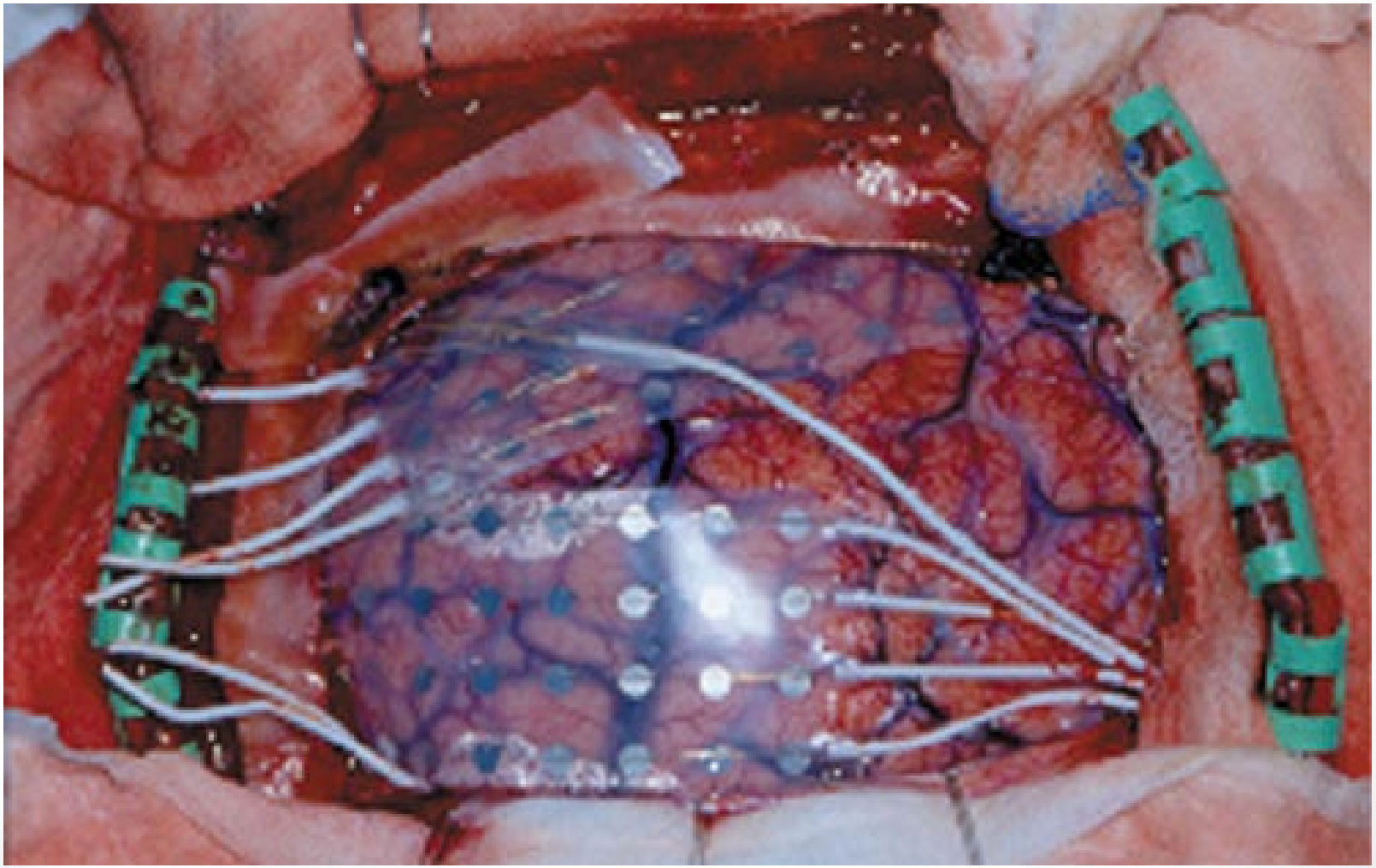
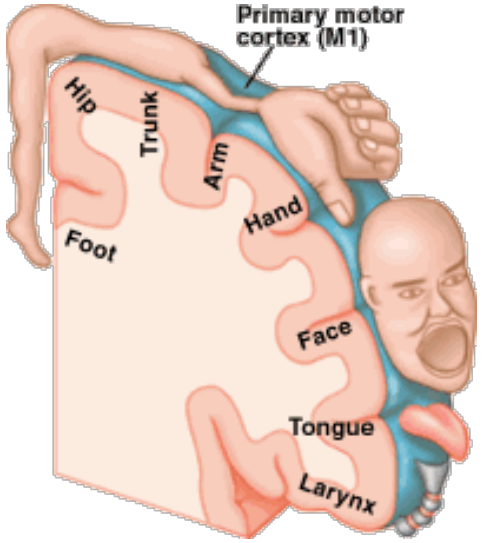
