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### **Quantum jump methods for the modelling of open quantum systems**

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This project was performed in collaboration with *Elanor Harrington*

#### **Abstract**

The aim of this project is to study open quantum systems: a quantum mechanical system which is in contact with environmental degrees of freedom. The study of such systems is crucial for real-world applications as no true quantum system is completely isolated from its surrounding. We look to outline the mathematical framework used to treat these systems with the main focus being to determine their time-evolution. This is done through solving effective equations of motion known as master equations. Particularly, we study a numerical technique called the quantum jump method which allows for calculation of the density matrix, an object containing all information about the system, as a stochastic average over many simulated trajectories of the systems wave-function with time. We will consider the numerical accuracy and physical interpretation of such a method and apply it in the case of both a simplified and more general spin-boson model.