

Marta Varela, PhD FHEA

Research Fellow, Imperial College London

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Experienced scientist researching artificial intelligence, image acquisition & analysis, and computational modelling solutions for high-impact problems in medicine and beyond.

EMPLOYMENT

2020–date	Research Fellow · NATIONAL HEART & LUNG INSTITUTE · Imperial College London <ul style="list-style-type: none">· Pioneered Physics-Informed Neural Networks (PINNs), combining mathematical models with experimental data, for systems identification in medical problems (34)· Designed AI-enabled image acquisition and analysis tools (21, 43)· Created AI tools to solve (39, 35, 33, 32, 27, 24, 20)· Built new computational models of the electromagnetic properties of the heart and used them to design effective treatments for cardiac disease (25, 22, 19, 16)
2019–2020	Research Fellow · SCHOOL BIOMEDICAL ENGINEERING & IMAGING SCIENCES · King's College London (KCL)
2017–2019	Senior Teaching Fellow (PT) · SCHOOL BIOMEDICAL ENGINEERING & IMAGING SCIENCES · KCL
2014–2015	Lecturer (PT) · PHYSICS · Birkbeck College, University of London
2012–2017	Research Associate · SCHOOL BIOMEDICAL ENGINEERING & IMAGING SCIENCES · KCL
2011–2012	Research Associate · MEDICAL PHYSICS · University College London
2011	Imaging Scientist · IXICO LTD · London, UK

QUALIFICATIONS

2017	PGCert · ACADEMIC PRACTICE · King's College London <ul style="list-style-type: none">· Awarded Fellowship of Higher Education Academy (FHEA)· Courses in: Curriculum Design, PhD Supervision, Assessment & Feedback
2011	PhD · IMAGE ACQUISITION & ANALYSIS · Imperial College London Thesis: "Quantitative Methods for Perfusion in the Neonatal Brain" (1, 3, 4, 10)
2006	Licenciatura (MSci) · PHYSICS & ENGINEERING · IST, University of Lisbon, Portugal First Class Honours · Final grade: 86%

FUNDING

Awarded >£365K in research funding, £250K as PI.

2022	NIHR Imperial Biomedical Research Centre · Co-I · £67,466 "5-Minute Scan to Automatically Predict Outcomes in Heart Disease"
2022	British Academy Pump Priming Award · PI · £9,740 "Identification of Atrial Fibrillation Risk from the ECG: an Artificial Intelligence Solution"
2021	Imperial-TU Munich Research Seed Funding · PI · £7,333 "Electrical Properties of the Human Atrium using Physics-Inspired Neural Networks"
2019	Wellcome-EP SRC Centre for Medical Engineering · FELLOWSHIP · £99,569 "Predicting Outcomes in Atrial Fibrillation using CINE-MRI and Convolutional Neural Networks"
2019	EP SRC Medical Imaging Network (MedIAN) · FELLOWSHIP · £28,921 "3D Atrial Deformations Using CINE-MRI to Predict Outcome of Atrial Fibrillation"
2018	Wellcome-EP SRC Centre for Medical Engineering Imaging Award · PI · £5,500 "Creation of 3D Maps of Atrial Mechanics Using High-Resolution Free-Breathing CINE-CMR"
2018	Institute of Physics Public Engagement Award · PI · £1,600 "The Physics of Heart Beats"
2018	EP SRC Advancing Impact Award · Co-I · £20,000 "Image-Based Computational Systems for Guiding Ablation of Cardiac Arrhythmias"
2016	KCL Parenting Leave Fund · PI · £9,861 "Atrial Wall Thickness Measurements using MRI"
2014	GSTT Cardiovascular Healthcare Technology Support Grant · Co-I · £14,981 "Imaging and Computational Tools for Optimising Catheter Ablation Treatment of Atrial Fibrillation"
2010	Japanese Society for the Promotion of Science & British Council · FELLOWSHIP · £6,100 "Advanced MRI Techniques to Investigate Cerebral Haemodynamics in Moya-Moya Disease"
2006	Portuguese Foundation for Science & Technology (FCT) · 4-YEAR PHD STIPEND · €88,500

TEACHING

Module lead (3 modules) and lecturer (5 modules) at UG and PG levels.