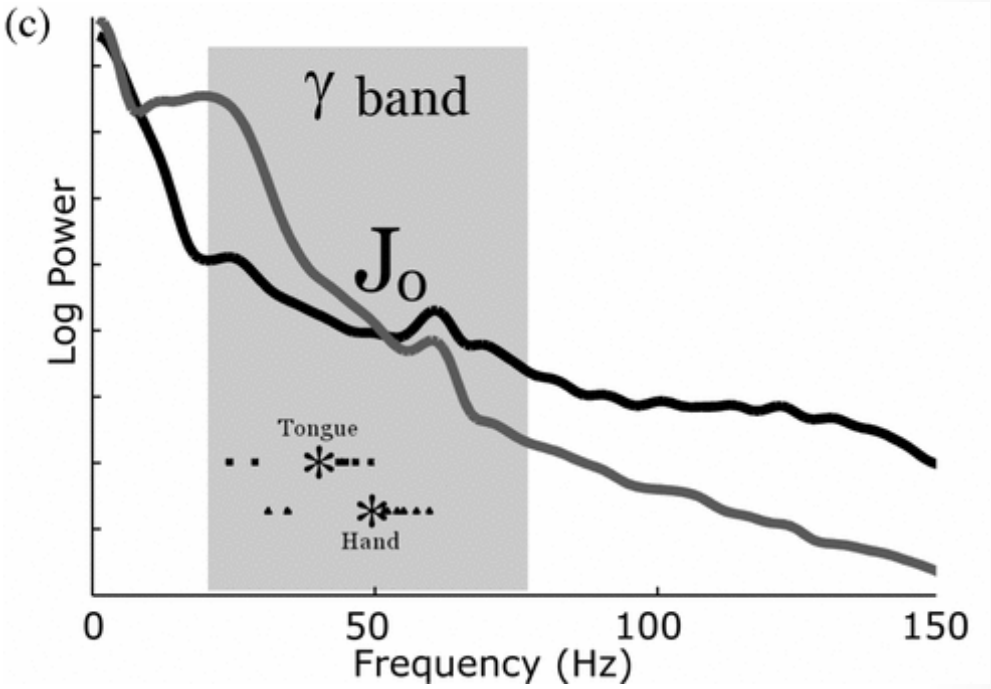
Electrocorticography (ECoG)



