

# Mixed quantum-classical dynamics for near term quantum computers

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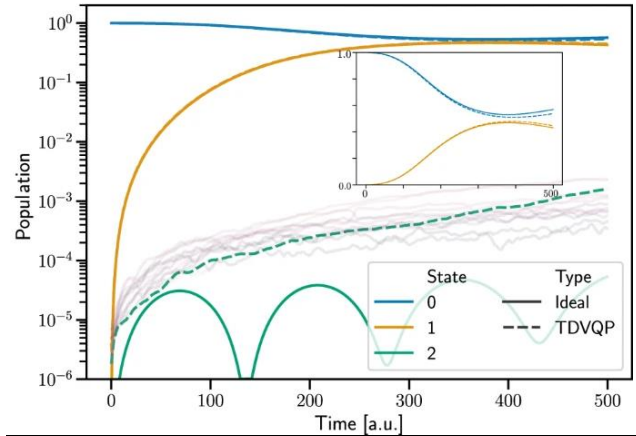
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Mixed quantum-classical dynamics is a set of methods often used to understand systems too complex to treat fully quantum mechanically. Many techniques exist for full quantum mechanical evolution on quantum computers, but mixed quantum-classical dynamics are less explored. We present a modular algorithm for general mixed quantum-classical dynamics where the quantum subsystem is coupled with the classical subsystem. We test it on a modified Shin-Metiu model in the first quantization through Ehrenfest propagation. We find that the Time-Dependent Variational Time Propagation algorithm performs well for short-time evolutions and retains qualitative results for longer-time evolutions.

Figures



**Figure 1:** Plot showing the state population (colours) dynamics populations of the Shin-Metiu Model with exact evolution (solid) compared to evolution on the quantum computer (dashed).

**Figure 2:** Cartoon showing the algorithm cycle. This includes initialization of the state, evolution of the quantum system, evolution of the classical system and the checkpointing of the algorithm which allows for long time evolution in a constant depth circuit.