2017–2019	Lecturer & Module Lead · KING'S COLLEGE LONDON · <ul style="list-style-type: none">· Module lead for 3 UG courses in: Computational Mathematics, Physics, and Mechanics.· Lecturer in 3 UG & 2 PG courses in Computational Modelling, and Image Acquisition & Analysis.· Developed curricula and learning materials, including lecture notes, computational exercises and laboratory guides.· Wrote and marked exams and assignments.· Led and managed 20 graduate teaching assistants, involved in tutorial-based teaching and marking.· ≥ 800 teaching hours/academic year
2014–2015	Lecturer · BIRKBECK COLLEGE, UNIVERSITY OF LONDON · <ul style="list-style-type: none">· Lectured the UG "Introduction to Physics" evening course.· Wrote and marked exams.
2013–2017	Graduate Teaching Assistant · KCL · <ul style="list-style-type: none">· Taught tutorial classes in Physics for Engineers.
2005–2006	Teaching Assistant · IST, UNIVERSITY OF LONDON · Portugal <ul style="list-style-type: none">· Taught exercise classes and tutorials in Programming (using C, Java and Matlab) and Electromagnetism.

SUPERVISION

Supervisor to: 4 PhD students (1 completed, 2 in second year, 1 in first year), and 42 Masters students.

2021–date	PhD Supervisor · IMPERIAL COLLEGE LONDON · <ul style="list-style-type: none">· First supervisor to two second-year PhD students, working on novel deep learning methods to analyse MR Images.· First supervisor to one first-year PhD student, working on Physics-Informed Neural Networks applied to clinical cardiovascular problems.
2023–date	Personal Tutor · IMPERIAL COLLEGE LONDON · <ul style="list-style-type: none">· Personal tutor to 5 MSc students.
2021–date	Mentor · IMPERIAL & KING'S COLLEGE LONDON · <ul style="list-style-type: none">· Mentor to 2 PhD students, 1 postdoctoral research associate and 1 technician.
2021–date	Assessor · IMPERIAL COLLEGE LONDON · <ul style="list-style-type: none">· Independent internal assessor to the progression stages of 3 PhD students.
2017–2020	PhD Supervisor · KING'S COLLEGE LONDON · <ul style="list-style-type: none">· Co-supervised one PhD student on computational modelling of the heart to completion.
2013–date	MSc/MRes Supervisor · IMPERIAL & KING'S COLLEGE LONDON · <ul style="list-style-type: none">· Supervisor to 42 Masters students, from MRes and MSc programmes in Biomedical Engineering, Physics and Computing.· Six students published their research findings as first authors in peer reviewed publications (13, 18, 26, 27, 34, 35).
2011–2012	Personal Tutor · UNIVERSITY COLLEGE LONDON · <ul style="list-style-type: none">· Provided pastoral support to 6 UG students.

EVIDENCE OF ESTEEM

2013–2019	Development, Diversity and Inclusion Committee Member · KCL · <ul style="list-style-type: none">· Organised and co-wrote the successful Athena SWAN Silver application awarded to the School of Biomedical Engineering & Imaging Sciences.· Led the School's Parenting Group.· Organised training in personal development and grant writing.
2011–date	Peer Reviewer & Editor · · <ul style="list-style-type: none">· Reviewer for ≥ 30 international journals across Computer Science, Maths, Engineering, Physics, and Artificial Intelligence, Medicine & Neuroscience.· Reviewer for two EPSRC grants in the Healthcare Technologies theme.· Guest Editor for special issues in "Networks in the Cardiovascular System".
2011–date	Member of Professional Bodies · · <ul style="list-style-type: none">· Higher Education Academy (Fellow), Institution of Engineering and Technology, IEEE Engineering in Medicine & Biology Society, Institute of Physics, Institution of Engineering and Technology, Biophysical Society.

INVITED TALKS

9 invited talks at international conferences and seminar series.

2024	· DYNAMIC DAYS EUROPE · Bremen, Germany "Using Neural Networks to Uncover Cardiac Dynamics"
2024	· FICKLE HEART: UQ, AI AND DIGITAL TWINS · Isaac Newton Institute for Mathematical Sciences, U Cambridge "Physics-Informed Neural Networks: Cardiovascular Research's Best Friend"
2023	· DIGITAL HEALTH MULTI-SCALE COLLABORATION WORKSHOP · Queen Mary, University of London "Marrying Maths and Data for Personalised Healthcare"
2023	· FIRST WORKSHOP ON MULTIMODAL AI (PANELLIST) · Sheffield University "The Future of Multimodal AI"
2023	· SIAM CONFERENCE ON APPLICATIONS OF DYNAMICAL SYSTEMS · Portland, OR, USA "Physics-Informed Neural Networks in Cardiology"
2022	· ICL DATA SCIENCE SEMINARS · Imperial College London "Physics-Informed Neural Networks in Medicine" (on YouTube)
2022	· BIOLOGICAL MATHEMATICS SEMINARS · TU Munich, Germany "How Computational Models of the Heart Improve Its Treatment"
2019	· BIOMEDICAL ENGINEERING SEMINAR SERIES · U Lisbon, Portugal "Computational Tools to Characterise and Treat Heart Disease"
2018	· DEVELOPMENTS IN HEALTHCARE IMAGING · Isaac Newton Institute for Mathematical Sciences, U Cambridge "Imaging to Enhance the Treatments and Understanding of Atrial Arrhythmias" (video recording)

SELECTED SCIENTIFIC OUTREACH

Regular speaker at schools, science festivals and Public & Patient Involvement events.

