PROJECT TITLE: AI-enhanced Quantum Technologies

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Project details: The discovery of new quantum materials is pivotal for advancing energy, healthcare, and quantum technologies. However, traditional methods of material characterization and device prototyping remain slow and resource-intensive. This PhD project seeks to transform the research landscape by developing an AI-driven lab assistant: an autonomous system capable of material characterization and device optimization with unmatched speed and precision. The project centers on integrating artificial intelligence, robotics, and advanced experimental techniques into a unified, automated framework. A state-of-the-art experimental platform will be utilized to acquire and analyze extensive datasets on optical, spectroscopic, and electrical properties of materials. High-precision robotic modules will be designed to enable automated characterization of wafer-scale samples. The AI system will process data in real time and dynamically adjust experimental parameters, such as probe configurations, light sources, and environmental conditions, to maximize the quality and relevance of its outputs. This platform will be validated using cutting-edge quantum materials, including atomically thin (2D) systems, applied to fields such as quantum photonics and electronics. The AI will identify key trends, anomalies, and physical mechanisms, accelerating the design and testing of prototype devices such as quantum emitters, single-photon detectors, and quantum chemical sensors. By bridging the gap between material characterization and functional device development, the system promises to drive transformative progress across physics, materials science, and engineering. Through close collaboration with experts in artificial intelligence, quantum materials, and quantum technologies, the student will engage in interdisciplinary research and contribute to breakthroughs at the forefront of emerging scientific fields. Training in advanced AI methodologies, robotics, and materials characterization will prepare the student to tackle fundamental and applied challenges, shaping the future of innovation. This project aligns with a broader vision of integrating AI into scientific discovery to address critical bottlenecks in the innovation pipeline. By drastically reducing the time required to transition quantum materials from theoretical predictions to real-world applications, this work will establish a robust foundation for future large-scale interdisciplinary initiatives.

Project Specific requirements: Should this position be advertised, when possible I require to be part of the panels shortlisting the applicants and conducting their interview.

Potential PhD programme of study: PhD in Physics

Department: Physics and Astronomy

Location: Physics, StockerRoad 6

Please direct project specific enquiries to: s.russo@exeter.ac.uk

Please ensure you read the entry requirements of programme to which you are applying.

To apply for this project please click here.