PhD/MSc/BSc/Internship Infineon Topics for University of Sarajevo / ETF Students				
Topic	**Topic details**	**Expected Outcome**	**Type**	**Skills (needed/to be acquired)**
Deep Reinforcement Learning (DQN) Based Sparse-Matrix Reordering for Analog Simulator (InfineonSpice/TITAN)	Explore possibility to replace the traditional Markowitz Heuristic and perform sparse-matrix reordering by application of reinforcement learning (DQN) using Convolutional/Graph Neural Networks as the Q-function approximator. Integrate and evaluate the approach within InfineonSpice/TITAN's nonlinear solver for transistor-level analog circuits.	Measurable speedups in TITAN's linear solver via reduced fill-in, factorization time, and memory use. Demonstrate gains via benchmarks, e.g., baseline (Markowitz) vs. neural re-ordering.	MSc / PhD	ML methods Feature Engineering Deep Reinforcement Learning Convolutional/Graph Neural Networks Programing Languages / Libraries C++, Python, PyTorch, TensorFlow Numerical Methods Newton-Raphson, direct solvers, integration Tooling and quality Git, Jenkins/GitLab Writing clear documentation (README, short design notes) EDA / Circuit Simulation (nice to have) Simulation methodology Spice syntax and models
Deep Learning Based Initial Guess Predictor for Newton-Raphson DC Operating-Point Analysis in an analog simulator (InfineonSpice/TITAN)	Train a deep neural network to predict high-quality initial guesses for Newton's method in DC operating-point analysis. Implement in-situ training built into the TITAN analog simulator engine so that the model can learn from simulation data and improve convergence on challenging circuits.	Deliver a simulator-integrated neural network based initial guess predictor that reduces Newton iterations and end-to-end DC solve time without any loss of numerical accuracy. Demonstrate gains via benchmarks (baseline vs. neural).	MSc	ML methods Feature Engineering Supervised Training of Deep Neural Networks Programing Languages / Libraries C++, Python, PyTorch, TensorFlow Numerical Methods Newton-Raphson, direct solvers, integration Tooling and quality Git, Jenkins/GitLab Writing clear documentation (README, short design notes) EDA / Circuit Simulation (nice to have) simulation methodology Spice syntax and models

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Web-Based (Online) Analog Schematic Editor	Implement a transistor-level analog schematic editor using state-of-the-art web front-end technologies such as React.js/Vue.js. The editor will be part of an online simulation tool used for system-level prototype circuit simulations with Infineon's cutting-edge analog simulator InfineonSpice/TITAN. Implement ERC checks for the created circuit and the relevant netlister.	The online-analog schematic editor allows users to add and connect symbols from a symbol library. The created schematic can be verified using ERC tests and it can be netlisted.	BSc / Internship	Web front-end JavaScript/TypeScript One modern framework: React or Vue State management (e.g. Redux, Pinia/Vuex, ...) Data modeling and algorithms Graph-like data structures 2D Vector Geometry / Polygon Processing Tooling and quality Git, npm/yarn, Jenkins/GitLab, Docker Writing clear documentation (README, short design notes) EDA/circuit schematic basics (nice to have) Transistor-level analog concepts (MOSFETs, BJTs, passives, subcircuits) ERC essentials (floating nets, shorts, pin-type compatibility) Spice syntax and models