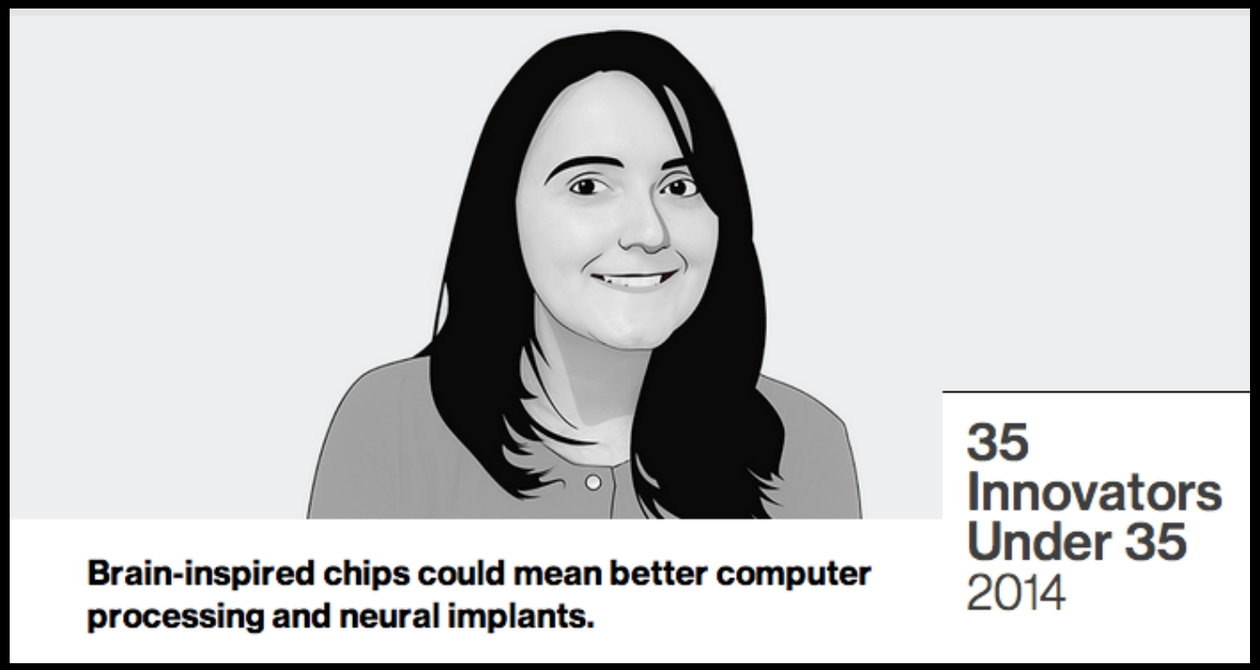
Data & Analysis: Cross-Training and Collaboration

Brian Litt, MD
Professor of Neurology and Bioengineering
Penn Epilepsy Center
University of Pennsylvania

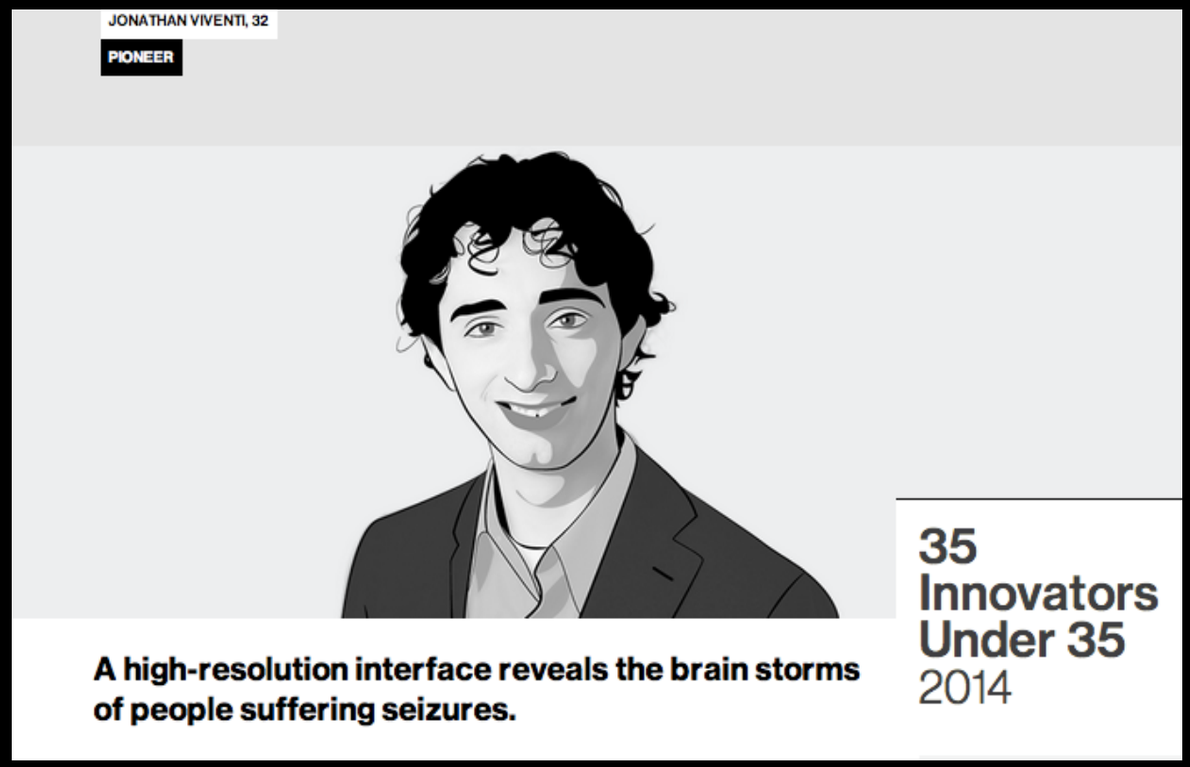
Disclosures: *Medtronic, BioQuantix, NeuroVista, NeuroPace, MC-10*

