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

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In this issue of the Student Corner Column, we interview Zhenling Mo, a student author of the paper titled "Sparsity-Constrained Invariant Risk Minimization for Domain Generalization with Application to Machinery Fault Diagnosis Modeling" published in the IEEE Transactions on Cybernetics.

1. Please tell us a bit about your background and your research area.
I am Zhenling Mo and I just officially obtained my Ph.D. degree from City University of Hong Kong in February 2024. My current research is to develop generalizable machine learning methods and apply them to SMC applications such as machine fault diagnosis and condition monitoring.

2. How did you become interested in your field?
My research interest starts from noticing that the performances of traditional machine learning methods usually degrade significantly in real-world applications where the training data distributions and test data distributions are different. Hence, building a generalizable machine learning method is imperative.

3. What motivated you to join the IEEE SMC Society?
The IEEE SMC Society is a platform where I can learn and communicate significant scientific discoveries in SMC with brilliant experts and researchers. It is an honor to be able to join the IEEE SMC Society and work with all the talents to develop theories and practical methods pertaining to systems science and engineering, human-machine systems, and cybernetics.

4. What motivated you to publish in the IEEE Transactions on Cybernetics?
The IEEE Transactions on Cybernetics is the top tier international journal that is well matched with my research area. It only publishes papers of high qualities and significant contributions.

5. What is the main innovation in your paper titled "Sparsity-Constrained Invariant Risk Minimization for Domain Generalization with Application to Machinery Fault Diagnosis Modeling" and its importance to IEEE Transactions on Cybernetics?
The essential innovation is that we methodologically and theoretically studied the possibility of elevating the domain generalization performance of empirical risk minimization via integrating sparsity measures. We pointed out the key properties of the sparsity measures required to regulate the model in learning invariant features. In addition, we showed that domain generalization of the proposed method could be possible given that the desired sparsity measure was applied under the proposed causal model. We also developed a practical machine fault diagnosis method to demonstrate the benefits of our proposed framework.

6. Where would you see yourself in 5-years' time career wise?
For the next five years, I will continue my research of studying new robust, generalizable, and interpretable machine learning theories or methods with causal perspectives and applying the developed theories or methods in the field of SMC. In addition, I am also looking forward to learning from and working with experts in the IEEE SMC Society and contributing more significant research in this field.

Biography:

Zhenling Mo received the B.Eng. degree from the School of Mechanical Science and Engineering, Huazhong University of Science and Technology, Hubei, China, in 2017, the M.S. degree from the School of Aeronautics and Astronautics, Sichuan University, Sichuan, China, in 2020, and the Ph.D. degree from the School of Data Science, City University of Hong Kong, Hong Kong SAR, China, in 2024. He is currently a Post-Doctoral Researcher with the School of Data Science, City University of Hong Kong. His research interests include generalizable machine learning, signal processing, condition monitoring, and machinery fault diagnosis.