IEEE brain
Brain Data Bank
Challenges & Competitions

Co-located with IEEE Sensors Conference 2019

BRAIN DATA BANK CHALLENGE

Montreal, Canada
October 28, 2019

Co-Chairs:
N. Nan Chu, CWLab International
IEEE Consumer Electronics Society Representative in Brain Initiative and Sensors Council.

Ferdinand Ephrem,
IEEE SMC Society
Saintrino Technologies, Inc.

BDB CHALLENGE DAY - AGENDA

Oct. 28, 2019 - BDB Challenge at the SC-2019

Palais des Congrès de Montréal, 1001 Jean Paul Riopelle Pl, Montréal, Quebec H2Z 1H5, Canada

- 9:00 – 11:00 IEEE SENSORS 2019 Conference Opening Plenary and Keynote
- 11:30 – 13:00 IEEE BDB Challenge Registration and Introduction. Lunch
- 13:00 – 14:30 IEEE BDB Challenge Keynote and Participant Networking
- 14:30 – 15:00 Preparation for Teams' Final Results
- 15:00 – 17:00 Team Presentation

Oct. 29, 2019 - Awards announcement at the 2019 SENSORS Conference Banquet.

REGISTRATION BY OCT. 21

- Register now: tiny.cc/Register4BDB
- Sign-up with Individual or Team (<= 5 people per team), no age limitation. State:
  - your Team Name,
  - Team Captain's name,
  - affiliation,
  - email address, and
  - project title/abstract
  - Maximum number of participants: 50 individuals/12 teams
  - IEEE members will be given priority.

AWARD JUDGING CRITERIA

- 1. Technical Approach – 40 points
- 2. Novelty – 40 points
- 3. Results & Presentation – 20 points

- Presentation Template is provided at the website ->

- The Judging Panel reserves the right for the final, in-disputable ranking decision.
- Winners announced at SC Dinner Banquet.

BRAIN IMAGING – DATA USABILITY & ANALYTICS

Considering:

- Brain Imagining datasets
  - Brain Computer Interface
  - EEG/fMRI Dataset Processing & Analytics
  - Interpretation, Contrasting, Sharing and Presentation
- Variations
  - Metadata Constructs
  - User-centered Iterative Brain Data Pooling
  - Brain Signal Data Interoperability
  - Other Physiological Signal Impact: ECG, EMG,EOG, PPG…
- Environment and Tools for Exploration
- Example Challenges
- Q&A

TOOLS

- MatLab - Fieldtrip toolbox (Oostenveld et al., 2011)
- EEGLab – SCCN, UCSD (Kothe, et al., 2012)
- BCILab, LabView, etc.
- Partially Open/Proprietary Software Development Kits thru vendors, e.g., Interaxon (MUSE), eMotiv, Neurosky, Brain Rhythm, OpenBCI, etc.
- Android, AWS, GCP, and Python capability
- Analysis code available at https://github.com/chail/, https://github.com/chail/ for NMF_neurodevelopment. Open PNC data available thru NIH dbGaP for 13 well-known cognitive systems, including the visual, motor, auditory, default mode, salience, frontoparietal, cinguloopercular, and attention systems
- Open software package available for temporal network measures : *Teneto*, written in Python, downloaded at github.com/wiheto/teneto

BDB CHALLENGE SAMPLE PROJECTS

SPCN 2017

Multi-user BCI

Dmitrii Altukhov, Nikolai Smetanin,
Aleksandra Kuznetsova

Centre for Cognition and Decision Making
Higher School of Economics

June 27, 2017

NEUROWRESTLING

A device was constructed and adapted for multi-user purposes. The first wrestling took place on June 26 (first Challenge day in St. Petersburg)
https://yadi.sk/i/x1t-i5BP3KUkPf

