

## IEEE Journal of Emerging and Selected Topics in Power Electronics

**Digital Twin Driven High-Reliability Power Electronic Systems**

Driven by the demand of developing zero-emission sustainable energy across the world, many industry sectors such as transportation and utility power generation are experiencing rapid revolution, in which power electronics is playing backbone role in numerous power conversion systems such as electric vehicles, airplanes, solar/wind power generations, and energy storage. However, the reliability of power electronics has not received sufficient attention, especially for safety-critical applications.

On the other hand, to embrace the industrial revolutions (i.e., Industry 4.0 and 5.0) that focuses heavily on interconnectivity, automation, intelligence, and real-time condition monitoring for all the physical systems such as power electronic converters, digital online preventive maintenance and optimization will be of paramount importance. The reason is that, it will not only fundamentally transform the accuracy of health monitoring of power converter systems, but also streamline an industrial product cycle from the stages of conceptual design, smart manufacturing, to operation and maintenance (O&M). Conventional offline and sensor-based health monitoring technologies are not compatible and synergized to the emerging technologies of interconnectivity, automation, as well as the intelligent Q&M required by the Industry 4.0 and 5.0. Therefore, transformative high-reliability design, optimization, and health monitoring methodologies that are synergized with the upcoming industrial digital technologies will be imperative for next-generation power electronic systems.

To fundamentally improve the reliability of next-generation power converters, predictive and diagnostic digital twin methods are required. Digital twin is the digital replica (i.e., interactive digital models) of a physical system which can accurately predict and reflect the real-time health condition of the physical systems (i.e., physical twin). One major difference between a conventional simulation model and a digital twin model is that, a digital twin model is embeddable, dynamic, and interactive, which may require real-time sensory data to automatically update the models based on various operating conditions to achieve high accuracy, while the digital twin model can provide predictive operation command to the physical systems.

In this context, this Special Issue intends to draw attention to the newest advances in digital twin technologies for power electronic devices and systems. The proposed Special Issue particularly fits the following topics, but are not limited to:

- Digital twin predictive reliability modeling of power electronic devices and systems
- Digital twin reliability-oriented control of power electronic systems
- Digital twin reliability-oriented design optimization of power electronic devices and systems
- Computationally efficient and high-fidelity digital twin models of power electronic devices and systems
- Development of artificial intelligence (AI) enabled advanced digital twin technologies
- Industry applications of digital twin modeling of power electronic devices and systems

All manuscripts must be submitted through Manuscript Central at <http://mc.manuscriptcentral.com/jestpe-ieee>. The cover page should be clearly marked with “**Special Issue on Digital Twin Driven High-Reliability Power Electronic Systems**”. When uploading your paper, please select your manuscript type “Special Issue.” Refer to <http://www.pels.org> for general information about electronic submission through Manuscript Central. Manuscripts submitted for the special issue will be reviewed separately and will be handled by the guest editorial board noted below. **Note:** The core of JESTPE is power electronics, so papers must include power electronics contents, and experimental verification is compulsory, otherwise papers may be considered as out of scope.

**Deadline for Submission of Manuscript: April 30, 2024**

**Guest Editors:** JiangBiao He, University of Kentucky, USA (Email: [jiangbiao.he@uky.edu](mailto:jiangbiao.he@uky.edu))

Paolo Mattavelli, University of Padova, Italy (Email: [paolo.mattavelli@unipd.it](mailto:paolo.mattavelli@unipd.it))

Fernando Briz, University of Oviedo, Spain (Email: [fbriz@uniovi.es](mailto:fbriz@uniovi.es))

**Guest Associate Editors** (in alphabetical order):

- Mohammed Agamy, SUNY University at Albany, USA
- Fang Luo, Stony Brook University, USA
- Deepak Ronanki, Indian Institute of Technology Madras
- Kai Sun, Tsinghua University, China
- Roberto Cardenas, University of Chile, Chile
- Hong Li, Beijing Jiaotong University, China
- Margarita Norambuena, Universidad Tecnica Federico Santa Maria, Chile
- Luca Solero, Roma Tre University, Italy

**Proposed Timeline:**

- Dec 15, 2023 – Call for Papers to JESTPE Editorial Office
- April 30, 2024 – Manuscripts Submission Deadline
- Aug 31, 2024 – Final Acceptance Notification
- Oct 31, 2024 – Manuscripts Forwarded to IEEE for Publication
- Dec 15, 2024 – Special Issue Appears in IEEE JESTPE