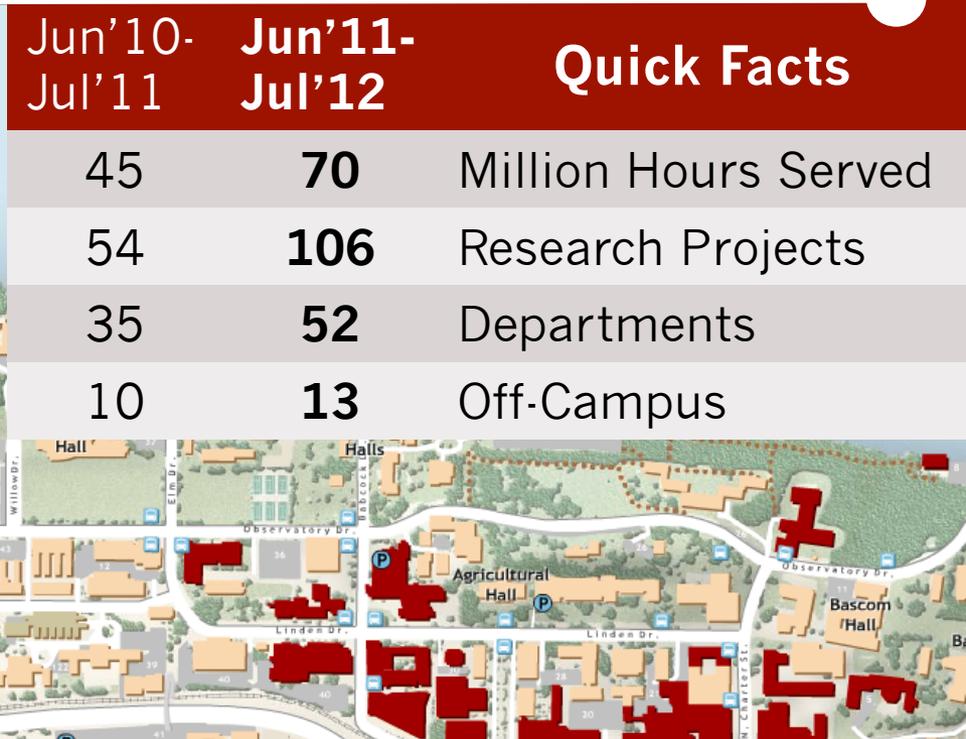
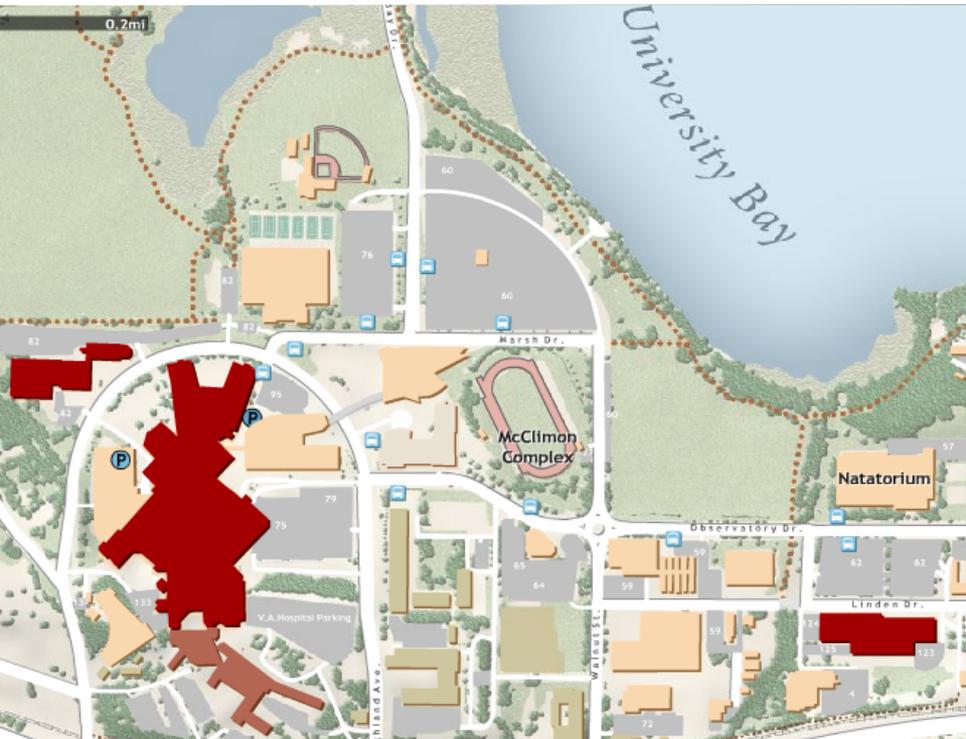




