Academic Corner
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In this issue, we are pleased to feature an interview with IEEE SMC member Prof. Ying (Gina) Tang. She is a Professor in the Department of Electrical and Computer Engineering at Rowan University and Associate Director of Rowan's Machine & Artificial Intelligence Virtual Reality Center (MAVRC). Her research pushes the frontier of Cyber-Physical-Social Intelligence by embedding human behavior into intelligent Digital Twins, transforming complex systems into adaptive, personalized, and situationally aware environments that augment human decision-making. Her work focuses on safety-critical and complex human–machine systems in domains such as education, aviation, and transportation, where Digital Twins fuse environmental and human behavioral data to enable adaptive and context-aware decision support. She currently leads multiple projects translating these technologies into deployable systems for real-world training and operations. Dr. Tang is an IEEE Fellow and has authored more than 270 scholarly articles published in leading journals and conference proceedings. Her work has earned numerous honors, including the 2025 IEEE SMCS Outstanding Service to Humanity Award, the 2025 IFAC TC Award for Outstanding Achievement in Social Computing and Cyber-Physical-Social Systems, and the 2024 Google Research Award.

(1) Please tell us a bit about yourself and your academic/professional background.
My academic journey started at Northeastern University in China, where I received my B.S. and M.S. degrees, and later continued at the New Jersey Institute of Technology, where I earned my Ph.D. I am now a Professor of Electrical and Computer Engineering at Rowan University and Associate Director of the Rowan's Machine Learning & Artificial Intelligence Virtual Reality Center. Throughout my career, I have been developing modeling and control strategies that integrate human behavior into complex systems, enabling adaptive and situationally aware decision support in environments characterized by uncertainty, system variability, and operational disturbances.

(2) Please tell us a bit about your research. What inspired you to follow this field?
As mentioned earlier, my research focuses on modeling and control techniques to capture the uncertainty, diversity, and complexity arising from human factors, system variability, and operational disturbances in human–machine systems. My interest in this area was inspired by the real-world challenges I encountered at different stages of my career.

During my Ph.D. studies at the New Jersey Institute of Technology, I joined the Multi-Lifecycle Engineering Research Center, an industry-driven initiative supported by the New Jersey Commission on Science and Technology to address the growing volume of end-of-life electronics awaiting processing. Overlooking environmental impacts at each stage of a product's life cycle has had severe implications for the environment and human health. At the same time, disassembly of these end-of-life products is inherently complex and uncertain, influenced by the variability of used products and the human factors involved in labor-intensive operations. To address these challenges, I developed adaptive modeling and control approaches that were integrated into a Multi-Lifecycle Assessment and Analysis tool. Adopted by major industrial partners such as AT&T, IBM, and Panasonic, the tool enabled a transition from manual to automated electronics disassembly, significantly reducing environmental impact and supporting sustainable economic development.

With my Ph.D. training, I began to view many problems through a systems lens. As a university professor, educating students is our foremost responsibility. One question that has always motivated me is how to design learning environments so that students with diverse backgrounds and abilities can all benefit and reach their full potential. Teaching is not a simple one-way process; it is a complex

system shaped by the interactions among instructors, students, and learning environments. Understanding and supporting these interactions has therefore become an important direction in my research. For example, I developed the Personalized Instruction and Need-aware Gaming (PING) system, an AI-empowered learning platform where intelligent pedagogical agents provide tailored instructional and emotional support through the gamified learning process.

Building on this line of work, my research has expanded into a broader class of complex human–machine systems. Through the lens of Cyber-Physical-Social Intelligence, I develop agentic AI and intelligent Digital Twin systems—often integrated with extended reality—to enhance situational awareness and decision-making in high-stakes operational settings. These systems support human operators by helping them better understand dynamic environments and manage cognitive demands in domains such as aviation, transportation, and other safety-critical systems.

(3) Are there any underexplored opportunities that you find particularly exciting in your field? Where do you see the field going in the next 5–10 years?
Humans are the most difficult part of any complex system to capture. Beyond physical actions, we must understand cognition, perception, and decision processes. This challenge has existed for decades and remains largely unresolved.

With the recent advances in AI, I believe the next 5–10 years will see the emergence of a new research direction focused on human-in-the-loop digital twins, where AI-human collaboration enables intelligent systems to better understand human cognition and behavior, enhancing situational awareness and supporting decision-making in complex environments.

(4) What practical advice would you give to early-career researchers (or PhD students) to build impactful work and a sustainable career?
One piece of advice I often give early-career researchers is to develop strong critical thinking skills. Impactful research rarely comes from simply following trends or applying the latest tools, rather it comes from questioning assumptions and identifying important problems that others may overlook.

Second, I strongly encourage young researchers to seek good mentors and build a supportive research network. A mentor can provide guidance not only on research direction, but also on navigating the broader academic and professional landscape. Mentorship helps young scholars avoid common pitfalls, broaden their perspective, and build confidence in pursuing ambitious ideas.

Lastly, be patient and stay curious. Meaningful research often takes time, and many important ideas emerge gradually through exploration and collaboration.

(5) What role have IEEE and IEEE SMC played in your career?
The IEEE Systems, Man, and Cybernetics Society has been an important part of my professional journey. It provides a platform where I could connect with researchers who share similar interests and passions. Through this community, I have had opportunities to present and publish my research, exchange ideas, and build collaborations with colleagues around the world.

At the same time, IEEE SMCS also offered me opportunities for leadership and service from serving as an executive officer and member of the Board of Governors to chairing a technical committee and serving on editorial boards. These experiences have allowed me to give back to the community while being recognized as a leader. Over the years, I feel that I have grown together with IEEE and SMCS—both as a researcher and as a member of this global professional community.

(6) Looking ahead, what would you like to see the SMC community prioritize, and how can readers get involved?
Looking ahead, I would like to see the SMC community continue to serve as an open and collaborative platform where researchers from diverse disciplines can come together to address grand challenges in complex human–machine systems.

For those who would like to get involved, there are many ways to contribute, for instance, participating in technical committees, contributing to conferences and workshops, and volunteering in society activities, etc. The continued vitality of the SMC community depends on the energy and creativity of its members.

(7) Any last words of advice you'd like to share with the SMC Society?
I feel very fortunate to have grown with this community. I hope it continues to remain an open and intellectually curious space where ideas are evaluated on their scientific merit and researchers feel encouraged to explore bold new directions.