MIT Technology Review

The "Neuroscience-Tech" Revolution

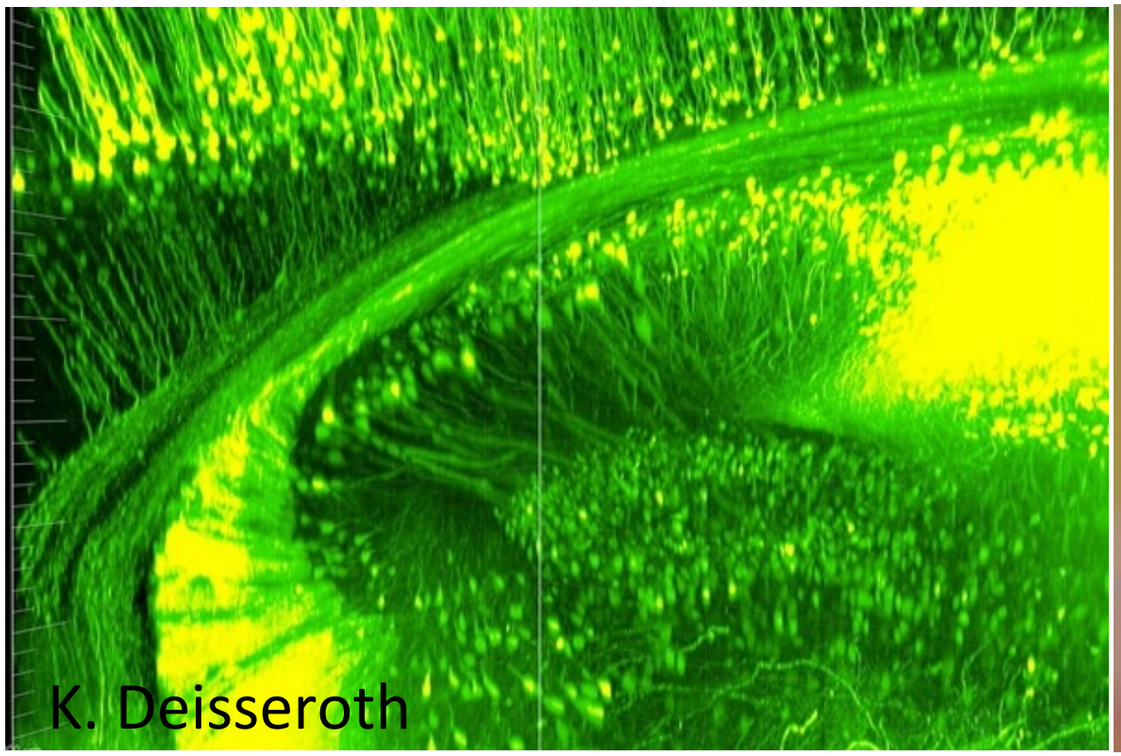


Duygu Kuzum, PhD

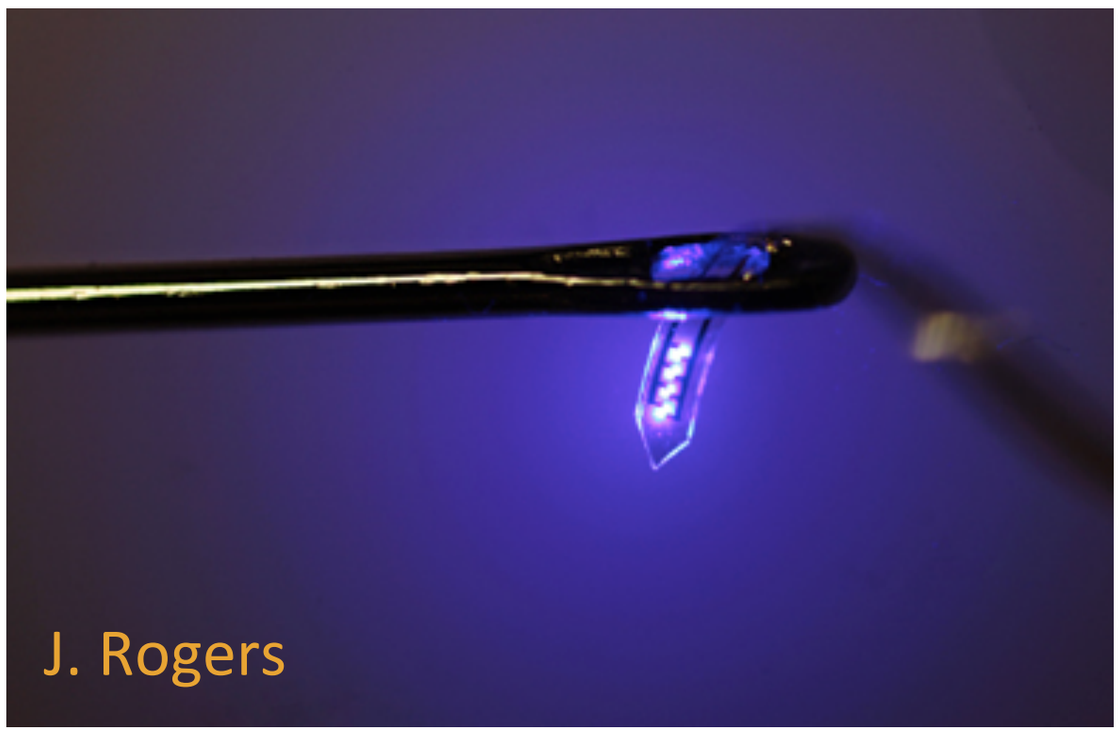


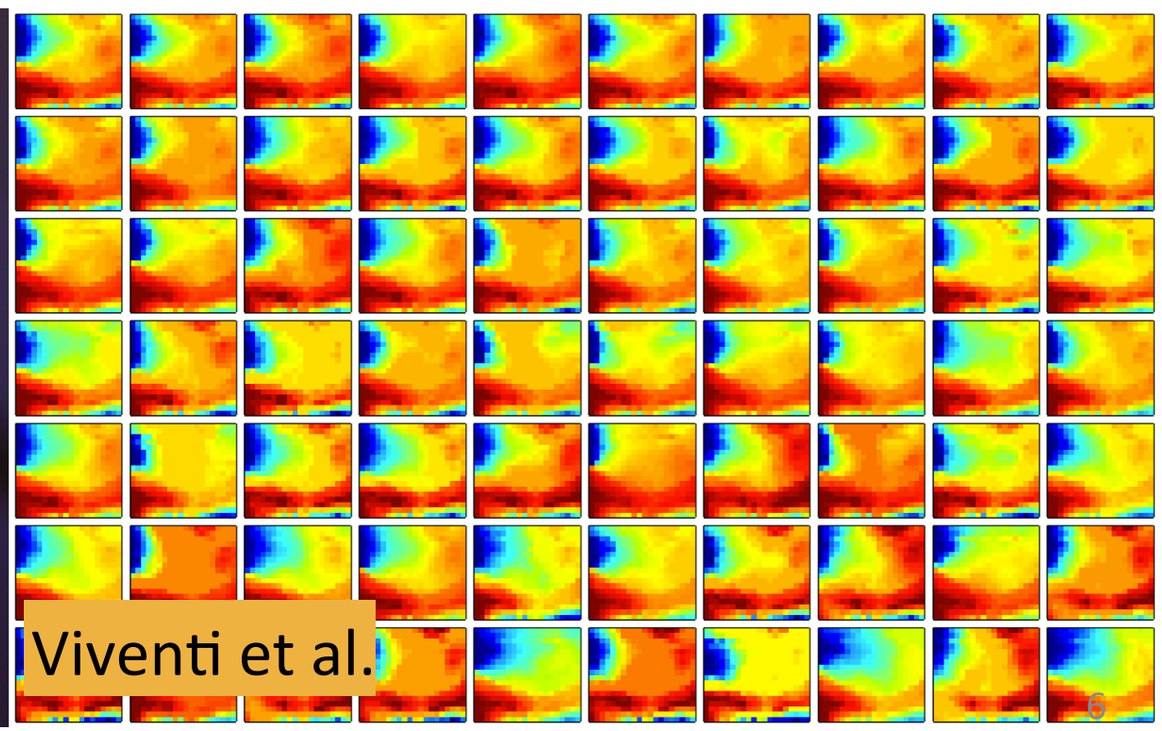
Jonathan Viventi, PhD

BIG DATA


K. Deisseroth


M. Schnitzer
Dan Stober, Stanford News Service


J. Rogers


Viventi et al.

Expertise Gap: Data Handling

- Which disciplines?
- How can outside disciplines help?

How

- Tracks: experimental, theoretical,“computation”
- Interdisciplinary courses
- Hands on experience
- Central resources/ infrastructure
- Recruit & pollinate with other fields…(we are!)
- Sharing…train them young
- Collaborative culture
- $upport







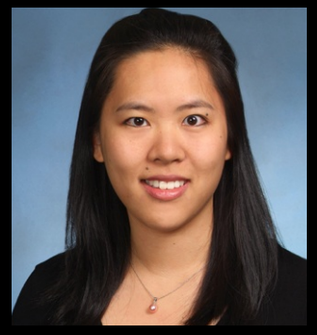




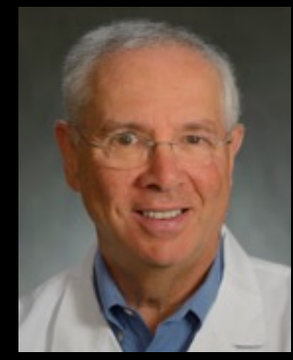

















Disciplines

Computer Science

- Databases/ Integration
- Cloud Computing
- Machine learning

Disciplines: Data Handling

Engineering

- Signal Processing
- Scientific Computing (MATLAB/ Python)
- Materials Science
- Nanotechnology

