

PhD in Computer Engineering and Systems

Research Title: Modeling techniques for energy analysis and optimization of complex systems

Funded by	DAUIN
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Context of the research activity	<p>Complex systems are increasing in our society. They all require new paradigms when considering modern techniques for energy analysis and optimization. Therefore, a different approach for modeling the various processes is needed, with the aim of possibly minimizing the complexity of such models with respect to what it has been developed in recent years.</p> <p>The basic idea of this proposal is the definition of a methodology for generating simple models of complex systems that can be directly used by most users, instead of always requiring data scientists or overly specialized professionals for the analysis and even optimization of such systems. In this way, possible user-friendly EDA tools and models could improve the accessibility of such analysis to most people.</p> <p>The research activities will be carried out, partly, in collaboration with the multi-Scale Modeling Laboratory (SMaLL @ DENERG) and will involve industry (e.g., STMicroelectronics).</p>
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Objectives	<p>The objectives of the PhD plan are the following:</p> <ol style="list-style-type: none">1. Developing the competence to analyze available data from product documentation and experiments, for extraction of features in complex components and systems.2. Presenting a general approach for generating simplified models for system performance analysis carried out directly by users. The abstraction level of the models (i.e., behavioral vs. structural) will depend on the available system data.
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	<p>3. The resulting analytical and/or software-based models will provide outputs with a limited (i.e., acceptable) error with respect to experimental data and, furthermore, they should also greatly reduce the simulation time compared to the existing models.</p> <p>4. Providing a framework for generating models in a semi-automatic way, so as to further facilitate the modeling process.</p> <p>The aforementioned research activities will focus on three main areas of application:</p> <ul style="list-style-type: none"> • Power electronics (e.g., energy storage devices and active components); • Renewable energy (e.g., photovoltaics); • Low-power digital electronic systems.
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<p>Skills and competencies for the development of the activity</p>	<p>Preferably MS degree in computer engineering or in electronics engineering</p> <p>Excellent skills in computer programming</p> <p>Technical background in electronic design, modeling, simulation and optimization.</p>
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