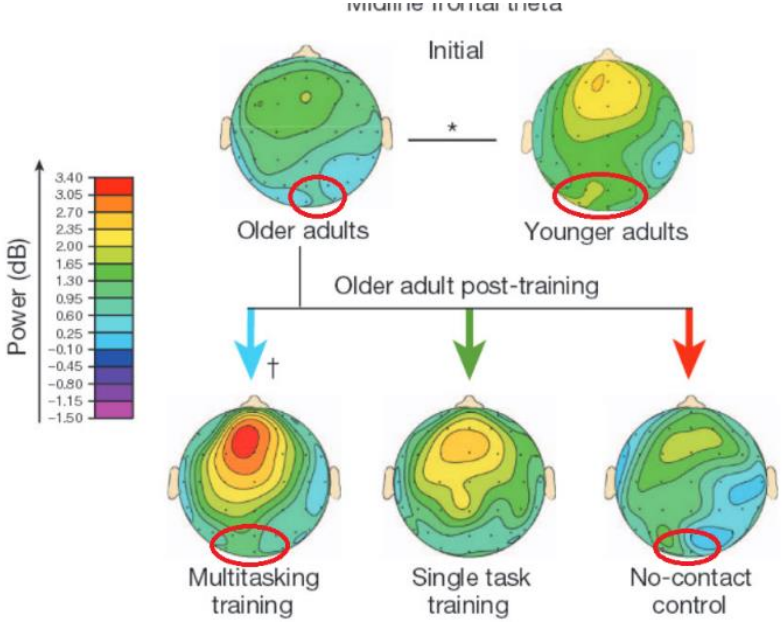
By Dmitrii Altukhov, Nikolai Smetanin & Aleksandra Kuznetsova

UMKC'S BRAIN INSIGHT - 2018

EXTRACTING FROM UCSF ORIGINAL DATASETS (> 350 GB)

Group	6 months	6 years	All Common
NCC	14	10	8
STT	14	9	9
MTT	13	10	9
Total	41	29	26

