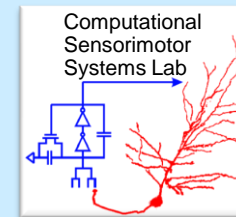


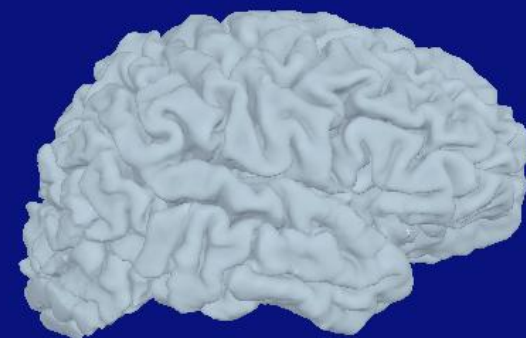
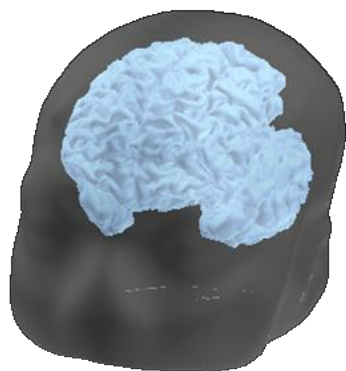


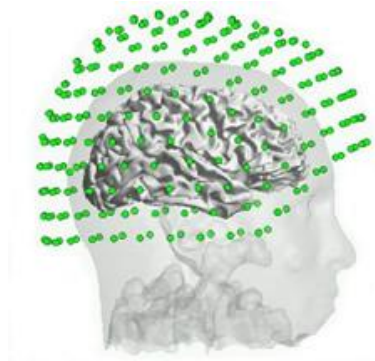
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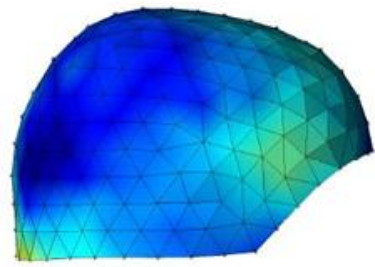
Neural Imaging of Visual Word Processing in Aphasia Patients

Abdulaziz Al-Turki, Corinne M
Graduate Student Mentor:
Faculty Mentor: Dr. Jonatha

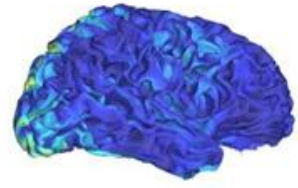




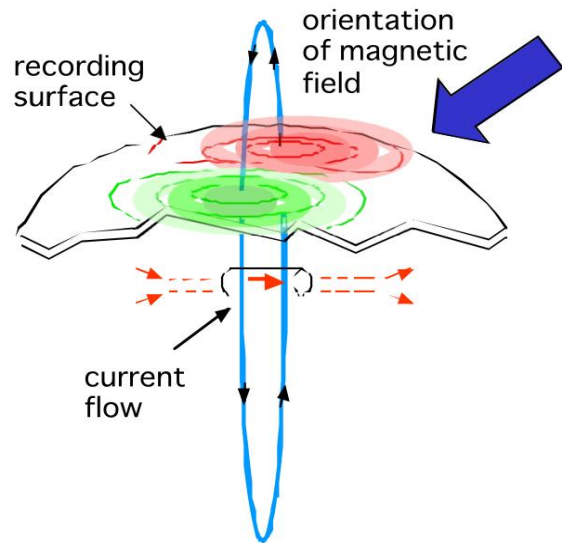
MEG Sensors



Magnetic Field
Measurements



Current Source
localization



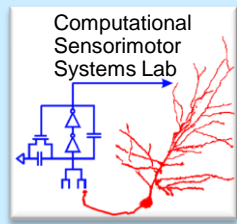
$$b(t) = \sum_{n=1}^N L(r_n) s(r_n, t)$$

