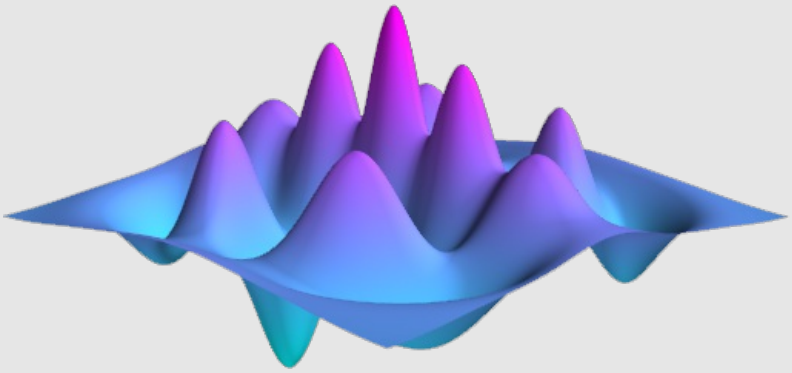

Fork me on GitHub

QuTiP

Quantum Toolbox in Python

Tutorials

This pages contains our collection of IPython notebooks for introducing and demonstrating features of QuTiP. Going through these notebooks should be a good way to get familiarized with the software. If you are new to scientific computing with Python, you might also find it useful to have a look at these IPython notebook Lectures on scientific computing with Python.

Example notebooks

These notebooks demonstrate and introduce specific functionality in QuTiP.

Python Introduction

- Quick introduction to Python
- Overview of NumPy Arrays
- Brief Introduction to Matplotlib

For a more in depth discussion see: Lectures on scientific computing with Python.

Basics

- Introduction to QuTiP
- Exponential series
- Groundstates: Jaynes-Cumming model in the ultrastrong coupling regime
- Superoperators, Pauli Basis and Channel Contraction

Visualization

- Visualization demos
- Energy-level diagrams
- Bloch-sphere animation
- Bloch Sphere with Colorbar
- Wigner functions
- Pseudo-probability functions
- Process tomography
- Qubism visualizations

Quantum information processing

- Quantum gates and circuits
- Toffoli gate to CNOT
- Spin Chain Qubit model

Time evolution

- Master equation solver: Qubit dynamics
- Master equation solver: Vacuum Rabi oscillations
- Master equation solver: Spin chain
- Monte-Carlo solver: Trilinear oscillators
- Monte-Carlo solver: Birth and Death of Photons in a Cavity
- Bloch-Redfield master equation solver
- Time-dependent Bloch-Redfield Quantum Dot
- Floquet formalism
- Quasi-steadystate of time-dependent (periodic) systems
- Time-dependent master equation: Landau-Zener transitions
- Time-dependent master equation: Landau-Zener-Stuckelberg inteferometry
- Stochastic master equation: Heterodyne detection
- Stochastic master equation: Inefficient detection
- Stochastic master equation: Jaynes-Cumming model with photocurrent detection
- Stochastic master equation: Feedback control
- Steady state solvers: Optomechanical system
- Homodyned Jaynes-Cummings Emission

Optimal control

- Overview
- Hadamard
- QFT
- Lindbladian
- Symplectic
- QFT (CRAB)
- state to state (CRAB)
- CNOT
- iSWAP
- Single-qubit rotation
- Toffoli gate

Quantum mechanics lectures with QuTiP

These lecture-style notebooks focus on particular quantum mechanics topics and analyze them numerically using QuTiP (some more detailed than others).

- Jaynes-Cumming model
- Cavity-Qubit Gates
- Single-Atom Lasing
- Dicke model
- Jaynes-Cumming with ultrastrong coupling
- Correlation Functions
- Pulse-wise second-order coherence, $g^{(2)}[0]$
- Pulse-wise two-photon interference
- Temporal photon scattering in quantum optical systems
- Particle emission from a photon cascade
- Parametric Amplifier
- Quantum Monte Carlo Trajectories
- iSWAP gate
- Adiabatic quantum computing
- Squeezed states of an harmonic oscillator
- cQED in the dispersive regime
- Superconducting charge qubits
- Decay into a squeezed vacuum field
- Resonance flourescence
- Kerr nonlinearities
- Nonclassically driven atoms
- Gallery of Wigner functions

Development notebooks

A collection of more technical development notebooks, which often focus on testing and benchmarking various features of QuTiP, is available here.