NCC: Non-contact Control
STT: Single-task

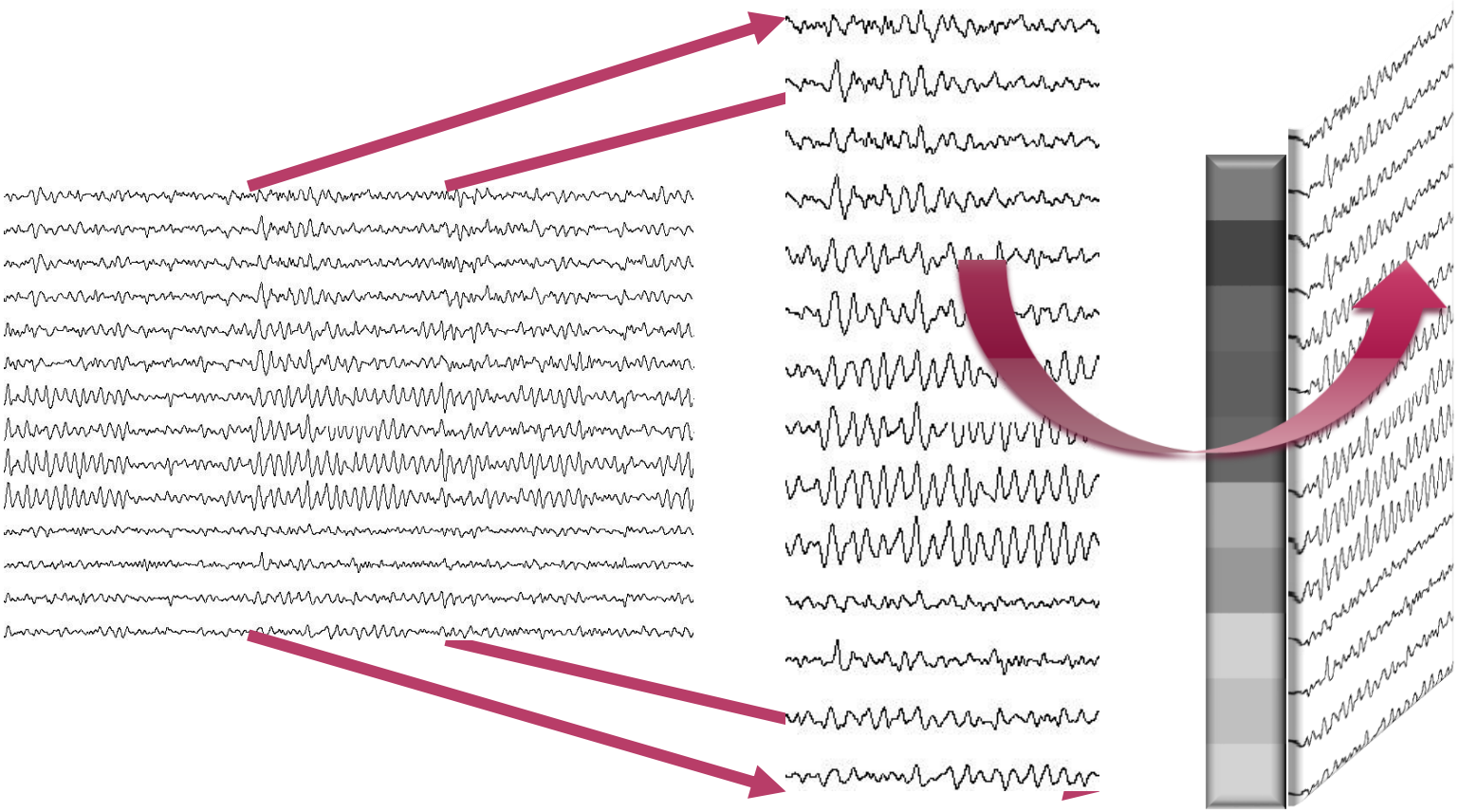


DATA SCALE & COMPLEXITY

Data set version	Size (Per Subject)	
	6 months	6 years
Extracted Data (.csv)	1.1 GB	2.2 GB
Imported data (.mat)	400 MB	850 MB
Normalized	550 MB	1.1 GB
Segmented	200 MB	200 MB
Features	8 MB	8 MB
Reduction	1/140	1/280

DATA TRANSFORMATION

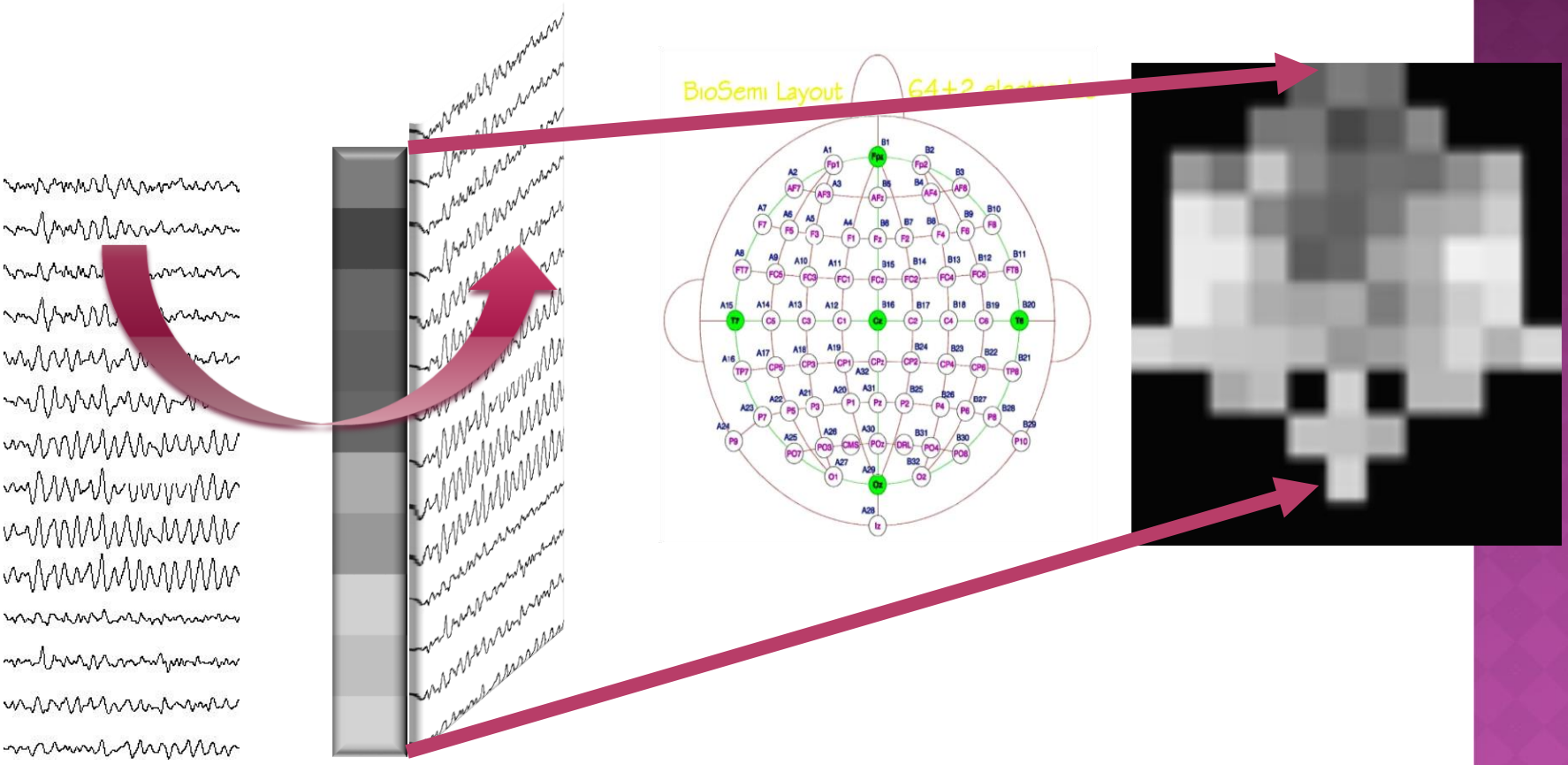
Raw Data → Filtering → Norm (Baseline) → Segmentation → Sample Normalization → Transpose [Temporal]