http://www.rcsed.ac.uk/RCSEDBackIssues/journal/vol47_5/47500001.html

How does the brain control movement?

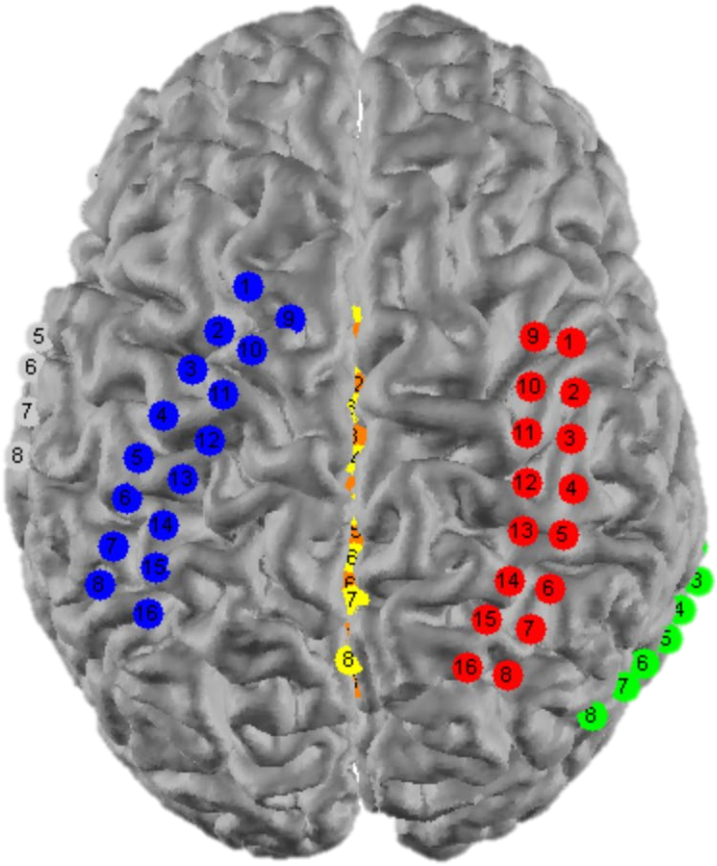




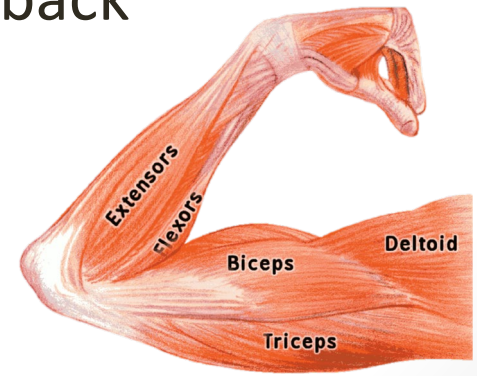
- Working with Kat Steele's lab to calculate synergies
  - which muscles activate together?
  - when do they activate?

https://rcc.uchicago.edu/about-rcc/news-features/visualizing-brains-hardware Kai Miller et al, 2008

