CV George Mihailescu

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Research

My research lies at the intersection of condensed matter physics and quantum information theory, with a particular focus on strongly correlated electron systems, critical many-body phenomena, and quantum metrology. I have a strong interest in open quantum systems, quantum transport, entanglement theory, and light–matter interaction.

During my PhD, I developed expertise in quantum impurity models and Kondo physics, employing advanced numerical techniques such as the numerical renormalization group (NRG) and exact diagonalization. I have also made extensive use of Green's function methods and linear response theory in the study of correlated systems.

My work involves both numerical and analytical approaches to complex quantum models, including the two-impurity Kondo model, the Lipkin–Meshkov–Glick (LMG) model, and various integrable spin chains such as the Ising and XY models. For the latter, I have developed analytical proficiency in the treatment of free-fermion systems, making use of the Jordan–Wigner and Bogoliubov transformations.

A key theme in my research is quantum sensing, where I have investigated the metrological capabilities of these many-body systems. This has allowed me to cultivate expertise in statistical inference, combining both frequentist (Fisher information) and Bayesian approaches to single- and multi-parameter estimation.

Education

2021 – 2025 ***PhD – University College Dublin***
Thesis: "Quantum sensing with many body systems".
Supervisor(s): Dr. Andrew Mitchell and Dr. Steve Campbell.
Examiner: Prof. Klaus Mølmer.

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.

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Publications

Summary: 3 first-author Published / Accepted and 2 first-author preprints with a h-index = 4 (Google Scholar). My research has garnered 88 citations according (Google Scholar). The citations below (sorted most recent to oldest) in brackets from Google Scholar.

1. **G. Mihailescu,** S. Sarkar, A. Bayat, S. Campbell, A. K. Mitchell
   Metrological symmetries in singular quantum multi-parameter estimation
   arXiv:2503.05483 (Submitted to Quantum Sci. Technol) [Cited by: 3]
2. **G. Mihailescu**, S. Campbell, and K. Gietka
   Uncertain quantum critical metrology: from single to multi parameter sensing
   Phys. Rev. A 111,052621(2025) [Cited by: 9]
3. **G. Mihailescu**, A. Kiely, and A. K. Mitchell
   Quantum sensing with nanoelectronics: Fisher information for an adiabatic perturbation
   arXiv:2406.18662 (Submitted to Phys. Rev. Lett.) [Cited by: 5]
4. **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: 37]
5. **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: 34]

Supervision

2024 – 2025	***Co-Supervisor*** **Bachelors Thesis: "**Optimizing quantum sensors by inverse design". **Student:** Anthony Slawski. **Main Advisor:** Dr. Andrew Mitchell.
2023 – 2024	***Co-Supervisor*** **Bachelors Thesis: "**Controlled quantum sensing". **Student:** Jessica DuBerry-Mahon. **Main Advisor:** Dr. Steve Campbell.

Teaching

2024/2025	**Trimester 1, second year physics:** Introductory quantum mechanics.
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

11 reviews in 5 different journals including: Phys. Rev. Lett. (APS) , Phys. Rev. A. (APS) , Quantum Sci. Technol. (IOP) , New J. Phys. (IOP) , and Physica B (Elsevier).

Scientific outreach and communication

2025	***Ross medal runner up*** **Subject:** Quantum nanoelectronic devices as a platform for quantum sensing. **Audience:** General physics. **Organiser:** Institute of Physics (IOP).
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.

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

03/2025 ***Criticality and Continuous Measurements in Quantum Sensing: From Theory to Experiments***
Presentation: Uncertain Quantum Critical Metrology: From Single to Multiparameter sensing.
Location: Scuola Normale Superiore, Pisa, Italy.

03/2025 ***IOP Ireland Spring Conference***
Presentation: Quantum nanoelectronic devices as a platform for quantum sensing.
Location: Galway, Ireland.

02/2025 ***Multiparameter Quantum Sensing and Metrology***
Poster: Understanding singularities of the Quantum Fisher Information Matrix using Bayesian approaches.
Location: Physikzentrum Bad Honnef, Bonn, Germany.

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.

Technical tools

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

Languages

English (native), Romanian (native), and French (proficient, leaving certificate).