Magnetic Field
Measurement

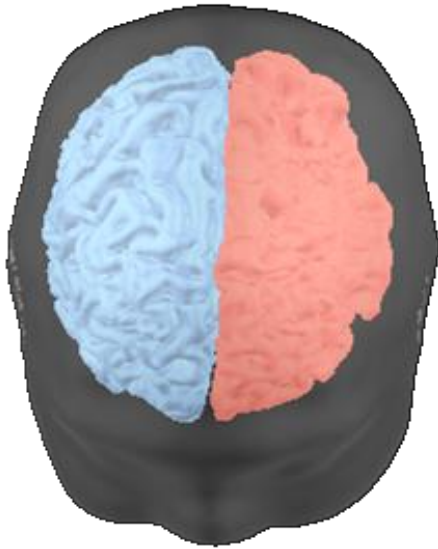
forward
solution

neural source
strength

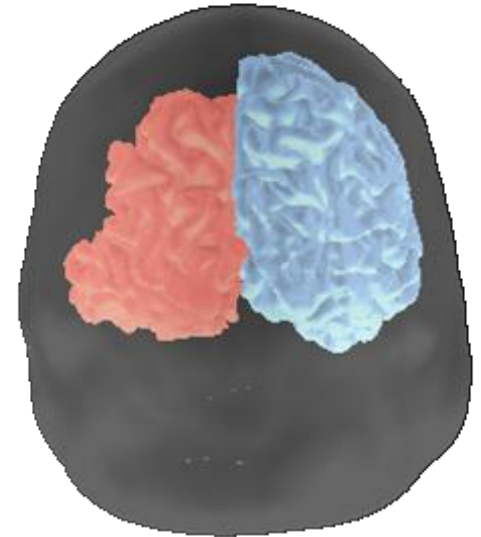
An Aphasia Patient



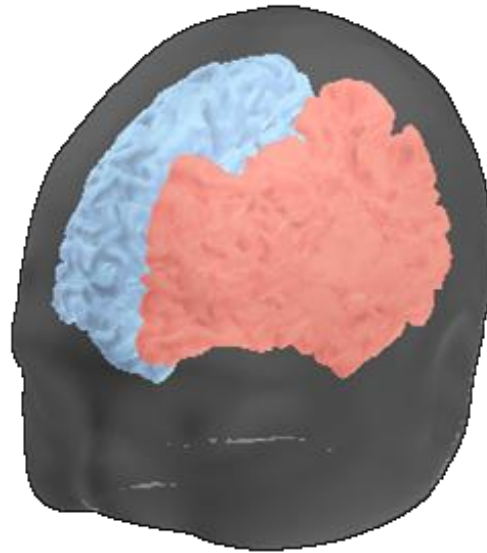
top view

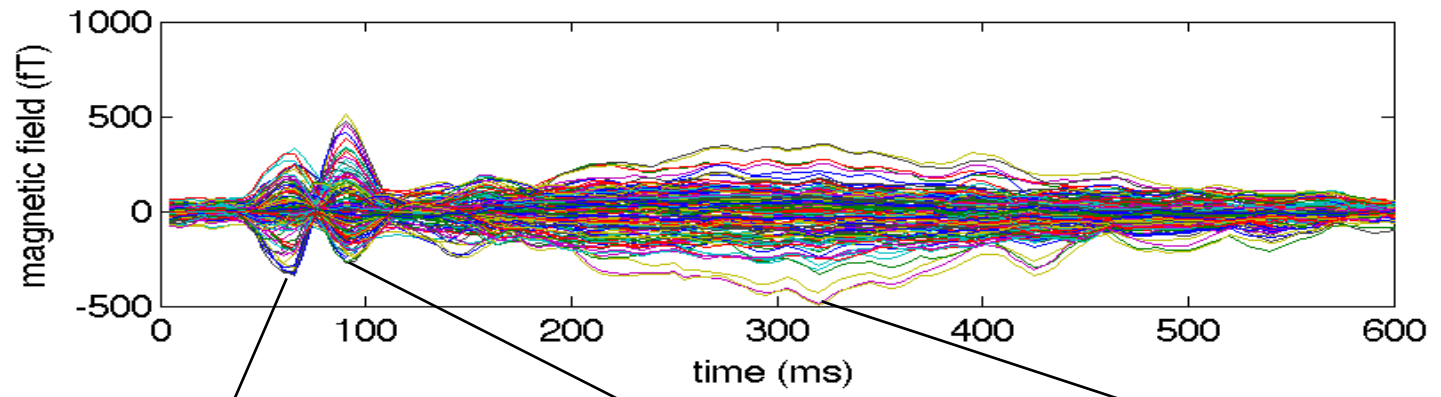


back view



front left view



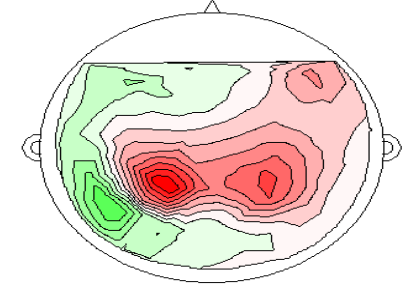
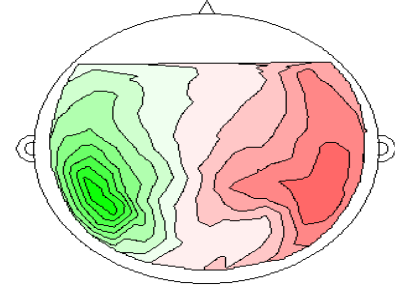
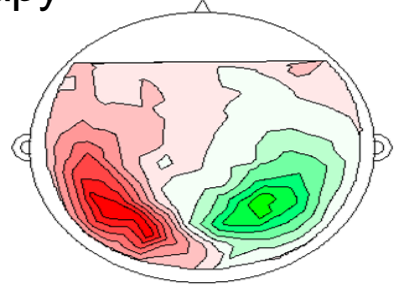