Experiment Background

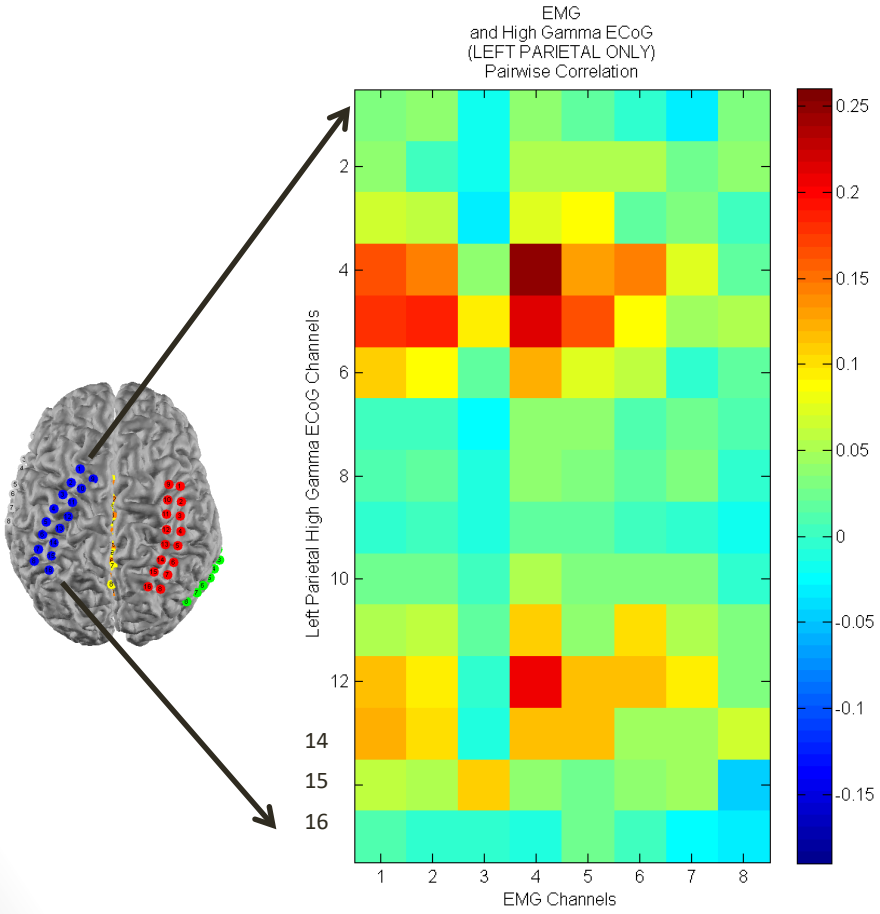


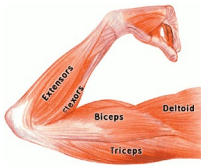
- Strips patient with left parietal coverage
- 16 EMG electrodes covering 8 muscles
- 6 directions: up, down, right, left, forward, back



James Wu
http://www.wpclipart.com/medical/anatomy/muscle/arm_muscles_labeled.png.html

