

A FRAMEWORK FOR DATA-DRIVEN SIMULATION OF ELECTRICAL CIRCUITS BASED ON DISCRETE-CONTINUOUS OPTIMIZATION

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Abstract.

In this presentation, we introduce a new framework for the data-driven simulation of electrical circuits based on discrete-continuous optimization. For this, we provide a formal derivation of the data-driven discrete forward-dynamics problem and for its recursive solution, we adopt a strategy relying on an alternating direction method. Even when we target capacitive elements and circuits of simple topology, the approach has great potential for its generalization. Finally, we study several examples of increasing complexity and show through their analysis, the very promising features of this novel approach. In particular, we investigate the precision of the resulting numerical method, the ability to deal with nonlinearities hidden by the data, the ability to handle data sets of varying size and the robustness with respect to noisy data. Where the last two, represent key features to establish data-driven digital twins. *This presentation is in memoriam of Prof. Gustavo C. Buscaglia [1964-2025], a dear friend and inspiring colleague to Cristian G. Gebhardt.*