Academic Corner
Hang Su

In this issue, we interview IEEE SMC member Ivan Volosyak. He received the Diploma in the field of automation and control of technical systems from the Dnipropetrovsk State University, Dnipro, Ukraine, in 1998, and the Ph.D. degree in electrical engineering from the University of Bremen, Bremen, Germany, in 2005. He is currently a Professor of Biomedical Engineering at the Rhine-Waal University of Applied Sciences, Kleve, Germany. Previously, he was a Postdoctoral Research Fellow at the Institute of Automation, University of Bremen, and Project Manager of several national and European Union-funded projects carried out at the University of Bremen, Germany. From 2005 to 2008, he held visiting positions at the Institute for Knowledge Discovery, Graz University of Technology, Austria, and at the Center for Rehabilitation Engineering, Glasgow University, U.K. His research interests include brain-computer interfacing, signal processing, digital image processing, service robotics, and assistive technology with the primary focus on applications in spinal cord injury rehabilitation.

(1) Could you please introduce yourself and your academic/professional background?
I am a Professor of Biomedical Engineering at Rhine-Waal University of Applied Sciences (HSRW) in Kleve, Germany. My background is in automation and control of technical systems and electrical engineering (Ph.D., University of Bremen, 2005). I began my academic career at the University of Bremen as a doctoral researcher, and I held visiting positions at Graz University of Technology and the University of Glasgow between 2005 and 2008. Since 2012, I have been at HSRW, where my research spans brain-computer interfacing, signal and digital image processing, service robotics, and assistive technology—with a primary focus on translating these methods into practical solutions for spinal cord injury rehabilitation. Across academia and collaborative projects, my aim has been consistent: rigorous engineering that enables reliable, user-centered neurotechnology in real-world settings.

(2) How would you describe your current research focus to a broad SMC audience, and what initially motivated you to pursue this direction?
My current research is about improving noninvasive electroencephalography (EEG)-based brain–computer interfaces (BCIs). EEG measures tiny electrical signals from the scalp that reflect brain activity, using sensors (electrodes) placed on the head. A BCI is a system that translates brain signals into commands for a computer or other devices, without relying on muscles or speech. The goal is twofold: to help people with disabilities in daily life and to make BCIs stable and easy to use outside the lab. We work on making BCIs more reliable by cutting calibration time (the setup period at the start where the system is set up and adjusts to individual brain patterns), reducing noise and artifacts (unwanted signals from blinks, muscle tension, or poor electrode contact), and creating novel decoding methods (algorithms that interpret EEG in real-time) that work well for different users and on different days.

A key part of my work tackles the well-known issue that some users cannot achieve reliable BCI control even after training, and I explicitly avoid using the stigmatizing term “BCI illiteracy,” preferring neutral phrases like limited BCI access or non-responsiveness. In 2019, our team published a paper showing that we could practically solve this problem for visually evoked potential (VEP)-based BCIs: all 86 participants were able to use the BCI system successfully. The main limitation is that most participants were healthy volunteers, mainly our students, so more studies with clinical users are still needed.

At the same time, we focus on real-world use: tools for communication and control for people with severe motor problems, simple setups for home and clinic use, and special situations where hands are busy or must stay sterile - for example, surgeons who cannot touch a screen. We also explore BCI for gaming because games are engaging and can test systems with many users. This helps us find weaknesses, measure usability (how easy and efficient the system is to learn and operate), and improve overall robustness.

What first motivated me was meeting patients who could not use their hands or speech but still had clear thoughts and strong will. Seeing how a simple, reliable BCI could give them independence made the goal very concrete for me. Since then, closing the gap between lab prototypes and everyday needs has been my main driver. My aim is to build EEG-based BCIs that more people can use, more often, and in more places.