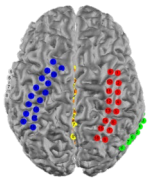
ECoG and EMG

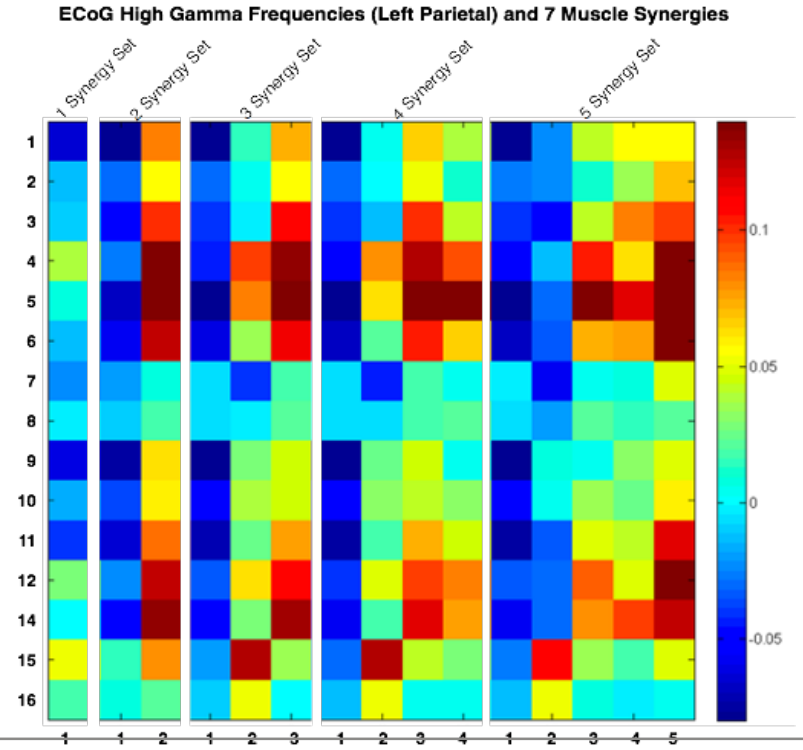


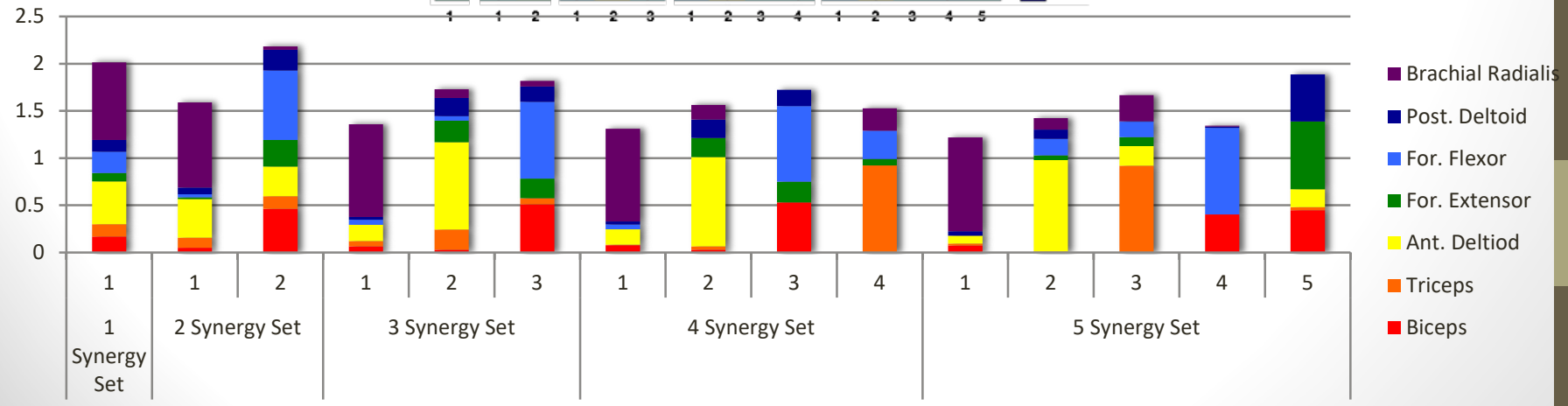


- Background around 0 correlation
- Areas of higher correlation centered around electrodes over MC
- Somatotopically aligned with expected arm control (relative to hand control)