Facilitating Research at UW-Madison with HTC

Lauren Michael, Research Computing Facilitator
OSG All-Hands Meeting 2013
Indianapolis, March 12



Jun'10- Jul'11	Jun'11- Jul'12	Quick Facts
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45	70	Million Hours Served
54	106	Research Projects
35	52	Departments
10	13	Off-Campus

Last 12 months	Projects	Users
CHTC	126	600+
CHTC to OSG	47	102
OSG to CHTC	n/a	736

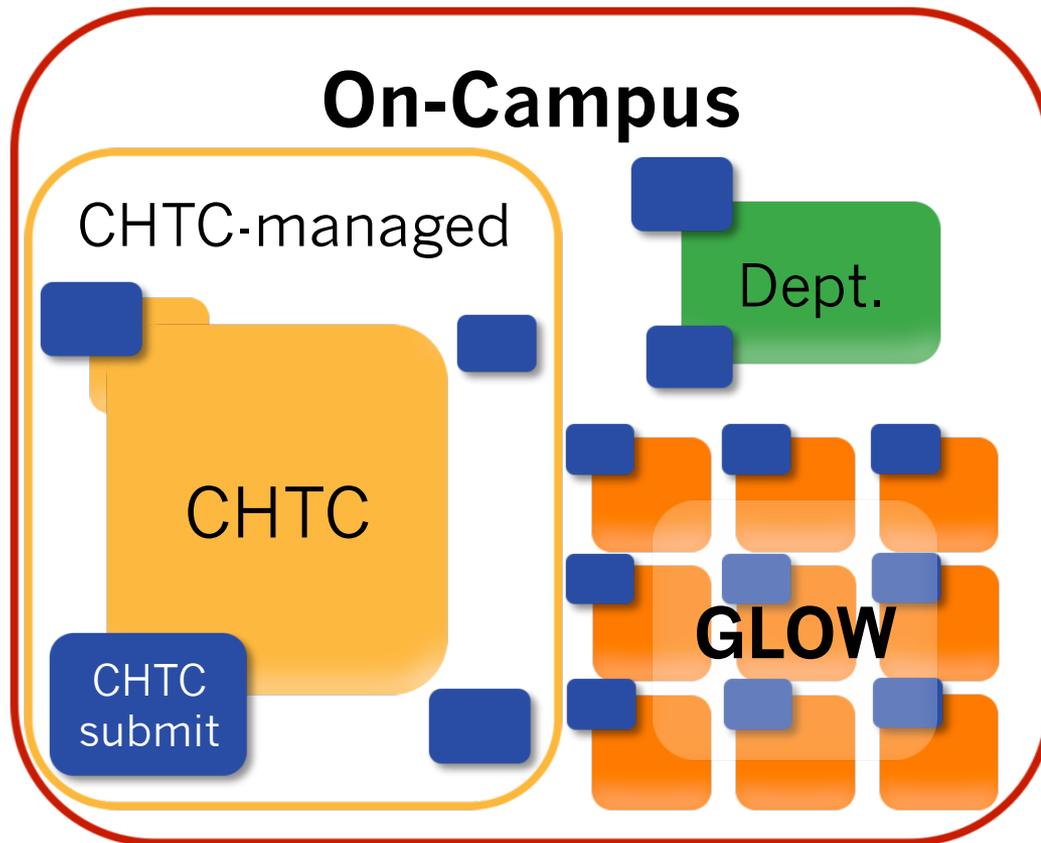


Researchers who use the CHTC are located all over campus (red buildings)

