



# ***IEEE Brain Initiative 2017 Challenges and Competitions Brain-Signal Data Bank Visualization & Analytics***

**October 31, 2017, 9:00 – 18:00**

**Adjacent to the IEEE Sensors Conference 2017  
Crown Plaza, Glasgow, Scotland**

**Gain new knowledge, find new colleagues and friends, and  
explore the IEEE Sensors Conference - 2017!**

## **PARTICIPANTS**

- Individual or Team (each up to 5 persons), no age limitation
- Maximum participants, 50 individuals/12 teams
- IEEE members will be given priority.

## **CHALLENGE**

Create value and/or determine usability of brain signal data, selected by the participant

## **REGISTRATION (open now through October 15, 2017)**

[https://docs.google.com/forms/d/e/1FAIpOLScHAtgbGufy8Cb\\_RTZkH3Ufr5ENFRiou\\_cuwng3wdqr-x-OTg/viewform](https://docs.google.com/forms/d/e/1FAIpOLScHAtgbGufy8Cb_RTZkH3Ufr5ENFRiou_cuwng3wdqr-x-OTg/viewform)

## **AWARDS**

Cash awards of \$1,000 will be presented to the winners.

## **MORE INFORMATION**

<https://brain.ieee.org/news/call-participation-ieee-brain-data-bank-challenges-2017/>

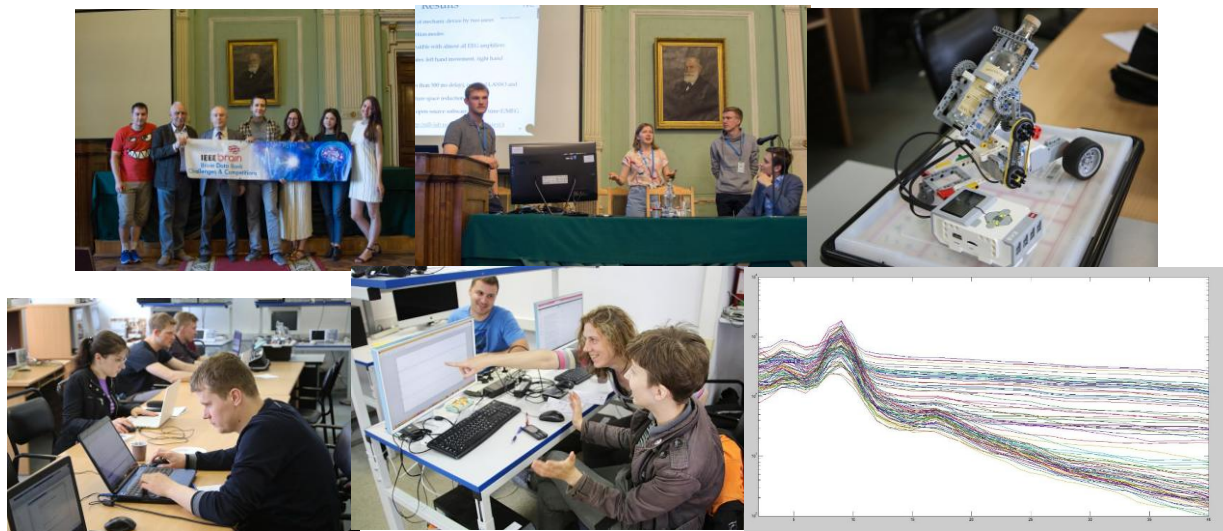
## **CONTACT**

If you have further questions, contact [bdb-glasgow@ieee.org](mailto:bdb-glasgow@ieee.org)



## **IEEE BRAIN DATA BANK CHALLENGES**

The IEEE Brain Initiative is sponsoring 4 challenges/competitions world-wide in 2017 to explore various brain EEG datasets. The first challenge concluded on 27 June, 2017, at St. Petersburg, Russia, as part of the SPCN 2017 program about Video Audio Signal Processing in the Context of Neurotechnology. Highlights are shown below, more at: <http://brain.ieee.org/>



## **QUESTIONS TO PONDER**

**Some questions of interest:**

- Is it possible to read someone's brain by looking at his EEG data?
- What appear in the brain data when one wears EEG headsets?

You are encouraged to investigate and challenge the neurotechnology state-of-the-art tools that utilize EEG data!

