**Novel Variable-Flux Electrical Machines for Transportation Electrification: State-of-Art and Future Frontiers**

Dr. Hui YANG

Associate Professor in Electrical Machines and Drives @ Southeast University, Nanjing, China

Postdoctoral Research Fellow @ The Hong Kong Polytechnic University, Hong Kong, China

Southeast University

This tutorial will point out the current challenges of the existing permanent magnet (PM) machines for electric vehicle applications first, and then introduce research developments of newly emerged variable-flux (VF) electrical machines by combing the advantages of constant PM flux and VF machines. This tutorial will propose a new “PM+X” concept by applying additional field excitation, winding reconfiguration, mechanical adjuster, special rotor design and VF magnet to the conventional PM machines. In addition, the topology features, working principle and control methods of several new VF electrical machines will be addressed, respectively. Finally, some future frontiers of VF electrical machines and drives, as well as their potential applications for automotive traction will be discussed.

**Biography**



Prof. Hui Yang received the B. Eng. degree from Dalian University of Technology, China in 2011, and Ph.D. degree from Southeast University, Nanjing, China in 2016, respectively, all in electrical engineering. From 2014 to 2015, he was supported by the China Scholarship Council through joint Ph.D. studentship at The University of Sheffield, Sheffield, U.K.

Since 2016, Dr. Yang has been with Southeast University, where he has been an Associate Professor at School of Electrical Engineering. Since 2019, He serves as a Postdoctoral Research Fellow at School of Electrical Engineering, The Hong Kong Polytechnic University. His research interests include design and analysis of novel permanent-magnet machines with particular reference to variable-flux machines for electric vehicles and renewable energy applications. He is the recipient of Best Paper Awards in ICEMS 2014, EVER 2015 and ICEMS 2019, and the holder of 18 patents. With extensive research experience in the field of electrical machines and drive systems for applications ranging from automotive through domestic appliance to wind power generation, which are sponsored by the Chinese government and many industry projects, he has authored >100 refereed journal and conference papers, including >50 papers in IEEE Transactions and IET Proceedings.