

Standards Roadmap: Neurotechnologies for Brain-Machine Interfacing IC17-007 - IEEE SA Industry Connections Activity 26 May 2020

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IC07-007: NeuroTechnologies for BMI

Multi- stakeholder, pre-standardization effort Goals:

- Overview standards activities related to BMI-related neurotechnologies
- Identify gaps and propose actions
- Engage with the community and promote development of standards

Created 2007, 91 people in shared working space



Neurotechnologies: A tale of diversity







Neurotech: A growing, evolving ecosystem...

BMIs are composed of multiple sub-systems for:

data acquisition | processing | actuation | feedback

- Interoperability becomes crucial while fulfilling requirements for reliability | safety | communication | | regulatory processes | biocompatibility | privacy
- Comprises clinical and consumer applications
 - Researchers, developers and innovators can exploit mutual synergies
 - Need to balance potential risks

... needs for standards in the field



STANDARDS ASSOCIATION

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STANDARDS ROADMAP: NEUROTECHNOLOGIES FOR BRAIN-MACHINE INTERFACING

IEEE SA Industry Connections Activity No. IC17-007

3 Park Avenue | New York, NY 10016-5997 | USA

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- Roadmap public link: <u>http://t.co/kvbu8tm5p7?amp=1</u>
- Released on Feb 24th. Available in:
 - IEEE SA, IEEE Brain, IEEEXplore
- Significant visibility in social media at launching time
- Initial positive response
- Need to reactivate engagement and call for feedback



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Public perception - Standardization Priorities









Status and priorities

	Sensor Technology	End-Effectors	Data management	User requirements	Performance Assessment
Current situation	Established standards for electromagnetic safety, biocompatibility	Electrical/Mechanical safety Standard lexicon for prosthetics Ongoing development on wearable robotics	Cybersecurity standards (non-BMI specific) Community driven standards EEG consumer devices	Human factors (seldom integrated in BMI design) Medical design device control	Community driven standards (focus on neural decoding) Benchmarking of individual sub- components
Level	High	High	Medium/Low	Low	Low
Standardisation Priorities	Interoperability	Unified Terminology Communication across devices and processes Measures of performance, especially when shared control	Cybersecurity/Privacy Interoperability between data mgmnt platforms Data annotation, Meta data, closed-loop data	User needs healthy and less severely affected patients User needs (beyond direct user. e.g., caregivers, family) Benchmarking of user needs fulfilling	Closed-loop evaluation Integrated evaluation of human factors Benchmarking on task- based performance and clinical use





General Recommendations

- Education activities on benefits of standards and their development procedure
- Safety, security and privacy appear as top priorities
- Need for standards on BMI specification and benchmarking
- BMI researchers should be involved in developing standards for related technology (e.g. robotics, VR/AR)
- Synergies between consumer and clinical applications should be supported by complementary standards
- Need for flexible and consistence governance frameworks ranging from good practices, soft law, standards and regulation





Outcomes

- Standards roadmap
- Generated three IEEE SA Working groups
 - WG P2725.1:Standard for Microwave Structural, Vascular or Functional Medical Imaging Device Safety (Chair: Joel Libove, Furaxa)
 - WG 2794: Reporting of In Vivo Neural Interface Research (Chair: Zach McKinney, Scuola Sant'Anna)
 - WG P2731:Standard for a Unified Terminology for Brain-Computer Interfaces (Chair: Luigi Bianchi, U. Roma)

EVENT PARTICIPATION

- IEEE EMBS conference, 2017-2019; IEEE SMC 2017-2019
- International BCI meeting, 2018; Graz BCI conference, 2019

COLLABORATION WITH OTHER ORGANIZATIONS

• OECD Workshop on responsible innovation for health and well-being, 2018

Led to an OECD working paper and recommendation to member governments

World Intellectual Property Organization (WIPO) request for input on assistive technologies





Follow-up activities

PUBLICATIONS

- Upcoming article in IEEE Brain eNewsletter
- Opinion paper. Task leader: Pepe Contreras Vidal (U Houston)

EVENTS

- Workshop Global Perspectives on Responsible Artificial Intelligence, Germany, June 2020
- Special session, COMPSAC 2020 IEEE Computer Society , Madrid, July
- <u>1st IEEE International Conference on Human-Machine Systems</u>, Rome, Sept 2020
- Workshop "Standards for Neurotechnologies: Strategic Vision2025" at EMBC 2020.
 CANCELLED
- Workshop on Benchmarking Standards for BMI, Int. BCI Meeting, Brussels, 9 June 2020 POSTPONED 2021

CALL FOR INPUT ON ROADMAP

- Extended to Sep 30th 2020
- Need for input for a more diverse group in order to refine the roadmap and inspire further standardization activities





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