Statistics

- R
- Visualization/ multi-variate

BE 521: Brain-Computer Interfaces

Brian Litt, M.D.
Cross-listed: Neuroscience & Bioengineering

BE-521

- Neuroscience + Engineering Students
- Collaborative Groups
- Lectures: how to and applications
- 10 HWs, intense practice
- Each person turns in own HW, lists collaborators
- Random calls on reading

BE 521: Technical Content

1. Digital Signal Processing: Aliasing, Nyquist, AtoD, Filtering
2. MATLAB Programming
3. Feature Extraction: time, frequency, wavelet, chaotic
4. Classifiers: Supervised, Unsupervised
   Regression
   Knn
   SVM
   Clustering
5. Data Basics: storage, databasing, integration, search, provenance
6. Basics: Cloud Computing
   storage, retrieval
   distributed processing
   Hadoop, Apache
   sharing data, algorithms, results
   Github: SCM

BE 521: Applications

1. Neural Signals: Units, LFP, EEG, EP,
2. Sort units
3. Extract features from LFPs
4. Reconstruct sound a la Cochlear implant
5. Seizure Detection: “Kaggle competitions”
6. Classification: Brain oscillations, HFO
7. Classify visual columns by orientation tuning
8. Motor control from multi-unit recordings in primates/ humans
9. Speech decoding from P-300 (Wolpaw/ Schalk)
10. Finger flexion from ECOG unknown data set
11. Decode limb position from sensory DRG activity

Infrastructure: http://ieeg.org

- On Amazon's S3
- Browser-based
- Common format….***vendor pressure
- Viewer, annotation, algorithms, provenance
- Complete access control
- Track, validate all experiments
- Scientific payload
- S-index

Penn — University of Pennsylvania | Mayo Clinic

http://ieeg.org

Access Data | Access Forums | Documentation | About Us

International Epilepsy Electrophysiology Portal

User login

Username: *

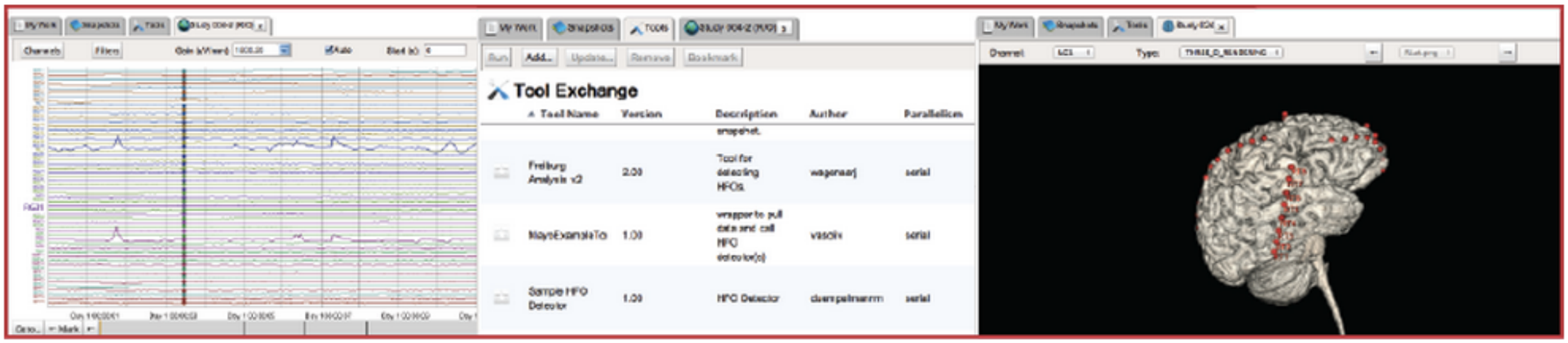
Password: *

Log in

- Create new account
- Request new password

IEEG Portal Tools

- The Matlab Toolbox
- The MEF Format
- 3D Co-registration Tools
- DClamp Software



The International Epilepsy Electrophysiology Portal is a collaborative initiative funded by the National Institutes of Neurological Disease and Stroke. This initiative seeks to advance research towards the understanding of epilepsy by providing a platform for sharing data, tools and expertise between researchers. The portal includes a large database of scientific data and tools to analyze these datasets. (United States National Institutes of Health Grant #1 U24 NS063930-01)

The portal on Amazon!

Fri, 10/05/2012 - 12:10 — Joost Wagenaar

As of last week, the IEEG-Portal is running on the Amazon cloud. The web-server runs on an EC2 node and the data is stored using Amazon's S3 service. The transition from the servers at the University of Pennsylvania to Amazon will allow more users to log on simultaneously and provide a more expandable long term solution for the IEEG-Portal. We will open the portal to more users over the next few weeks.