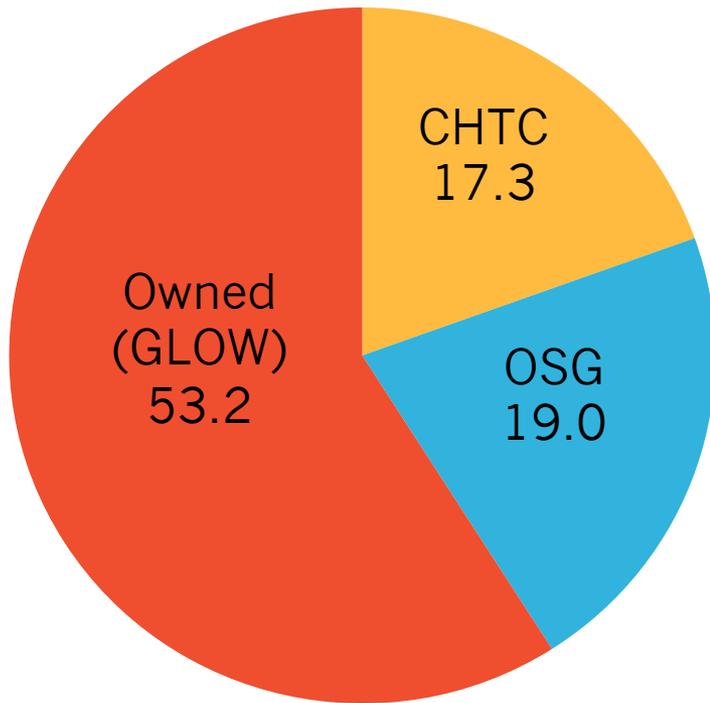
Campus DHTC Resources

Center for High Throughput Computing, est. 2006

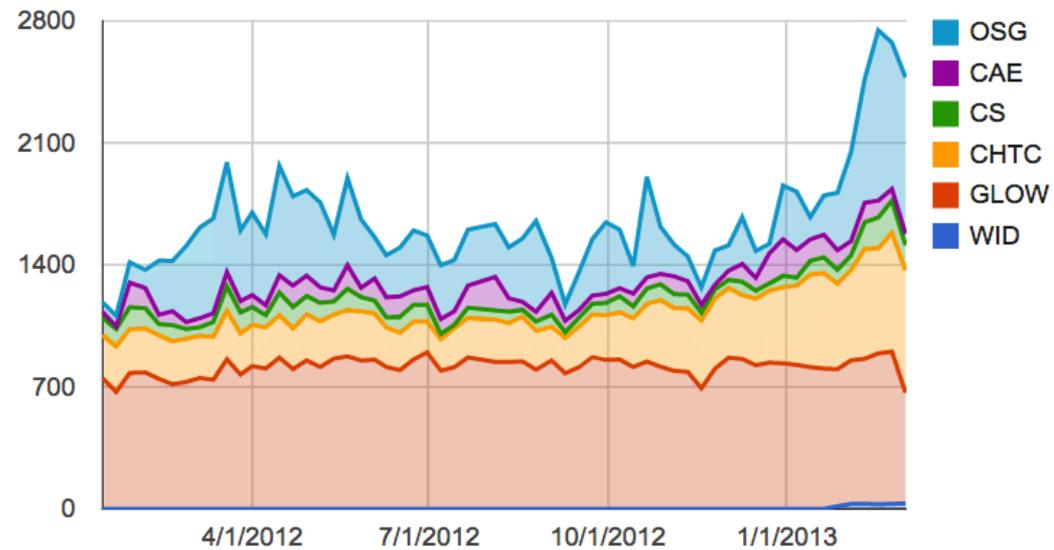
Grid Laboratories Of Wisconsin



Campus Usage



Millions of Hours, Last 12 Months



Thousands of Hours per Week

CHTC Services

- All Free!
- Website: **chtc.cs.wisc.edu**
 - “Get Started” via webform
 - Online guides (increasingly)
- Consultations & Office Hours
 - with our Research Computing Facilitators (RCFs)
 - PI present at initial consultation
 - One-on-one teaching and check-ups
- Ongoing Support
 - User support: chtc@cs.wisc.edu
 - Infrastructure support: htcondor-inf@cs.wisc.edu



