SMC eNewsletter's Student Corner Column (June 2024 Issue)

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In this issue of the Student Corner Column, we interview Anne Tryphosa Kamatham, co-author of the paper "SonoMyoNet: A Convolutional Neural Network for Predicting Isometric Force from Highly Sparse Ultrasound Images" published in the IEEE Transactions of Human-Machine Systems (Vol. 54, No. 3, June 2024).

1. Please tell us a bit about your background and your research area.

I am Anne Tryphosa Kamatham, a PhD scholar at the Indian Institute of Technology - Delhi. My research focuses on sonomyography based control for upper extremity bionics. Sonomyography is an ultrasound-based muscle-activity sensing modality. My research is to develop a wearable sonomyography system and control algorithms to improve upper extremity prosthetic devices' sensing and control strategies.

2. How did you become interested in your field?

As a biomedical engineer, I have realized the need for efficient and accurate sensing modalities to measure physiological parameters. Therefore, I've decided to pursue my research in biosensors for human-machine interfacing, specifically with applications in assistive technology. Sonomyography aligns very much with my research interests as it can potentially improve prosthetic control strategies by accurately sensing voluntary muscle activity.

3. What motivated you to join the IEEE SMC Society?

IEEE SMC Society provides an opportunity to connect and stay updated on research contributions of the extensive scientific community in human-machine systems. I am broadly interested in understanding how machines and humans interact to improve daily life. IEEE SMC provides several opportunities to connect with peers in HCI, cybernetics, and cyber-physical systems at large.

4. What motivated you to publish in the IEEE Transactions on Human-Machine Systems?

The work lies within the scope of the IEEE Transactions on Human-Machine Systems. Our work focuses on developing computationally efficient methods to derive muscle activity from ultrasound images. This work is widely applicable to human-machine interfaces, bionics, and cybernetics. As such, THMS provides the right and relevant audience for my work.

5. What is the main innovation in your paper titled "SonoMyoNet: A Convolutional Neural Network for Predicting Isometric Force from Highly Sparse Ultrasound Images" and its importance to IEEE Transactions on HMS?

The main contribution of this work is the CNN-based feature-free approach for estimating isometric muscle force from highly sparse ultrasound images, hence obviating the need for engineering, extracting, and selecting features from ultrasound images. Conventional ultrasound probes are being replaced by single-element transducers that detect muscle activity as a 1D amplitude mode (A-mode signals) in an attempt towards the development of wearable ultrasound systems. By creating sparse ultrasound images from brightness mode images, we emulated the use of wearable ultrasound systems to evaluate the effects of sparsity on force prediction performance. SonoMyoNet showed promising results by accurately predicting force from low-resolution ultrasound images. We believe that sonomyography has excellent potential for human-machine interfacing.

6. Where would you see yourself in 5-years' time career wise?

In the next five years, I see myself as a researcher continuing to work towards addressing challenges by innovating in the fields of biosensors for human-machine interfaces. I also have a deep interest in mentoring and teaching and would like to pursue a career in academia.

Biography:

Anne Tryphosa Kamatham is a PhD scholar and a Prime Minister's Research Fellow at the Centre for Biomedical Engineering, Indian Institute of Technology – Delhi, India. She received her master's in Bioengineering from Christian Medical College Vellore (Jointly with SCTIMST, Trivandrum, India) and her Bachelor's in Electronics and Communication Engineering from JNTUK, India. Her research interests include biomedical sensors and instrumentation, sonomyography, and biomedical signal processing.