Joost Wagenaar's blog Read more

IEEG-Portal Webconsole

https://www.ieeg.org

Apps | UPHS Intranet | EPIC | Penn ERA | Blackboard | UPenn Pubmed | CDMRP | CrossCutting | IEEG qa | EEG Portal Qa | Import to Mendeley | proposalCENTRAL | Other Bookmarks

IEEG-Portal

Log In

Updates | Work

Welcome to the IEEG-Portal!

The International Epilepsy Electrophysiology Portal is a collaborative initiative funded by the National Institutes of Neurological Disease and Stroke. This initiative seeks to advance research towards the understanding of epilepsy by providing a platform for sharing data, tools and expertise between researchers. The portal includes a large database of scientific data and tools to analyze these datasets.

REQUEST A USER ACCOUNT | DOWNLOAD THE TOOLBOX | READ THE DOCUMENTATION

You can also:

- Explore some sample datasets in the 'Work-Tab.
- Log in and explore hundreds of datasets.
- Email us with inquiries at ieeg-portal (at).gmail.com.

Penn University of Pennsylvania | MAYO CLINIC | National Institute of Neurological Disorders and Stroke, National Institutes of Health

Recent Activity

You opened snapshot I001_P034_D01 @ *2014 Oct 28 10:12:14*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 28 10:12:12*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 28 09:22:46*
You opened snapshot I001_P034_D01 @ *2014 Oct 27 20:08:02*
You opened snapshot Study 006 @ *2014 Oct 27 20:04:06*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 27 20:04:00*
You opened snapshot I001_P034_D01 @ *2014 Oct 27 19:43:07*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 27 19:42:51*
You opened snapshot I001_P034_D01 @ *2014 Oct 27 16:47:06*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 27 16:46:57*
You opened snapshot I001_P034_D01 @ *2014 Oct 27 16:13:25*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 27 16:13:21*
You opened snapshot Study 005 @ *2014 Oct 27 15:56:12*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 27 15:56:06*
You opened snapshot Study 006 @ *2014 Oct 27 15:55:02*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 27 15:54:50*
You opened snapshot I001_P034_D01 @ *2014 Oct 27 15:10:07*
You opened the project Sample_Intracranial_Datasets @ *2014 Oct 27 15:10:03*
You opened snapshot Study 005 @ *2014 Oct 27 14:47:27*
You opened snapshot Study 005 @ *2014 Oct 27 14:46:47*
You opened snapshot Study 005 @ *2014 Oct 27 14:46:21*

Portal Status

478 public datasets **557** academic datasets*

566 registered users **731** clinical datasets**

* 316 and ** 162 datasets are publicly accessible, others are shared privately within a workgroup.

IEEG-Portal Webconsole

https://www.ieeg.org/main.html?login=true

Apps | UPHS Intranet | EPIC | Penn ERA | Blackboard | UPenn Pubmed | CDMRP | CrossCutting | IEEG qa | EEG Portal Qa | Import to Mendeley | proposalCENTRAL | Other Bookmarks

IEEG-Portal

littb

Updates | Work | Datasets | Tools

littb
Unknown affiliation

Recent Activities

You opened snapshot Study 029 @ *2014 Oct 22 09:00:15*
You opened snapshot Study 029 @ *2014 Oct 22 08:59:45*
You opened snapshot Study 029 @ *2014 Oct 22 08:59:07*
You opened snapshot Study 020 @ *2014 Oct 22 08:58:33*
You opened snapshot I013_A0001_D003 @ *2014 Oct 22 08:54:03*
You opened snapshot I013_A0001_D003 @ *2014 Oct 21 16:44:35*
You opened snapshot I004_A0003_D001 @ *2014 Oct 21 16:36:22*
You opened snapshot I014_P047_D02 @ *2014 Oct 21 16:35:22*
Joost Wagenaar opened the project 131011_Medtronic_Visit_ @ *2014 Oct 20 11:53:04*
You opened snapshot I014_P047_D02 @ *2014 Oct 17 19:22:15*
You opened snapshot I014_P050_D02 @ *2014 Oct 17 19:18:50*
You opened snapshot I014_P049_D02 @ *2014 Oct 17 19:16:10*
hoameng opened the project vespa @ *2014 Oct 17 18:55:05*
hoameng opened the project vespa @ *2014 Oct 17 18:51:26*
You opened snapshot I014_P003_D02 @ *2014 Oct 17 16:14:22*
You opened snapshot I014_P008_D02 @ *2014 Oct 17 16:11:55*
You opened snapshot I014_P006_D01 @ *2014 Oct 17 16:10:51*
You opened snapshot I014_P050_D02 @ *2014 Oct 17 15:58:22*
You opened snapshot I001_P013_D01 @ *2014 Oct 17 15:58:00*
mlazarew opened the project 131011_Medtronic_Visit_ @ *2014 Oct 10 11:16:59*
Joost Wagenaar opened the project Pitkanen Data @ *2014 Oct 9 11:39:09*
You opened snapshot I004_A0002_D001 @ *2014 Oct 6 10:20:22*

Portal Status

478 public datasets **557** academic datasets*

566 registered users **731** clinical datasets**

* 316 and ** 162 datasets are publicly accessible, others are shared privately within a workgroup.

