Max-Planck-Institut für
Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter

IMPRS UFAST Call for PhD applications 2023/2024

ME1-Quantum-inspired algorithms for non-equilibrium Green's functions

Title of PhD Project	**Quantum-inspired algorithms for non-equilibrium Green's functions**
Type	Theory
Supervisor(s)	Prof. Dr. Martin Eckstein
Affiliation(s):	UHH
Number of positions:	1
Abstract:	Non-equilibrium Green's functions (NEGF) provide a versatile framework to describe driven quantum many-particle systems, from photo-induced phase transitions in correlated materials to dynamically stabilized states in synthetic quantum matter. However, the huge separation of timescales inherent in many physical problems provides a severe bottleneck for these calculations. For example, simulations of photo-induced states in condensed matter are mostly restricted to few bands and femtosecond timescales, while relevant dynamics for photo-induced transitions can happen on the picosecond scale. Recently, the use of tensor networks, which otherwise are rather known as an ansatz wave function for interacting quantum systems, have been proposed to tackle the emergent multi-scale nature in problems of classical physics. In this project, we aim to apply such an ansatz to efficiently deal with the temporal multi-scale nature in NEGF simulations.
Contact person for scientific questions about the project:	Prof. Martin Eckstein: martin.eckstein@uni-hamburg.de