

SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING

Website: <https://cde.nus.edu.sg/ece>

Area: Power and Energy Systems (PES)

Host: Prof Dipti Srinivasan

Co-organized by Green Energy Management and Smart Grid Research Center, ECE NUS, IEEE Power & Energy Society Singapore Section, and IEEE Computational Intelligence Society Singapore Section

TOPIC	:	Evolutionary Computation for Electric Vehicles: Powertrain Design and Control Optimization
SPEAKER	:	Dr Nuo Lei Research Fellow, ECE Department, NUS
DATE	:	Thursday, 22 October 2026
TIME	:	7:30PM to 8:30PM
VENUE	:	SDE3 – LT422

ABSTRACT

Electric vehicles (EVs) exhibit significant nonlinearity, strong coupling, and multiple constraints, and their overall performance depends largely on how their powertrain designs and control strategies are optimized. In practical vehicle development, conflicting objectives are often considered simultaneously, resulting in complex multi-objective optimization problems. Evolutionary computation offers robust global search capabilities, while the resulting Pareto-optimal solution sets can provide diverse design options and decision support for different design preferences, thereby offering an effective framework for addressing complex optimization problems in EVs. This lecture first introduces the research background, fundamental principles, and main advantages of evolutionary computation in the field of EVs. It then systematically discusses its applications in powertrain component sizing and control strategy optimization using practical vehicle-development case studies, covering key stages such as problem formulation, optimization algorithm design, Pareto-front analysis, and simulation and experimental validation. The lecture further introduces the integration of evolutionary computation with data-driven approaches, including machine learning, reinforcement learning, and surrogate modeling, and explores its potential for achieving efficient, adaptive, and intelligent optimization in complex dynamic environments. Finally, the lecture examines challenges and future directions related to computational efficiency, cross-scenario transferability, and deeper integration with large language models and other advanced technologies, and summarizes the potential of evolutionary computation to advance transportation electrification.

BIOGRAPHY

Nuo Lei received his Ph.D. degree from the School of Vehicle and Mobility at Tsinghua University, China, in 2026. He is currently a Postdoctoral Research Fellow in the Department of Electrical and Computer Engineering at the National University of Singapore. He has published more than 30 SCI- and EI-indexed papers, including 10 papers in Q1 SCI-indexed journals as a first or corresponding author. One of his first-author papers was recognized as an ESI Highly Cited Paper. He is also the inventor of three granted patents. His publications have received more than 1,100 citations, and he has an h-index of 18. He has served as a guest editor for two special issues (Machines, IF = 3.0; Frontiers in Robotics and AI, IF = 3.7). He has also served as a peer reviewer for 47 SCI-indexed journals, two academic monographs, and one international conference. His research interests include the optimization and control of smart grids and electric vehicles, evolutionary computation methods, and reinforcement learning algorithms. He is a member of the IEEE Power & Energy Society (PES) Singapore Chapter.

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