Messages And Recommendations

Invite your collaborators and colleagues!

Contributions

You contributed:

7 datasets, and **93** annotations

85 other users viewed your datasets

IEEG WebConsole

https://view.ieeg.org

UPHS Intranet | EPIC | Penn ERA | Blackboard | UPenn Pubmed | CDMRP | CrossCutting | IEEG qa | EEG Portal Qa | Import to Mendeley | proposalCENTRAL | U@Penn | Other Bookmarks

IEEG.org WebConsole

Share... littb x

Data

Series	Snapshot
LG1	Study 012-2
LG10	Study 012-2
LG11	Study 012-2
LG12	Study 012-2
LG13	Study 012-2
LG14	Study 012-2
LG15	Study 012-2
LG16	Study 012-2
LG17	Study 012-2
LG18	Study 012-2

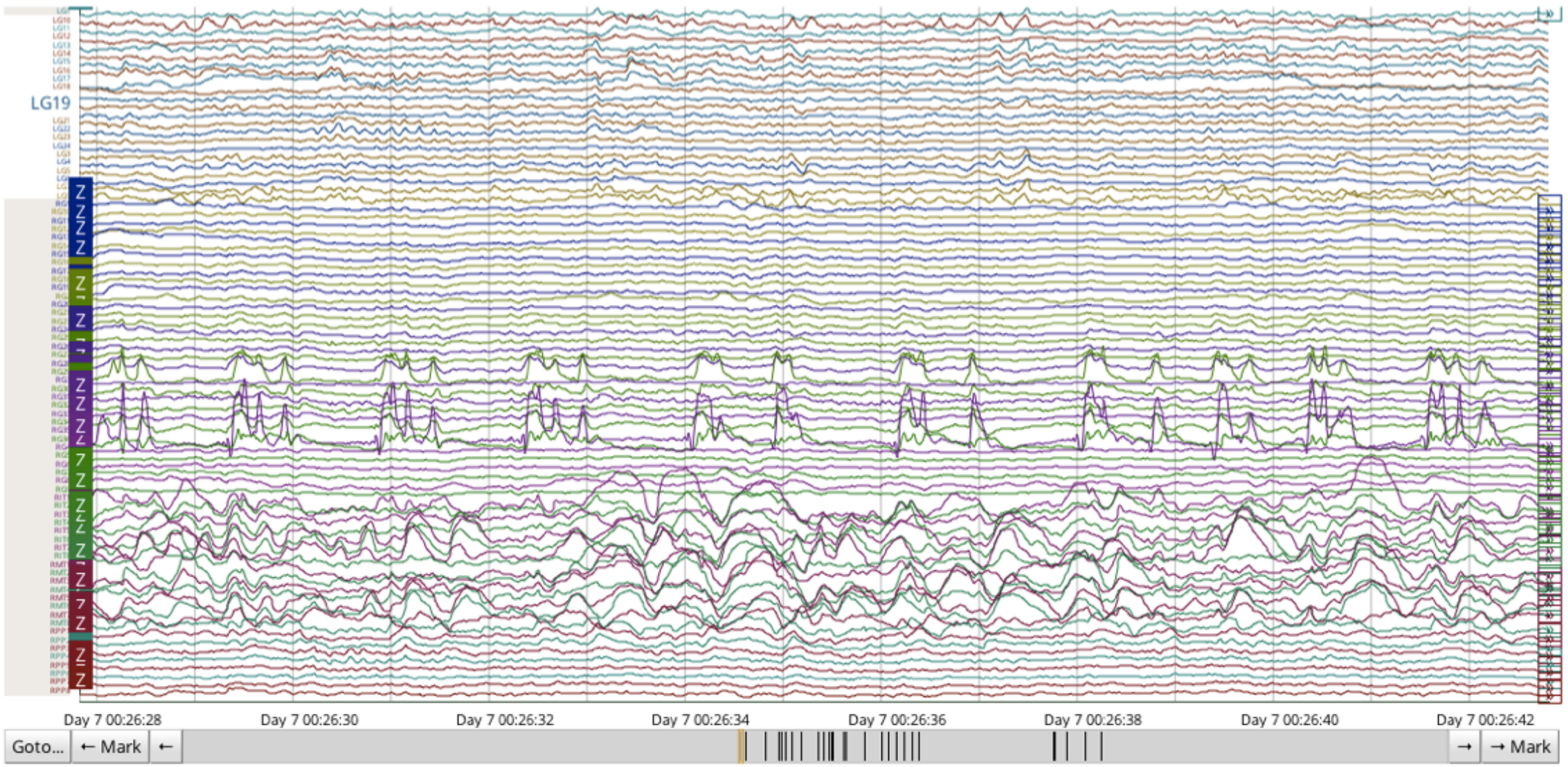
Download: CSV

Annotations

Analyses

My Work | Snapshots | Tools | Study 012-2 (R/O) x | Study 012-2 x

Channels | Filters | Gain (uV/mm): 95.32 | Auto | Start (s): 519987.82 | Width (s): 15.00



Goto... | ← Mark | ← | → | → Mark

IEEG WebConsole

https://view.ieeg.org

UPHS Intranet | EPIC | Penn ERA | Blackboard | UPenn Pubmed | CDMRP | CrossCutting | IEEG qa | EEG Portal Qa | Import to Mendeley | proposalCENTRAL | U@Penn | Other Bookmarks