Other Practices

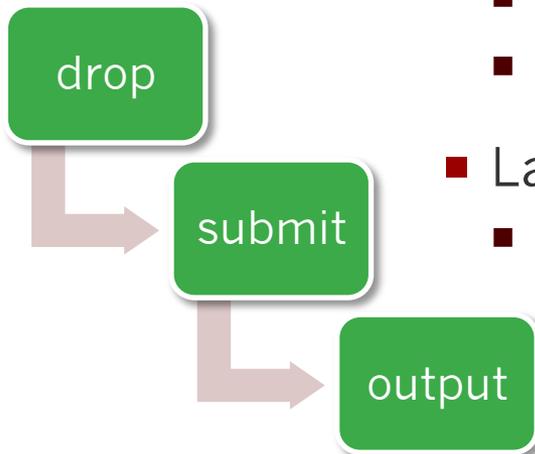
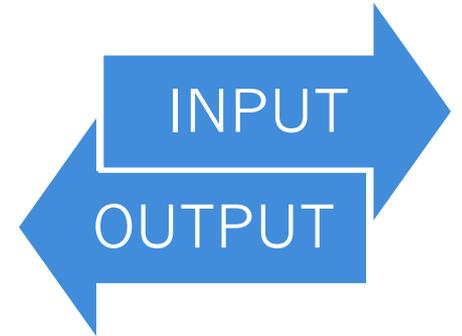
- Resource Management
 - Buy-in additions to CHTC pool
 - Project submit nodes
- Courses and Seminars
- Collaborations
 - Grant proposal development
 - Projects: e.g. “Running Galaxy with HTCondor”
 - Bosco!
- User Management Web App
 - Creating user accounts
 - Managing user groups, contact information, consultation history

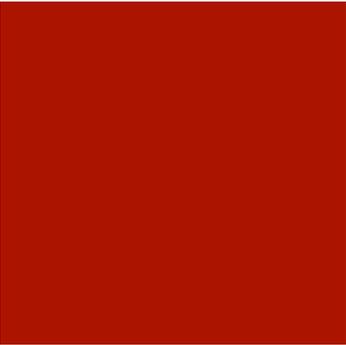


softwarecarpentry.org

Useful DHTC Solutions: By Problem

- Large I/O (submit node overload)
 - Proxy server
 - Post-scripts remove unwanted files
 - Group submit nodes
- Environment/Dependency Issues
 - Options to specify Linux 5 or 6
 - Designated compiling machines, interactive slots
 - Matlab, R, and Python sources and compiling tools
- Large, complex workflows; repetitive batches
 - Data dropping and automated workflow





More on Matlab in Zach's talk at 2pm!

Challenges:

- Matlab code must be compiled (campus license)
- Job may fail, HTCondor returns normal (“0”)
- Our most common programming language

Solutions:

- CHTC compiling tools
- DAG job manager and job wrapper
 - Submit file template, jobs submitted individually
 - Pre-scripts and post-scripts
 - Automated output checking and retries