(3) What is one underexplored opportunity (or emerging challenge) you find particularly exciting, and where do you see the field going in the next 5–10 years?
Recent BCI breakthroughs in invasive methods have been remarkable, and the pace is easy to track by browsing the annual BCI Awards, which showcase rapid gains in communication, control, and restoration of function. My expectation remains that we can approach similar capabilities with noninvasive EEG, as signal processing, sensor technology, and especially AI continue to improve. Advances in foundation models, self-supervised learning, robust decoding under distribution shift, and explainable AI (to ensure trust, safety, and clinical acceptance) could be key enablers, helping bridge the gap between invasive and noninvasive performance. With these trends, I anticipate genuine breakthroughs in noninvasive EEG-based BCI within the next decade, including more reliable everyday communication, assistive control, and passive monitoring that generalizes across users and contexts.

(4) What is a current challenge in your research that is both difficult and rewarding?
I work at a University of Applied Sciences, where the regular teaching load is 18 hours per week, pursuing ambitious research in EEG-BCI alongside these duties. Balancing high-quality teaching with competitive research is demanding. Under the umbrella of the Promotionskolleg PK NRW, the Graduate School for Applied Research in North Rhine-Westphalia, I prepared a proposal for the renowned European Union Marie Skłodowska-Curie Actions Doctoral Network (EU MSCA DN). The effort was substantial, from assembling an international consortium to designing coherent training, supervision, and impact plans. Fortunately, the project DONUT was funded, and, to our knowledge, it is the first time a University of Applied Sciences is coordinating such a program.

The reward is that I now supervise three doctoral candidates in a scheme where the PhD is the central objective, not an add-on to narrow project deliverables (as in most regular third-party funded research projects), which lets us pursue long-term and rigorous beyond-the-lab research the BCI field needs. It remains challenging to sustain this alongside heavy teaching and service, but watching doctoral researchers grow, publish, and advance our EEG-BCI agenda makes the effort worthwhile and demonstrates that Universities of Applied Sciences can lead funded, high-quality international research when the right framework and support are in place. Consider this scheme if you value deep, PhD-centered research with strong training, even if preparation is demanding, and note that non-EU partners are allowed (university located in the EU leads).

(5) What practical advice would you give to early-career researchers / PhD students to build impactful work and a sustainable career?
Invest seriously in yourself. Deep skills and sound judgment come from deliberate practice: read widely beyond your niche, replicate key results, master your tools properly, and seek honest, critical

feedback. At conferences, don't limit yourself to your own presentation—attend diverse sessions, ask questions, and introduce yourself to speakers. Many of the best ideas come from unexpected corners. Lean into teaching early, even if it is voluntary and not your contractual obligation. Academic teaching forces clarity, improves communication, and exposes gaps in your understanding. It also builds leadership and empathy, these are things that matter in labs, industry teams, and collaborations.

Be thoughtful about work-life balance, but accept that formative years often require focused periods of extra effort. I see many PhD students attending only their own sessions at conferences or avoiding stretch tasks; instead, push yourself: take on responsibilities, aim for challenging venues, and deliver results that actually work. These experiences compound.

Finally, cultivate breadth with purpose. Combine solid theory with practical skills in data, software, hardware, and experimentation, and stay curious about adjacent fields. With AI launching a new era, standards are rising. Those who pair rigor, hands-on ability, and sustained curiosity will set the pace.

(6) What role have IEEE and the IEEE SMC Society played in your career, and what would you like to see the SMC community prioritize next?

IEEE, especially the IEEE SMC Society, has been central to my professional growth. My first IEEE SMC journal publication appeared in 2004, which set the tone for my engagement with this community. SMC conferences consistently offer strong technical content and, just as importantly, many new connections across disciplines, where new collaborations often begin. The IEEE SMC BMI workshop has been a consistent anchor for my community engagement; after years of regular participation, I am now involved in its organization, which has broadened my network and refined my perspective on emerging challenges.

IEEE journals also play a crucial role. Their rigorous peer review can take longer than some other venues, but this depth improves clarity, reproducibility, and overall impact, which is essential for fast-moving areas like BCI and neurotechnology.

Looking ahead, I encourage the SMC community to strengthen interdisciplinary bridges among control, AI, and human systems, to foster open benchmarks, datasets, and reproducible toolchains, to advance responsible standards for safety, privacy, and clinical translation, and to keep investing in inclusive events and workshops that support early-career researchers. Combining rigorous publications with vibrant conferences and hands-on workshops will keep SMC a strong engine for scientific progress and real-world impact.