CV George Mihailescu

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Website
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Google Scholar
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Research

My main research focus is in the intersection of condensed matter and quantum information theory. In particular, I am interested in strongly correlated electron systems, many-body systems, critical systems, and quantum metrology. Furthermore, I am interested in open quantum systems, quantum transport, entanglement theory, and light-matter interacting systems. Throughout my PhD, I have developed expertise in Kondo physics and quantum impurity models, requiring the use of sophisticated numerical methods such as Numerical Renormalization Group (NRG) and exact diagonalization. Furthermore, in the context of condensed matter physics, I have frequently employed Green's functions techniques and linear response theory. In terms of quantum critical systems I have looked at the two-impurity Kondo, Lipkin-Meshkov-Glick (LMG), Ising, and XY-models. For the latter two models, I have developed the analytical skills to explore free-fermion systems, in particular, the Jordan-Wigner and Bogoliubov transformations, along with other relevant skills. To date, I have explored these systems in the context of quantum sensing. This has allowed me to develop expertise in statistical inference, looking at both the frequentist (Fisher information) and Bayesian approaches to single and multi-parameter estimation.

Education

2021 – 2025 ***PhD – University College Dublin***
Thesis: "Dynamics and control in quantum nanoelectronic devices".
Supervisor(s): Dr. Andrew Mitchell and Dr. Steve Campbell.

2019 – 2020 ***MSc – University College Dublin***
Subject: Applied Mathematics and Theoretical Physics.
Degree award: 1st Class Honours.
Thesis: "Optimal control protocols for charging quantum batteries".
Supervisor: Dr. Steve Campbell.

2015 – 2019 ***BSc – Dublin City University***
Subject: Physics with Biomedical Sciences.
Degree award: 1st Class Honours.
Thesis: "Applications of artificial neural networks in quantum many-body problems".
Supervisor(s): Dr. Kevin McGuiness and Dr. Tony Cafolla.

Supervision

2023 – 2024 ***Co-Supervisor***
Bachelors Thesis: "Controlled quantum sensing".
Student: Jessica DuBerry-Mahon.
Main Advisor: Dr. Steve Campbell.

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Teaching

2023/2024	**Trimester 1, second year physics:** Introductory quantum mechanics.
2022/2023	**Trimester 1, third year physics:** Classical mechanics and relativity. **Trimester 2, masters course:** Quantum theory of condensed matter physics.
2021/2022	**Trimester 1, second year physics:** Fields, waves, and light. **Trimester 1, first year physics**: Physics labs. **Trimester 2, masters course**: Quantum theory of condensed matter physics.

Reviewing

3 verified reviews in 3 different journals including: Quantum Sci. Technol. (IOP), New J. Phys. (IOP), and Physica B.

Scientific outreach and communication

2024	***Ross medal finalist*** **Subject:** Quantum sensing: from fundamental uncertainties to experimental imprecision. **Audience:** General physics. **Organiser:** Institute of Physics (IOP).
2024	***Guest Speaker*** **Subject:** Quantum science and space. **Audience:** General (non-physics). **Organiser:** Space and Robotics Club, Dublin City University.
2023	***Under the microscope – Podcast*** **Subject:** Quantum science and sensors. **Audience:** General (physics, and non-physics). **Organiser:** The Science Talk.
2019 – 2020	***STEAM education – Teacher*** **Subject:** Thought general science to primary school children. Subjects ranging from general physics, astronomy, to biology. Lecture-like class with experimental demonstration and active participation from students. **Audience:** School children. **Company:** STEAM education Ireland.
2016 – 2020	***Space and Robotics Club*** **Role:** Founder and President.

Audience: General (physics, and non-physics) undergraduate students.
Highlights: Secured over 15K euro in funding which supported equipment for building robots, 3D printers, and drones. Further organised and led a trip abroad to Iceland for over 20 undergraduate students. Organised talks with invited speakers from various universities on topics such as black hole physics, exoplanet discovery, and artificial intelligence.

Technical tools

Programming Languages	- Python. - Fortran. - Mathematica. - Bash.
Additional	- Linux. - Slurm.

Languages

English (native), Romanian (native), French (proficient, leaving certificate), Spanish (conversational).

Invited Talks and Research Visits

Invited visit	***University of Electronic Science and Technology China*** **Duration:** 3 months. **Hosted by:** Prof. Abolfazl Bayat. **Location:** Chengdu, China.
Invited talk	***University of Electronic Science and Technology China*** **Title:** Multiparameter critical quantum metrology with impurity probes. **Invited by:** Prof. Abolfazl Bayat **Location:** Chengdu, China.
Invited talk	***University of Utrecht*** **Title:** Quantum sensing in strongly correlated electron systems. **Invited by:** Dr. Lars Fritz. **Location:** Utrecht, Netherlands.
Invited talk	***University of York*** **Title:** From single parameter to multiparameter quantum sensing. **Invited by:** Dr. Irene D'Amico. **Location:** York, England.
Invited talk	***Trinity College Dublin***

Title: Multiparameter critical quantum metrology with impurity probes.
Invited by: Dr. Mark Mitchison.
Location: Dublin, Ireland.

Conferences

04/2024 ***IOP Ireland Spring Conference***
Presentation: Quantum sensing: from fundamental uncertainties to experimental imprecision.
Location: Dublin, Ireland.

02/2024 ***Quantum Metrology in Interacting and Open Systems***
Poster: Multiparameter critical quantum metrology with impurity probes.
Location: Les Diablerets, Switzerland.

09/2023 ***Irish Theoretical Physics***
Poster: Multiparameter critical quantum metrology with impurity probes.
Location: Maynooth, Ireland.

09/2023 ***Quantum Festival***
Poster: Temperature estimation of quantum environments with impurity probes.
Location: Dublin, Ireland.

03/2023 ***APS March Meeting***
Presentation: Temperature estimation of quantum environments with impurity probes.
Location*:* Las Vegas, Nevada, USA.

09/2022 ***Irish Theoretical Physics***
Poster: Thermometry of strongly correlated quantum environments.
Location*:* Dublin, Ireland.

08/2022 ***Quantum Symposium***
Presentation: Thermometry of strongly correlated quantum environments.
Location: Dublin, Ireland.

Schools

09/2023 ***Coherent Quantum Dynamics – OIST***
Topic: Coherent control of quantum systems; Quantum metrology; Quantum thermodynamics.
Poster: Thermometry and multiparameter critical quantum sensing.
Location: Okinawa, Japan.

Publications

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Summary: 2 Published / Accepted and 2 preprints with a h-index = 2 (Google Scholar). My research has garnered 36 citations according (Google Scholar). The citations below (sorted most recent to oldest) in brackets from Google Scholar.

1. **G. Mihailescu**, S. Campbell, and K. Gietka
   Uncertain quantum critical metrology: from single to multi parameter sensing
   arXiv:2407.19917
2. **G. Mihailescu**, A. Kiely, and A. K. Mitchell
   Quantum sensing with nanoelectronics: Fisher information for an adiabatic perturbation
   arXiv:2406.18662 [Cited by: 2]
3. **G. Mihailescu**, A. Bayat, S. Campbell, and A. K. Mitchell
   Multiparameter critical quantum metrology with impurity probes
   Quantum Sci. Technol. 9, 035033 (2024) [Cited by: 11]
4. **G. Mihailescu**, S. Campbell, and A. K. Mitchell
   Thermometry of strongly correlated fermionic quantum systems using impurity probes
   Phys. Rev. A 107, 042614 (2023) [Cited by: 23]