**You can raise many more questions or you can engage your energy in this challenge event to tackle:**

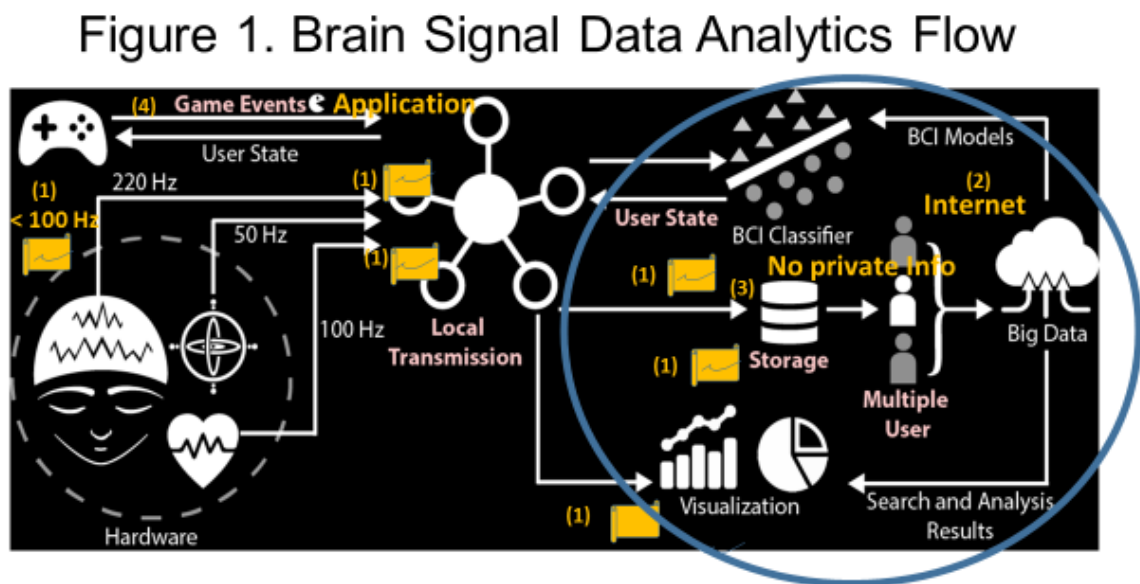
- What would the brain wave of a game player look like?
- How could you tell if a stroke patient recovers his memory?
- How concentrated is a student in the classroom learning?
- How reliable are the electrode measurements?
- How do you read, normalize and correlate the EEG data?
- How sensitive are the EEG data regarding time, space, age, gender, and culture/education factors?

- What can you infer from static or dynamic brain signal images?
- How can one make the brain data universally accessible? or can the brain data be universally applicable?
- What are the essential attributes that might be overlooked in these datasets?

## BACKGROUND

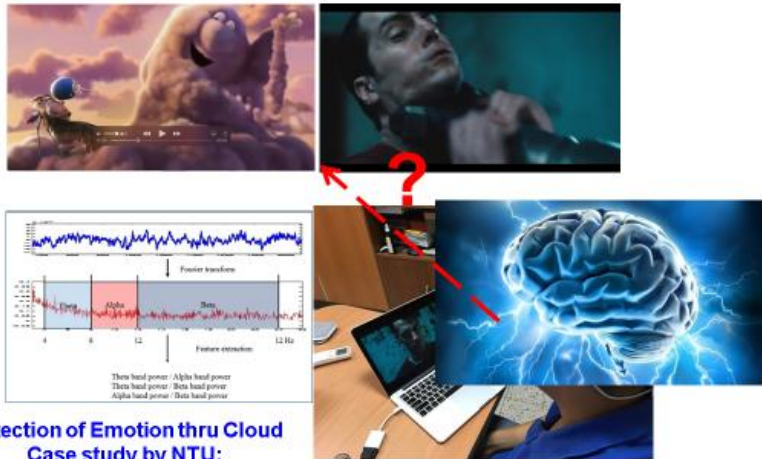
Terabytes of brain EEG data are available through open source, collected from tests associated with human cognitive capability, stroke patient recovery, class learning ability, and other social environments, over a wide range of demographics. Some also play with stimulus such as audio, music, video, lights and digital games.

Figure 1 illustrates the data flow in brain signal data utilization. The 2017 IEEE Brain Data Bank (BDB) Challenges will explore creative means to investigate brain data and analytics (circled in blue.)



Source: N. Bigdelys-Shamlo, T. Mullen, C. Kothe, N. N. Chu, & K. A. Robbins, 2015

The 2016 IEEE Brain Initiative BCI Hackathons have used equipment as illustrated below, with great inspiration.



**Detection of Emotion thru Cloud**  
**Case study by NTU:**  
**16/20 = 80 % accuracy**

The 2017 Brain Data Bank Challenges intend to carry the thrill from prior year, while further investigate ease of use of brain datasets available from publications and open sources.

## DATASETS

Teams/individuals are expected to creatively demonstrate value based on their selected open source data.

Some examples of open source brain data include the following:

- University of California – San Francisco, NeuroRacer brain signal datasets, Nature, The International Weekly Journal of Science, doi:10.1038/nature12486, p. 97- 101, continued with notes, p.1-28, 5 Sept., 2013. The UCSF datasets are available upon request on-line from the [IEEE Dataport Competition page](#).
- University of California – San Diego, Swartz Center of Computational Neuroscience released [EEG data](#) acquired using the Neuroscan software
- Brain/Neural Computer Interaction: Horizon 2020 – Open access BCI [datasets](#).

Published data with no privacy violation can be accepted for the BDB Challenge (all open sources or published, no privacy violation, no individual names or health conditions specified without consent). The Judging Panel reserves the right to screen and reject datasets. No data collection is allowed on-site.

