

IEEE SMC Brain-Machine Interface (BMI) Systems Workshop Highlights from the 2024 Edition

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The 14th IEEE SMC Brain-Machine Interface (BMI) Systems Workshop was held October 6–9, 2024 in Kuching, Malaysia as part of the annual Conference of the IEEE Systems, Man, and Cybernetics Society. Sarah Power, Ivan Volosyak, Xiang Zhang, and Chang S. Nam served as the Technical Program Committee Co-Chairs, Yaoping Hu and Abdelkader Belkacem served as the Special Sessions Co-Chairs, while Alexandre Marois served as the Industry Liaison Chair. Seventeen papers were accepted after careful peer-review and were presented in three sessions entitled:

- (i) Recent Advances of Brain-Computer Interfaces,
- (ii) Movements, Tones and Music Detection with Brain-Computer Interfaces, and
- (iii) Novel Algorithms and Privacy-Preserving Brain-Computer Interfaces.



Figure 1: 2024 BMI Workshop paper presentations session.

The BMI Workshop featured two keynote speakers:

- **Vinod A. Prasad** (Singapore Institute of Technology, Singapore):
“Online Brain-Machine Interface Based Neurofeedback Training for Motor and Cognitive Rehabilitation” and
- **Dongrui Wu** (Huazhong University of Science and Technology, China):
“Privacy-Preserving BCIs”



Figure 2: Vinod Prasad (left) and Dongrui Wu (right) delivering their keynote talks.

The BMI Workshop hosted the 9th BR41N.IO Brain-Computer Interface (BCI) Hackathon held from October 6–7, 2024. Over 800 attendees participated in the Hackathon across 87 teams both in person and remotely. To support remote attendees, 15 institutes worldwide hosted students who accessed their labs and equipment: Vrije Universiteit Amsterdam (Netherlands), NYIT Vancouver (Canada), g.tec (Austria), UAE University Abu Dhabi (United Arab Emirates), University of Melbourne (Australia), Aalborg University (Denmark), West University from Timisoara (Romania), Tec de Monterrey (Mexico), University of Tennessee (USA), Queen’s University (Canada), Hangzhou Chongwen Century City Experimental School (China), Hangzhou NeuroTechX Ltd. (China), University of Valle (Colombia), PSNC Poznan (Poland), and Union College (USA). The IEEE SMC Society sponsored awards totaling USD\$6,000 that were given to the top three teams across three categories: BCI Gaming, BCI Programming, and BCI Data Analysis. Details are posted at <https://www.br41n.io/IEEE-SMC-2024>.



Figure 3. In-person BCI Hackathon participants.

The BCI Hackathon hosted five local speakers who shared insights about their research and ongoing projects:

- **Ishak Aris** (Universiti Putra Malaysia, Malaysia):
“High-Performance EEG Analysis”
- **Garry Kuan** (Universiti Sains Malaysia, Malaysia):
“The Power of Imagination: Exploring Internal and External Imagery for Badminton Skills Acquisition Using EEG on Skilled Badminton Players”
- **Sofina Tamam** (Universiti Sains Islam Malaysia, Malaysia):
“Exploring the Neurophysiological Correlates of Fragrance-Induced Calmness and Working Memory Through EEG Analysis”
- **Ivy Jong Hui Ying** (Universiti Sains Malaysia, Malaysia):
“The Effects of Inhibitory, Orienting, and Alerting Processing in the Children's Version of the Attention Network Test (ANT-C): An ERP Analysis to Identify Children With Dyslexia”
- **Samhani Ismail** (Universiti Sultan Zainal Abidin, Malaysia):
“Event-Related Desynchronization Revealed Cortical Activity in Knee Osteoarthritis”

On October 8, 2024, the BMI Workshop hosted an expert panel on “BMI Applications for Daily Life: Challenges and Opportunities” moderated by Prof. Yaoping Hu. Panelists included Prof. Vinod Prasad, Prof. Dongrui Wu, Dr. Subasree Ramakrishnan, and Prof. Ivan Volosyak who shared their insights to an engaged audience.



Figure 4. The moderator and panelists of the BMI Workshop expert panel.

On October 8th, the Workshop hosted the International BCI Award Ceremony. The BCI Awards recognize outstanding and innovative research in the field of BCI. Twelve projects are nominated each year and the top three winners are announced at the BCI Award Ceremony. This year, around 80 top-level research projects were submitted from 30 countries for the BCI Award 2024. Chair of the jury Fabien Lotte and five reviewers carefully selected the 12 nominated projects. The 1st place prize went to the project entitled “Synthetic Touch for Brain-Controlled Bionic Hands: Tactile Edges and Motion Via Patterned Microstimulation of the Human Somatosensory Cortex,” by Giacomo Valle and co-authors. The 2nd place was awarded to the project “A Brain to Spinal Cord Digital Bridge to Restore Voluntary Arm and Hand Movements After a Spinal Cord Injury” by Thibault Collin and co-authors. Finally, the 3rd place prize was awarded to the project “Brain-Controlled Augmented Hearing for Spatially Moving Conversations in Multi-Talker Environments” by Vishal Choudhari and co-authors. Congratulations to all winning projects! The 2025 BCI Award Call for Project Nominations is currently open. Details are available at <https://www.bci-award.com>.

The 2024 BMI Workshop and Hackathon were a great success! Preparations are already underway for the 2025 BMI Workshop and Hackathon to be held from October 5–8, 2025 in Vienna, Austria. The 2025 edition will mark the 15th anniversary of the BMI Workshop and the 10th anniversary of the BCI Hackathon and numerous special activities are being planned. Stay updated about the preparations by bookmarking the Workshop’s website at: <https://sites.google.com/view/smc-bmi-workshop2025>.

We hope to see many of you in Vienna next year!