Future Work – CHTC



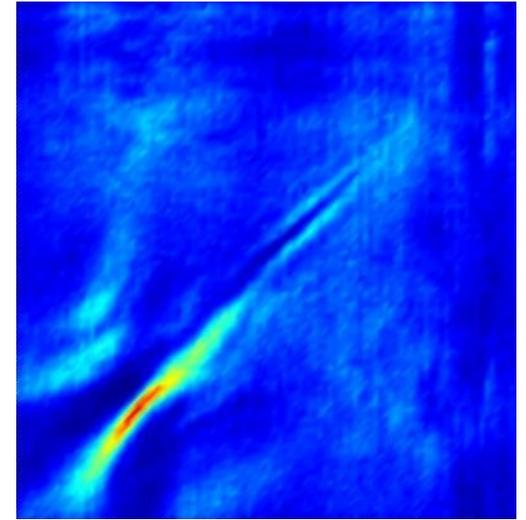
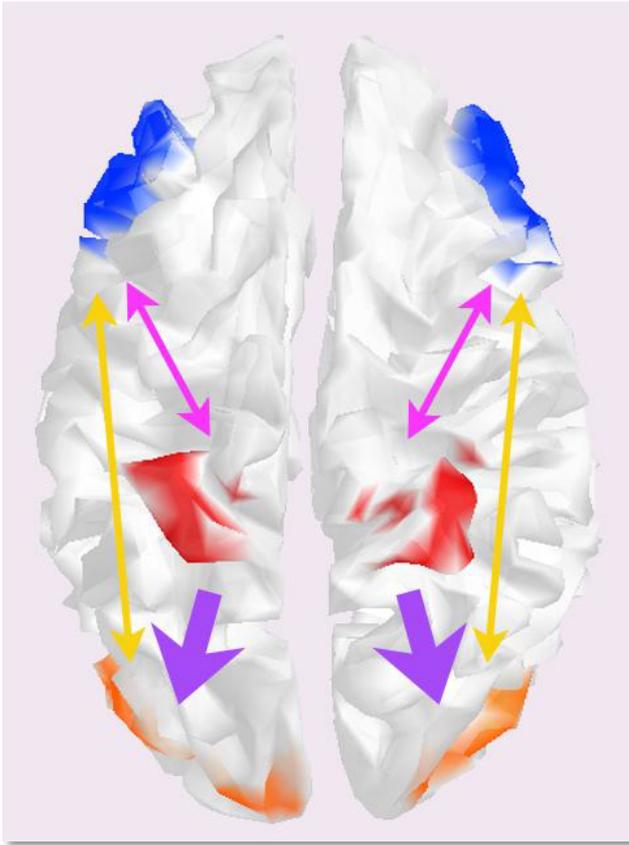
- Website and Online Guide Improvements
- Accounting Improvements
 - jobs by number, code, run time, etc.
 - number, code, and run time by department
 - post-consultation user behavior?
- **HPC Resources** – arriving soon!
 - Collaboration with new **Advanced Computing Infrastructure (ACI)**
 - SLURM-managed; 48 nodes X 16 cores X 8GB RAM
 - Shared Gluster storage, 4 X 36TB
 - Infiniband connection

Future Work – Campus-Wide

in collaboration with ACI

- **Large-** and **Small-**Scale Computing Services
 - **Communication: central campus website**
 - Support: facilitators, online guides, wikis
 - Learning: **Software Carpentry** bootcamps, **DoIT** software training, central advertising of UW courses
 - Interactions: matchmaking, brown-bag discussions, user groups, seminars
- Computing, Storage, and Networking Resources
- Collaborations and Proposal Development





