Special Session on

Multi-Physics Data-Driven Design for Advanced Propulsion Machine Drives

Organized and co-chaired by:

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Abstract

The rapid acceleration of electrified transportation to tackle climate crisis and to reach Net-Zero carbon emission has raised significant challenges on electrical machine drives for sustainable propulsion systems with unprecedent levels of performance requirements, such as high-power density, high efficiency, wide operational region, high reliability, fault-tolerance capability, and economical sustainability. As the expected performances are reaching the boundaries in several disciplines, it becomes critical to integrated design electrical machines and power electronics and to consider multi-physics characteristics simultaneously to reach a more comprehensively optimized solution for propulsion machine drives, which is struggling to be address using the traditional physics-driven design methods focusing on each discipline, like electromagnetic, thermal, mechanical, insulation, and control strategies, individually. In this context, significant interests have been given to multi-physics data-driven design technology, which uses artificial intelligence-assisted methods such as surrogate-assisted approaches that are inherently suitable for multi-physics and integrated design for the whole machine drive systems. Although notable efforts have been made by researchers on data-driven designs for electrical machines and power electronics, particularly in individual disciplines, there remains to have significant challenges on multi-physics design methodology, multi-physics modelling and sampling, explainable and physical informed surrogate model, and design optimization methods for inter-disciplinary domains and wide operational ranges. Therefore, more efforts on multi-physics modelling, design, and optimization are still required to address the existing issues for data-driven design of advanced propulsion electrical machine drives.

This Special Session aims to provide a forum for worldwide researchers in academia and industry to share their contributions and discuss further advances in the subject of data-driven design for advanced electrical machine drives with particular interests

on sustainable propulsion applications including full-electric and more-electric aircrafts, electrical vehicles and railways. Manuscripts with original ideas and both theoretical and practical contributions are warmly welcome.

Topics of interest include, but are not limited to:

- Surrogate-model assisted design methodology for multi-physics disciplines.
- Transfer-learning based design techniques using multiple-fidelity models.
- Design of experiment (DoE) techniques considering multiple physics domains.
- Data-driven stochastic and heuristic algorithms.
- Design optimization algorithms for multi-disciplinary and wide operation region.
- Artificial intelligence-assisted design for integrated motor drives in full electric or hybrid electric propulsion.
- Electrical machine designs for electrified transportation and sustainable aviation propulsion.

Important dates

- Full Paper Submission: February 1, 2026
- Full Paper Notification: May 1, 2026
- Final Paper Upload: June 1, 2026

Submission of papers

Paper submission follows the rules of regular papers. All the instructions for paper submission are included in the conference website:
https://icem2026.ubi.pt/submission.html