IEEG.org WebConsole

Share... | littb

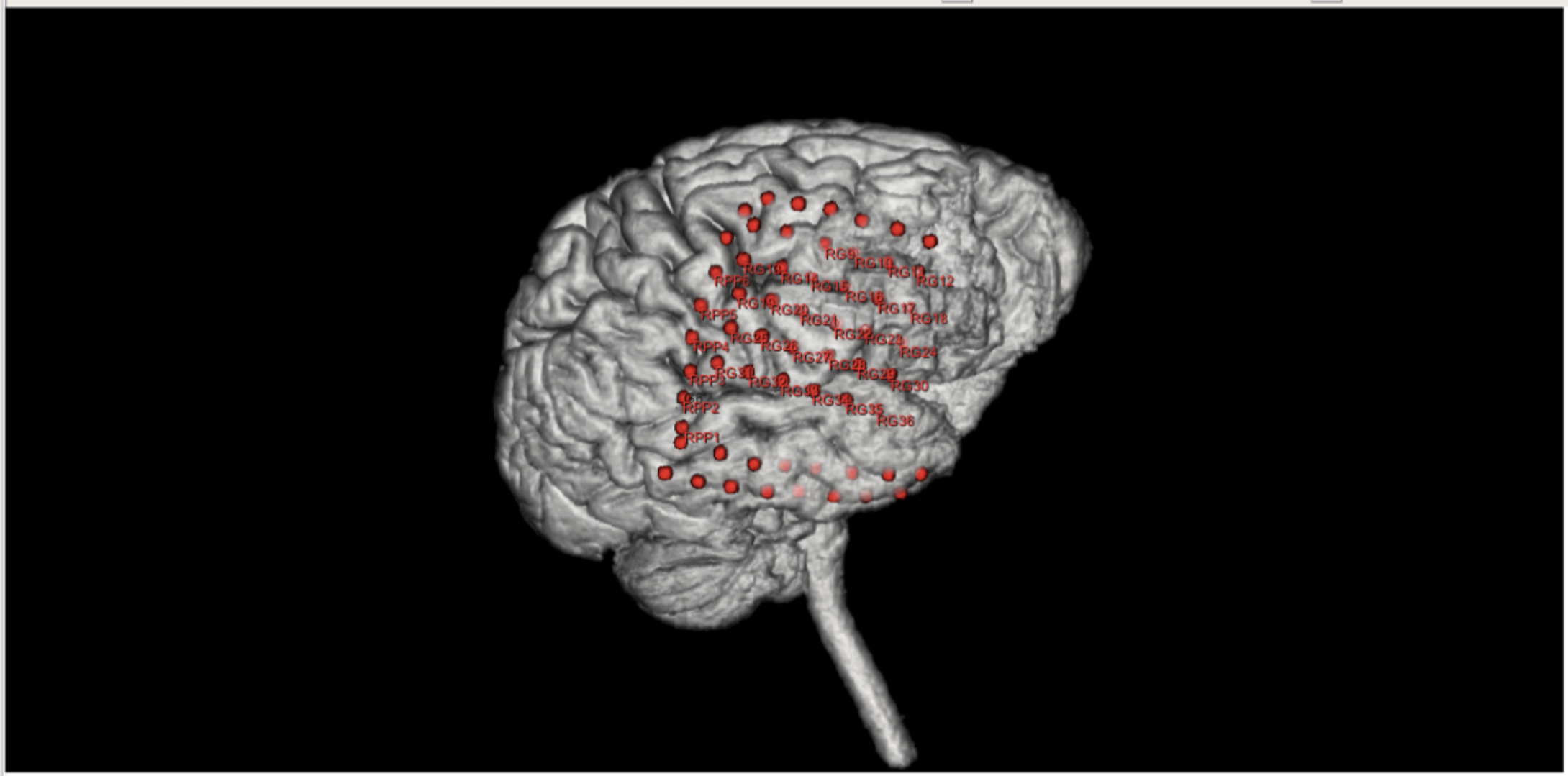
Data

Series	Snapshot
LG1	Study 012-2
LG10	Study 012-2
LG11	Study 012-2
LG12	Study 012-2
LG13	Study 012-2
LG14	Study 012-2
LG15	Study 012-2
LG16	Study 012-2
LG17	Study 012-2
LG18	Study 012-2

Download: CSV

My Work | Snapshots | Tools | Study 012-2 (R/O) x | Study 012-2 x

Channel: LG1 Type: THREE_D_RENDERING ← RAntLat.png →



IEEG WebConsole

https://view.ieeg.org

UPHS Intranet | EPIC | Penn ERA | Blackboard | UPenn Pubmed | CDMRP | CrossCutting | IEEG qa | EEG Portal Qa | Import to Mendeley | proposalCENTRAL | U@Penn | Other Bookmark

UPHS Intranet
http://uphsxnet.uphs.upenn.edu/home/

IEE

Share... littb

Data

Series	Snapshot
LG1	Study 012-2
LG10	Study 012-2
LG11	Study 012-2
LG12	Study 012-2
LG13	Study 012-2
LG14	Study 012-2
LG15	Study 012-2
LG16	Study 012-2
LG17	Study 012-2
LG18	Study 012-2