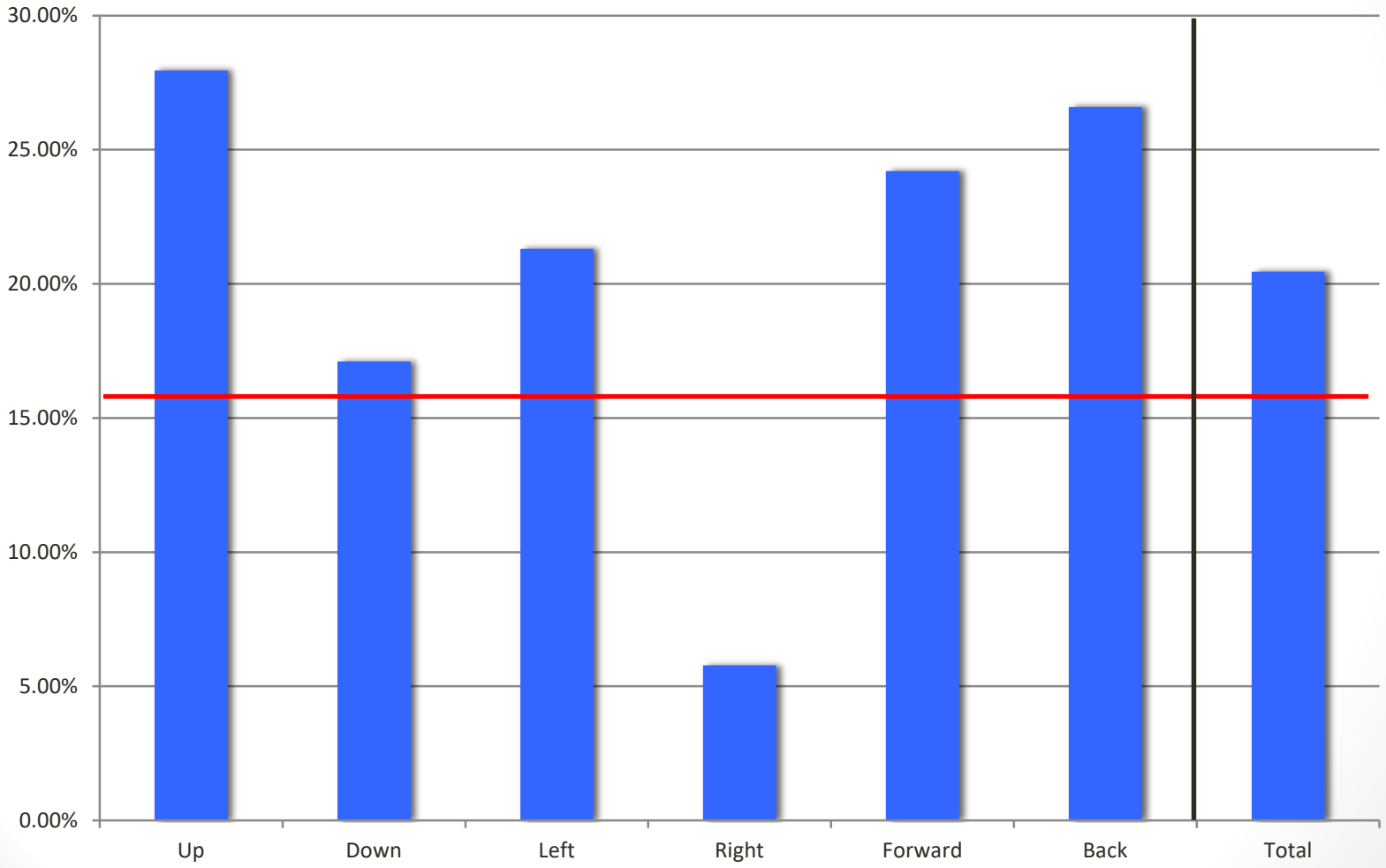
ECoG and Synergies





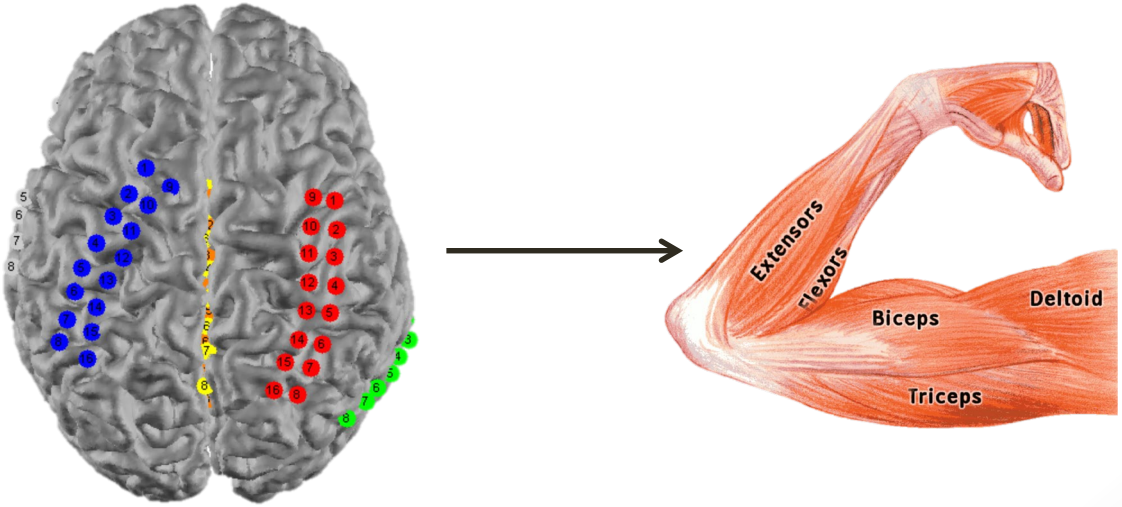


Machine Learning



Conclusions

- Specific brain regions appear to align well with specific muscles
- We haven't seen good evidence for muscle control from the brain with muscle groups
- The computer is able to extract information from ECoG but not yet enough to power a prosthetic—potentially with more investigation



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- James Wu
- GRID Lab