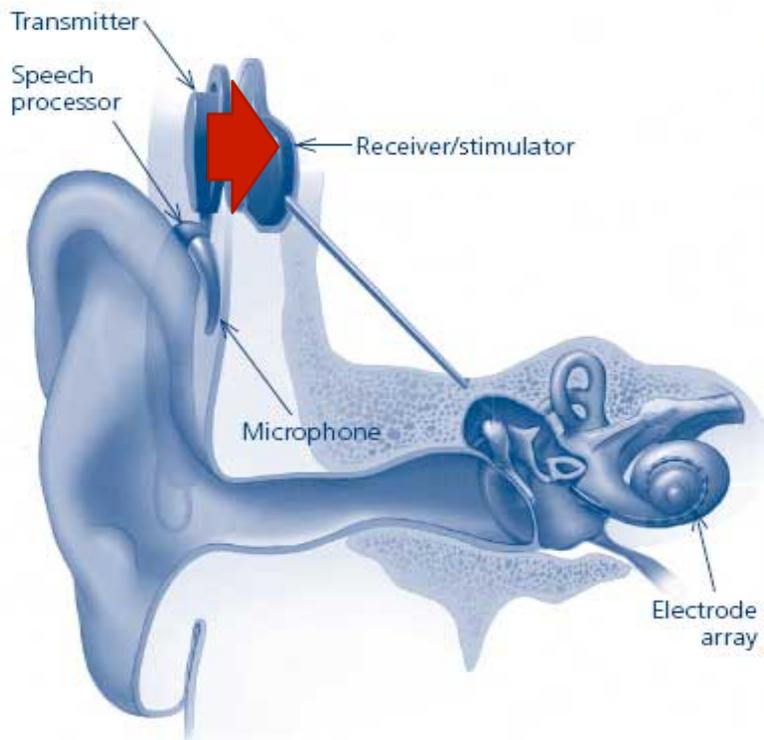
Science enabled by HTC

Neuroscience and Psychological Research



Binaural Hearing and Speech Lab

Improving Cochlear Implants

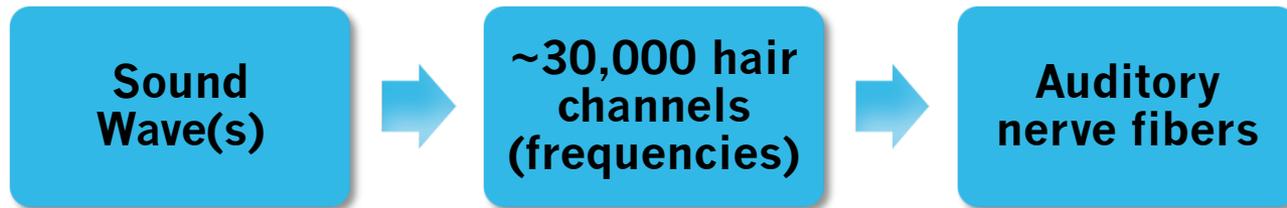


Can patient perception be improved with novel signal transmission to the receiver?

5 x 5000 stimuli signals generated with Matlab (~1 CPU hr each).
Stimuli used in clinical trials with CI patients

