Jeffrey Morais
Quantum gravity theorist

Website Email
LinkedIn Github

Educational Background

2019 - 2023 **B.Sc. Honours Physics**, *McGill University*, Montréal, Canada (GPA: 3.84/4.0)

- Thesis on de Sitter space compactifications in type II string theory and M-theory.
- All research awards: 2 NSERC USRAs with FRQNT, SURA, SURE, BSA (Total Amount: $41,600)

Selected Experience

Summer 2023 **Quantum Computing Theorist**, *University of Alberta*, Edmonton, Canada

- **Demonstrated a novel relationship between topological wormholes and quantum tunnelling** for systems of entangled qubits in potential-well lattices.
- Characterized the general entanglement structure of confined qubits which enabled **quantum algorithms to run 2x more efficiently**.
- Computed non-perturbative, non-local corrections to the qubit path integral, allowing for **measuring quantum observables with more accuracy**.

Supervisor: Prof. Igor Boettcher

Summer 2022 **String Cosmology Theorist**, *McGill University*, Montréal, Canada

- **Increased efficiency of extracting cosmic string signals by 1.7x** within non-linear noise, allowing for sampling much larger areas with **wavelet/match filter statistics**.
- Created the cosmic string signal and **developed numerical algorithms** in **Python** to recognise its profile with **45% more accuracy than previous statistics** with correlation functions.
- Classified the stability of the cosmic strings to **constrain the signal distribution in the expanding spacetime**.

Supervisor: Prof. Robert Brandenberger

Fall 2021 **Quantum Cosmology Data Scientist**, *McGill University*, Montréal, Canada

- **Developed computational methods in Python** for decoupling the fast radio burst signals from noise for describing black-white wormhole tunneling events.
- **Coordinated with 10+ physicists at Canada Compute Cedar** to optimize the calculation of scintillation and decorrelation bandwidths of the burst via **bash scripts**.
- **Established a method for finding the position of the bursts** using spatial correlation functional defined in the our universe's spacetime.

Supervisor: Prof. Victoria Kaspi

2019 - 2020 **Quantum Theorist**, *Vanier College*, Montréal, Canada

- **Developed a novel approach to solve non-linear PDE** Hamilton-Jacobi equations of motion and generated quantum trajectories in pilot-wave theory.
- Developed efficient **real-time simulations of quantum trajectories with recurrent neural networks in Python** for arbitrary potentials.
- **Numerically solved the time-dependent Schrödinger equation** with the **Crank-Nicolson method** to train the neural networks.

Supervisor: Prof. Ivan Ivanov

Ongoing Experience

Present **Post-Quantum Cryptography Intern**, *BTQ*, Vancouver, Canada

- Using topological quantum error correction and fault-tolerant codes, we look at **optimizing blockchain consensus computations in post-quantum cryptography**.
- We apply this framework to quantum sampling events done in clusters of scalable quantum computers.

Collaborator: Dr. Peter Rohde

Present **Quantum Neural Network Theorist**, *Fudan University*, Shanghai, China

- Using topological quantum neural networks we look at renormalization group flow in quantum gravity.
- We use this to describe topological wormhole networks connecting entangled qubits for **more efficient measurements in quantum computers**.

Supervisor: Prof. Antonino Marcianò