Download: CSV

Analyses

My Work | Snapshots | Tools | Study 012-2 (R/O) x | Study 012-2 x

Run | Add... | Update... | Remove

Tool Exchange

Tool Name	Version	Description	Author	Parallelism	License	ID	Download
IEEGexample_1	1.00	Example tool for the IEEGToolbox	wagenaarj2	serial	Apache	e7b45606-e375-404d-b153-633e0228fb1c	download
MayoExample	1.00	Detect HFOs	vasoliv	serial	Apache	ee47bf4b-11c5-40eb-89f6-c6d89b2b2c95	
Sample Parallel Seizure Detector	1.00	Parallel Seizure Detector	Javier Echauz	channel	Apache	8101e061-5856-4955-bfb1-2d27acac9cb2	download
Sample Seizure Detector	1.00	Seizure Detector	Javier Echauz	serial	Apache	566a0c66-b96f-48a4-a6fa-	download

Executing Tasks

Output Snapshot	Tool	Description	Tasks
5ad1c255-6f93-4b4a-80fc-c8edba66c6e2	ee47bf4b-11c5-40eb-89f6-c6d89b2b2c95	Detect HFOs	1

Refresh | Kill

GitHub Search GitHub Explore Features Enterprise Blog Sign up Sign in

ieeg.org

Tools developed by the ieeg.org community.

University of Pennsylvania http://www.ieeg.org ieegportal@gmail.com

People 1 ›

jwagenaar
Joost Wagenaar

Filters ▾ Find a repository…

brainmapperApp

Shell ★ 0 ⑂ 3

forked from vkrish1/brainmapperApp

as of Aug 2013

Updated 2 days ago

PortalMatlabAlgos

Matlab ★ 0 ⑂ 0

Updated 8 days ago

PortalMatlabTools

Matlab ★ 0 ⑂ 0

Updated 8 days ago

EDF-Reader

Matlab ★ 1 ⑂ 1

Allows users to read EDF (.edf) EEG files in Matlab

Updated on Sep 25

Persyst-Reader

Matlab ★ 0 ⑂ 0

Allows users to read Persyst (.lay) files in Matlab

Updated on Sep 11

$25,000 • 296 teams

American Epilepsy Society Seizure Prediction Challenge

Enter/Merge by

Mon 25 Aug 2014 — Mon 17 Nov 2014 (30 days to go)

Predict seizures in intracranial EEG recordings

Seizure forecasting systems hold promise for improving the quality of life for patients with epilepsy.

Epilepsy afflicts nearly 1% of the world's population, and is characterized by the occurrence of spontaneous seizures. For many patients, anticonvulsant medications can be given at sufficiently high doses to prevent seizures, but patients frequently suffer side effects. For 20-40% of patients with epilepsy, medications are not effective --

$25,000 • 371 teams

American Epilepsy Society Seizure Prediction Challenge

Enter/Merge by

Mon 25 Aug 2014 — Mon 17 Nov 2014 (20 days to go)

Dashboard

Public Leaderboard - American Epilepsy Society Seizure Prediction Challenge

This leaderboard is calculated on approximately 40% of the test data.
The final results will be based on the other 60%, so the final standings may be different.

See someone using multiple accounts?
Let us know.

#	Δ1w	Team Name * in the money	Score	Entries	Last Submission UTC (Best – Last Submission)
1	↑1	Michael Hills *	0.84447	236	Tue, 28 Oct 2014 00:57:05 (-5.8d)
2	↓1	Jonathan Tapson *	0.84356	51	Fri, 24 Oct 2014 20:16:36 (-3.5d)
3	—	Fission *	0.84208	97	Tue, 28 Oct 2014 00:19:47 (-3.5d)
4	↑4	Carlos Fernandez	0.82896	147	Mon, 27 Oct 2014 22:18:32 (-0h)
5	↑47	Medrr	0.82713	126	Tue, 28 Oct 2014 11:30:38 (-19.8h)
6	↑27	Trent	0.82313	124	Tue, 28 Oct 2014 04:15:41 (-27.7h)
7	↑8	cgp & Alexandre & blaine	0.82268	212	Mon, 27 Oct 2014 13:16:07 (-3.2h)
8	↓4	Tsakalis Kostas	0.81576	207	Mon, 27 Oct 2014 17:55:32 (-14.4d)
9	↓2	golondrina	0.81033	54	Tue, 28 Oct 2014 12:22:23 (-6.7d)

HTI Program

- Health, Technology and Innovation
- Wharton, SOM, SEAS
- Experiential, bring new tech forward
- Paid experience
- Industry, academic partnership
- Lead to jobs

CNT T32

- PhD, MD, both
- Leverage Mahoney Institute/ Penn
- MDs: Bridge training and career
- University-wide learning

How

- Tracks: experimental, theoretical,“computation”
- Interdisciplinary courses
- Hands on experience
- Central resources/ infrastructure
- Recruit from other fields…(we are!)
- Sharing…train them young
- Collaborative culture
- New programs: Internships, HTI, T32