Binaural Hearing and Speech Lab

Modeling Auditory Nerve Behavior

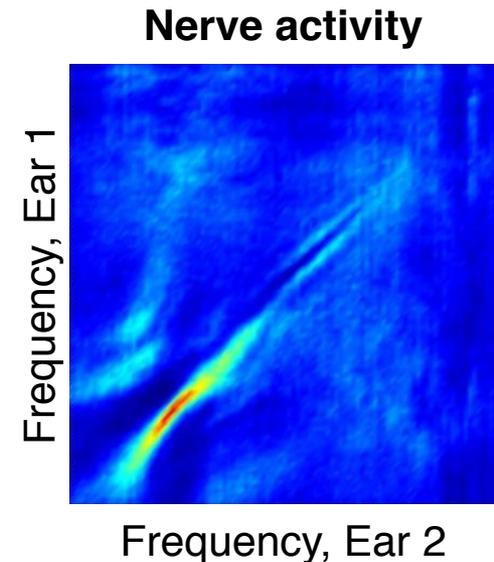


Model 1: simulates auditory nerve activity from sound files

Model 2: (in optimization) predicts cognitive perception from output of model 1

Up to 100,000 Matlab jobs per week

1.1 million hrs last year, **~800,000 OSG hrs**

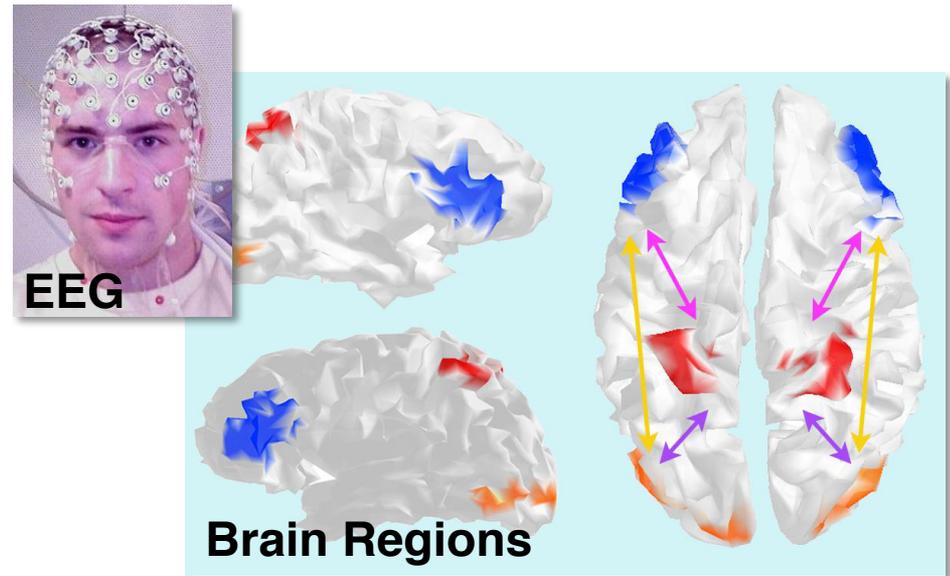


Modeling Brain Networks

Expectation Maximization Algorithm

EM algorithm predicts *de novo* models of connectivity strength and directionality between key brain regions, against EEG data.

Algorithm optimization performed with OSG resources in the lab of **Dr. Barry Van Veen**, UW-Madison Dept. of Electrical and Computer Engineering.



Used by multiple UW-Madison Psychology and Psychiatry projects to study a variety of mental processes. Results impossible without DHTC.

1.8 million hours, **1.1 million OSG hours** in the last 12 months

Center for Sleep and Consciousness

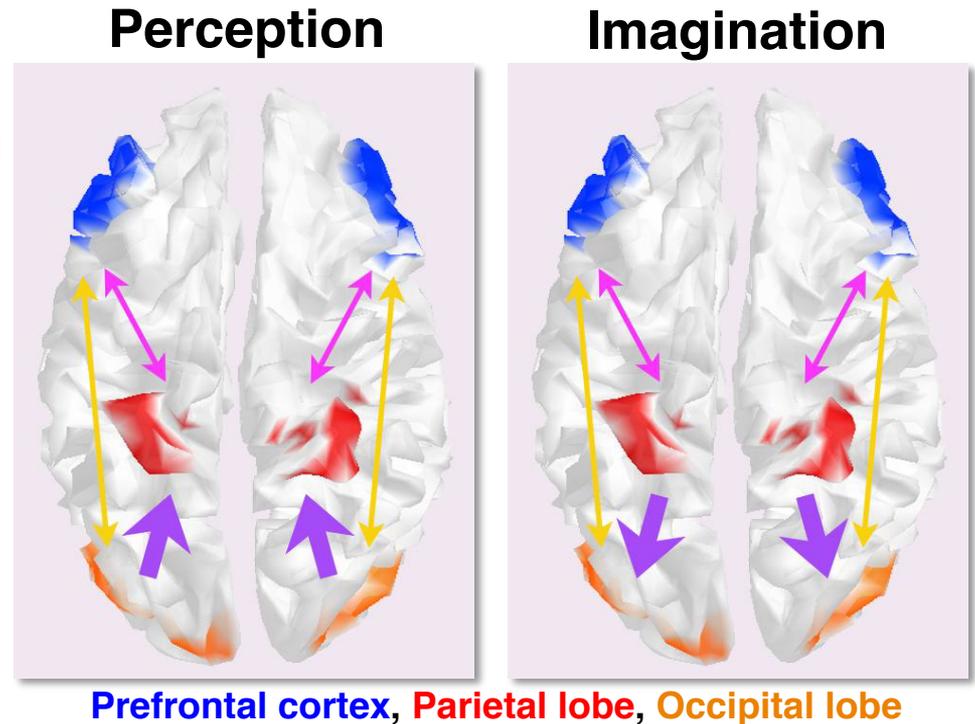
Imagination vs Perception

EM algorithm determined a reverse directionality, from cognition to visual processing, in imagination versus perception.

Per subject, per condition, per time:
20 initiations of 20,000 Monte Carlo iterations of the model

Data analyzed as periodic, identical large batches.

Similar for other studies using the EM algorithm.



Daniela Denticò, MD PHD and PI Julio Tononi
Dept. of Psychiatry, unpublished work
<http://tononi.psychiatry.wisc.edu/>

Top 5 Tips for Facilitating Research with DHTC



1. Effective Outward Communication
2. Accessible, Organized Support
3. Generalizable Tools (with customization options)
4. Customer Relationships
5. Network of Collaboration





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