Pre-therapy

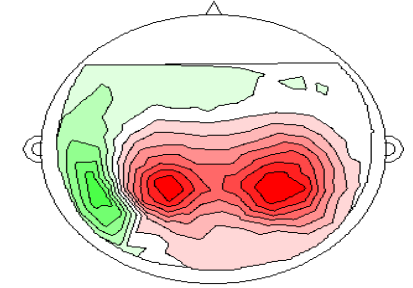
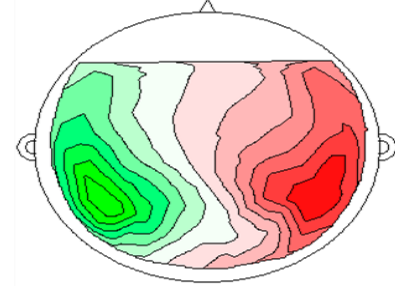
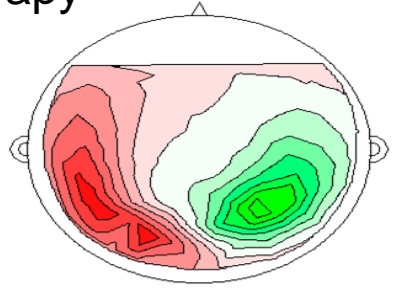
time = 65 ms

time = 85 ms

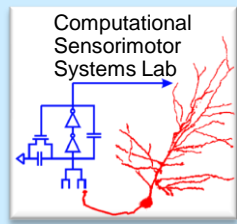
time = 200-400 ms



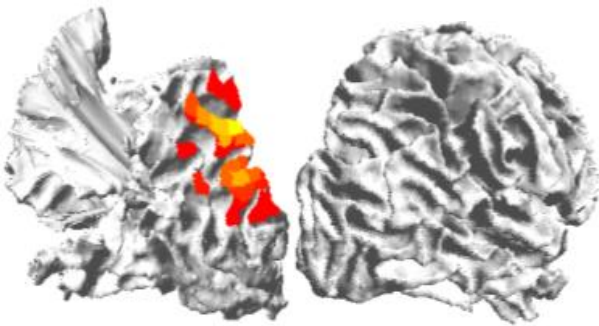
Post-therapy



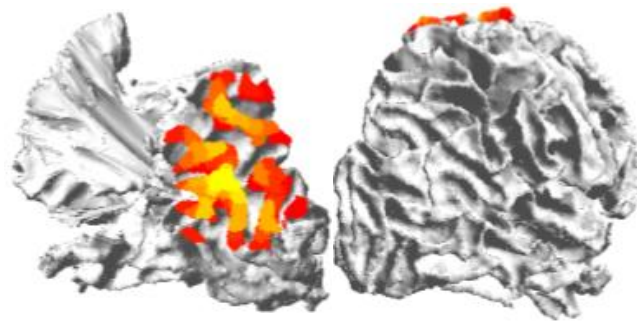
Localization (back view)



