Aradhika Paul

Homer L. Dodge Department of Physics and Astronomy – The University of Oklahoma
Norman, Oklahoma, USA
Aradhika.Paul-1@ou.edu

Education

The University of Oklahoma — **Norman, Oklahoma**
Ph.D. in Physics, CGPA: 3.50 / 4.00 — *2025–Present*

Indian Institute of Technology Madras — **Chennai, India**
M.Sc. in Physics, CGPA: 8.68 / 10 — *2023–2025*

Ramjas College, University of Delhi — **Delhi, India**
B.Sc. (Hons.) in Physics, CGPA: 9.05 / 10 — *2019–2022*

Research Experience

Indian Institute of Technology Madras — **Chennai, India**
M.Sc. Thesis Project, Reinforcement Learning for Quantum Control
Supervised by Prof. Siddharth Dhomkar — *May 2024–May 2025*

- Developed deep reinforcement learning frameworks for quantum state preparation within the unitary circuit model, treating multi-qubit control as a sequential decision-making problem
- Implemented Deep Q-Networks (DQN) in custom OpenAI Gym environments to learn efficient quantum gate sequences for Bell, GHZ, and linear cluster state preparation in two- and three-qubit systems
- Designed fidelity-based reward functions with gate-efficiency shaping and evaluated robustness under imperfect gate operations using simplified noise models
- Observed improved generalization performance when agents were trained under noisy conditions
- Extended the framework toward physically motivated spin systems by exploring NV center spin control using Hamiltonian dynamics and QuTiP simulations

Teaching Experience

The University of Oklahoma — **Norman, Oklahoma**
Graduate Teaching Assistant, Physics I (Mechanics) for Engineering Students — *2025–Present*

- Led discussion sections and problem-solving sessions for undergraduate engineering students
- Assisted with instruction on newtonian mechanics concepts
- Held office hours and graded assignments

Technical Skills

Computational: **Programming:** Python, C++
Quantum simulation: QuTiP, Qiskit
Machine learning: TensorFlow, OpenAI Gym
Scientific computing: NumPy, SciPy, Matplotlib, Pandas
Software: Mathematica, Scilab, Origin, LaTeX

Awards & Scholarships

2023–2025: Usha Krishnaswamy Scholarship for Academic Merit

2024–2025: Institute Free Studentship, IIT Madras

2024–2025: 64th Foundation Endowment Scholarship, IIT Alumni Charitable Trust

2019–2022: National Scholarship Portal (NSP) Scholarship

2023: Qualified IIT Joint Admission Test (JAM)

2023: Qualified Joint Entrance Screening Test (JEST)

2018: Qualified Regional Mathematical Olympiad (RMO), Meghalaya Region