DATA TRANSFORMATION

(continued)

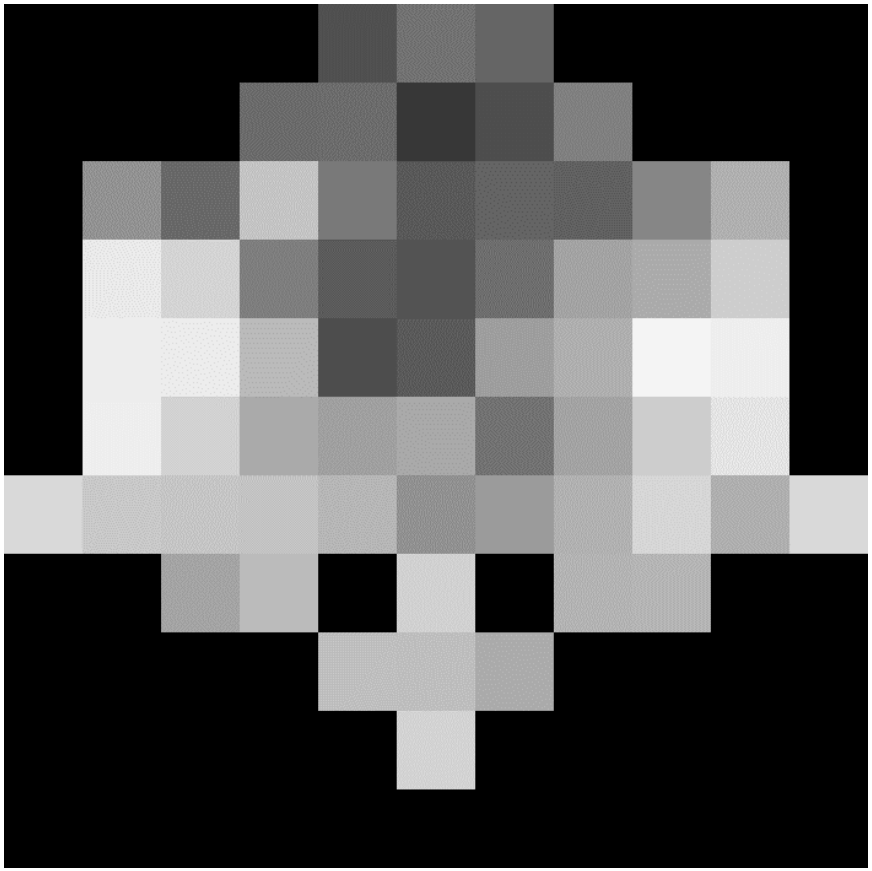
Transpose [Temporal] → Map Reconstruction → Reshaping (3D)



DATA VISUALIZATION

Average combined response:
(40 samples,single subject)

Finding:
12 out of 64 sensors show dominate EEG signals



QUESTIONS & ANSWERS