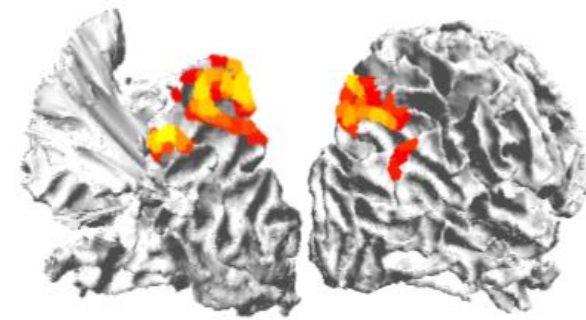
Pre-therapy



time = 65 ms

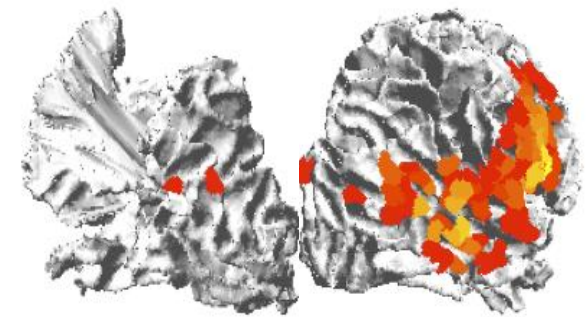
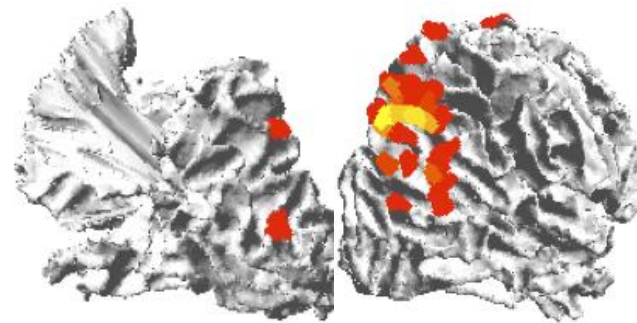
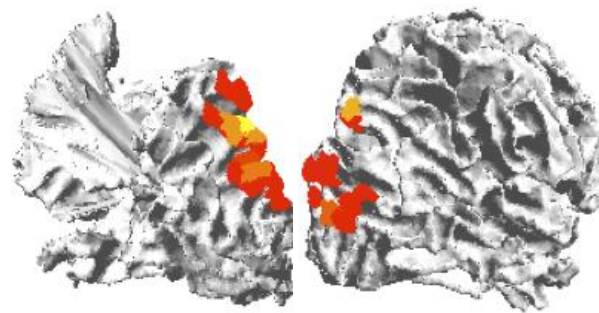


time = 85 ms



time = 200-400 ms

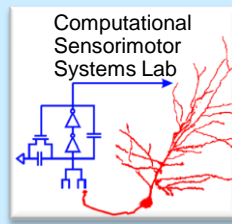
Post-therapy



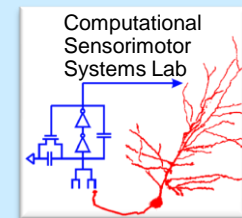


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Number of Differences



- We analyze the data from four subjects: two normal subjects and two aphasia patients
- Four different types of stimuli were displayed to each subject, each a different type of word:
 - 1: Inflected words (eg. “riding”, “pushing”)
 - 2: Pseudo inflected words (eg. “ridest”, “pushest”)
 - 3: Pseudo words (eg. “drism”, “zide”)
 - 4: Uninflected words (eg. “ride”, “push”)



Normal subject

Type of Word	Pseudo inflected	Pseudo	Uninflected
Inflected	729 (5%)	1857 (12%)	797 (5%)
Pseudo inflected		1501 (10%)	681 (4%)
Pseudo			1466 (9%)

Total = 7031

Aphasic subject

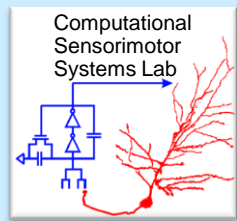
Type of Word	Pseudo inflected	Pseudo	Uninflected
Inflected	599 (4%)	1270 (8%)	1075(7%)
Pseudo inflected		724 (5%)	638 (4%)
Pseudo			535 (3%)

Total = 4841



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Acknowledgments



- National Science Foundation CISE award #0755224
- MERIT Program
- We thank Dr. Yasmeeen Shah for providing the MEG and MRI recordings.

Please visit us at our poster if you have any questions or wish to know more.

Neural Imaging of Visual Word Processing in Aphasia Patients
Abdulaziz Al-Turki, Corinne M Cameron

Introduction
In our analysis of aphasia patients who have left hemisphere damage resulting in language processing problems, we use Magnetoencephalography (MEG) measurements to extrapolate the different current source locations in order to quantify pre and post therapy results.

Methods
•Data was acquired from two aphasic and two normal subjects.
•Four different stimuli:
1: Inflected words (eg. "riding")
2: Pseudo inflected words (eg. "ridest")
3: Pseudo words (eg. "driasm")
4: Uninflected words (eg. "ride")
•MEG signals were recorded using a 157 channel whole head model and the brain structure was scanned using a 3 Tesla Magnetic Resonance Imaging (MRI) system.
•We use a Boundary Element Model (BEM) to construct a realistic head model of the subject using MNE-suite and calculate the corresponding forward solution.
•The neural source locations indicated by MEG recordings are localized by solving the inverse problem.

Results
MEG Recorded waveform
Spatial Distribution of Magnetic Field
From aphasia patient R0655
time= 65ms, time= 90 ms, time= 200-400 ms
Neural Source (back view)

•Based on MRI information, we use Freesurfer software to reconstruct the cortical surface of the subjects.
•We employ a correlation based method to solve the inverse problem.
•Neural source locations are constrained to be on the cortical surface.

Conclusion
In aphasia patients, the MEG response to visual words is featured by an early and a late response component. By solving the inverse problem, we localized the early component, near 100 ms, to the visual cortex and the late component, near 300 ms, to the parietal cortex.

Acknowledgments: NSF, MERIT, Dr. Jonathan Z Simon, Dr. Yasmeeen Shah, Graduate Student, Nai Ding