Below are other example datasets that have been used during our BDB Challenges:

- Z. Iscan, et al. “Pre-stimulus Alpha Oscillations and Inter-subject Variability of Motor Evoked Potentials in Single- and Paired-Pulse TMS”, 2016.
- M. S. Treder, et al., “Braincomputer interfacing using modulations of alpha activity induced by covert shifts of attention”, J. Neuroeng Rehabil. 8. 24 p. 2011.

## PARTICIPANTS

Individual or Team (each up to 5 persons), no age limitation

Maximum participants: 50 individuals/12 teams

IEEE members will be given priority.

## **PURPOSE**

- To educate Brain Signal System Technology
- To assess usability of current brain signal databases
- To explore Big Data Analytics, Artificial Intelligence, Deep Learning for user-centric brain signal databank.
- To facilitate Brain Signal Data Formatting Standardization

## **JUDGING**

Judging criteria will be based on, but not limited to, criteria as follows:

1. Selection criteria of the brain signal datasets
2. Clarity and relevance of analysis
3. Methodology
4. Interpretation of brain signal data
5. Significance of findings and recommendations
6. Delivery of findings and recommendations.

## **PRELIMINARY SCHEDULE**

- Sept. 28, 2017, starting at 6 pm, BST time - BDB Introduction Webinar
- Oct. 12, 2017, starting at 6 pm, BST time - BDB Challenge Tutorial Webinar
- Oct. 31, at Crown Plaza, Glasgow, UK
  - 9 am - 9:30 am - Participating Teams check-in and working table assignment
  - 9:30 am - 4 pm - Working
  - 4 pm - 6 pm - Team Presentation and Judging
- Nov. 1, 2017
  - Morning after SC Plenary - Announcement of Challenge Winners & Award Presentation.

## **AWARDS**

Cash awards of \$1,000 will be presented to the winners.

## **REFERENCES FOR PREPARATION**

1. J. A. Anguera, et. al., “Video Game Training Enhances Cognitive Control in Older Adults”, “Game Changer”, Nature, The International Weekly Journal of Science, doi:10.1038/nature12486, p. 97 - 101, notes followed on p.1-28, 5 Sept., 2013.
2. N. Chu, “Surprising Prevalence of ElectroencephalogramBrain–Computer Interface to Internet of Things”, CE Magazine, vol. 6, No. 2, April 2017.
3. CTA-2060, R6SC4WG3 Standard on EEG Data Interoperability Specification: Standard for Consumer EEG file format (Attuned Container Format), obtainable from Karriane Haresign, CTA Staff: [kharesign@cta.tech](mailto:kharesign@cta.tech), 2017.
4. BHI 2017: Big Data Analytics Competition/ IEEE DataPort, <https://iee-dataport.org/competitions/bhi-2017-big-data-analytics-competition>
5. IEEE Brain Initiative BCI Hackthons 2016, <http://brain.ieee.org/news/ieee-brain-initiative-sponsor-3-hackathons-fall/>

6. W. H. Thompson, et. al. , “From static to temporal network theory ~ applications to functional brain connectivity”, a software package can be freely downloaded at [github.com/wiheto/teneto](https://github.com/wiheto/teneto) (Teneto, written in Python,).Network Neuro Science – an open access Journal, Issue 1, The MIT Press, 2017 Winter, <http://www.mitpressjournals.org/toc/netn/1/1>
7. Y. Ezzyat, D. Rizzuto, et. al., “Direct Brain Stimulation Modulates Encoding States and Memory Performance in Humans”, Current Biology 27, 1-8, May 8, 2017.
8. Restoring Active Memory (RAM) program, <https://opencatalog.darpa.mil/RAM.html> DARPA Open Catalog/Information Innovation Office.
9. P. Sajda, “Integrating Brain-Computer Interface Technology With Augmented and Virtual Reality.” ICCE Keynote video, January 10, 2017. <https://www.youtube.com/watch?v=fn9eBJFvSuA>
10. Brain Initiative Education Resources: <http://brain.ieee.org/education/>
11. A. Garten & T. Mullen, “Brain Computer Interface: Present and Future.” ICCE Keynotes video, January, 2016. <https://www.youtube.com/watch?v=kD9d6dSy97g&index=6&list=PLcS-HUwSHpFqS0AsXnS8JQF7hNFM08G4y>
12. N. Chu & S. Flint, “Therapeutic Neurogame Application Development for Healthcare/Wellness.” ICCE Tutorial vidoe, January, 2015. <https://www.youtube.com/watch?v=T89GGTeDaac&index=11&list=PLcS-HUwSHpFopISeGUTDb3CJ-SfdnnR1>
13. BCI Headset Youtube - by Dr. Cody Rall: MUSE , Part 1. <https://www.youtube.com/watch?v=K5n9ljX3dFE>; Part 2, <https://www.youtube.com/watch?v=K5n9ljX3dFE>; Comparison of Muse, Neurosky, and Emotiv, <https://www.youtube.com/watch?v=8Hyhljnq9Z4>