

Bayesian Inversion for Semiconductor Inverse Problems

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Semiconductor devices such as nano-biosensors have many applications in our real life including medical applications for diagnostic purposes. In this work, we describe incorporating uncertainties in the mathematical modeling of semiconductor devices, as well as the propagation of uncertainties in the solution of the corresponding PDE model. We then formulate and solve a Bayesian inverse problem for the nanoscale devices. To this end, we first show that the parameter-to-observable map corresponding to this inverse problem satisfies sufficient conditions to guarantee the well-posedness properties of the proposed Bayesian inversion approach. Then, we propose a Markov-chain Monte-Carlo method for the Bayesian posterior estimation of the unknown parameters from the voltage-current measurements.

Author: TAGHIZADEH, Leila (TU Wien)

Presenter: TAGHIZADEH, Leila (TU Wien)

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