Created Android app and other outreach materials using Public Engagement funding from the Institute of Physics.

2024	Organiser · AIUK FRINGE EVENT · London, UK "Latest Developments in Physics-Informed Machine Learning"
2022	Speaker · BRITISH SCIENCE FESTIVAL · Leicester, UK · "Be Still, my (Virtually) Beating Heart"
2021	Fellow · ROYAL SOCIETY PAIRING SCHEME · London, UK · Shadowed Lord Patel, Head of the Lords' Science & Technology Committee (blog post)
2020	Organiser & Speaker · PUBLIC & PATIENT INVOLVEMENT EVENT · St Thomas' Hospital, London · "How Artificial Intelligence Will Change Medicine"
2018–2022	Mentor of 4 A-Level Students · LONDON, UK · in2Science UK & Social Mobility Foundation · Was shadowed by students, and provided advice on scientific careers.
2018	Organiser & Demonstrator · PATIENT INVOLVEMENT EVENT · St Thomas' Hospital, London · "Physics of Heart Beats" (blog post) · Designed interactive Android app for simulation of virtual cardiac ablations
2018–date	Speaker in Schools · · London, UK · 13 visits to primary and secondary schools to present my research. · Visits conducted independently or with Native Scientists or STEM Ambassadors
2018	Participant in "University Challenge" TV Show · BBC Two · Team Member for King's College London
2017	Competition Runner-Up · I'M A SCIENTIST, GET ME OUT OF HERE · · Answered scientific questions from secondary school students online.
2015	Article in Popular Science Magazine · PHYSICS WORLD · April Issue · "Bringing the Quantum to Life"

SELECTED CONFERENCE PRESENTATIONS & AWARDS

Presented research at 23 international conferences: 13 as an oral presentation, 10 as a poster presentation.

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| 2023 | Research Prize · FUNCTIONAL IMAGING & MODELLING OF THE HEART · Lyon, France
"Prototype of a Physics-Based Simulator for Cardiac MRI" |
| 2020 | Research Prize (Silver) · EMIDEC · MICCAI Conference
Imaging-Based Disease Classification Challenge |
| 2007 | Research Prize · BRIT CHAP INT SOC MAGNETIC RESONANCE MEDICINE · Birmingham
"Rapid In Vivo Measurements of Blood T_1 " |
| 2000 | National Team Member (Portugal) · 31 st INTERNATIONAL PHYSICS OLYMPIAD · Leicester, UK |

PEER-REVIEWED PUBLICATIONS

44 publications: 14 as first author, 8 as senior author (Google Scholar page).

≥ 1150 citations, h-index: 17, i10-index: 24.

44. Colman M, **Varela M** ... Aslanidi OV · Interactions between calcium-induced arrhythmia triggers and the electrophysiological-anatomical substrate underlying induction of atrial fibrillation · J Physiology 2024 · eprints.whiterose.ac.uk/208121
43. Galazis C ... **Varela M** · High-Resolution Maps of Left Atrial Displacements and Strains Estimated with 3D CINE MRI and Unsupervised Neural Networks · *under review*: IEEE Trans Med Imag · arxiv.org/abs/2312.09387
42. Vimaslevaran K ... **Varela M** ... Cole GD · Aortic stenosis assessment from 3-chamber CINE: ratio of blood signal between aorta and left ventricle predicts severity · J Cardiovasc Reson Med 2024 · doi.org/10.1016/j.jocmr.2023.100005
41. On YH ... **Varela M** · Automatic Aortic Valve Pathology Detection from 3-Chamber Cine MRI with Spatio-Temporal Attention Maps · Lect Notes Comp Sci 2023 · doi.org/10.1007/978-3-031-35302-4_66
40. **Varela M**, Bharath AA · Prototype of a Cardiac MRI Simulator for the Training of Supervised Neural Networks · Lect Notes Comp Sci 2023 · doi.org/10.1007/978-3-031-35302-4_38
39. On YH ... **Varela M** · Automatic Detection of Aortic Valve Pathology using 3-Chamber Cine MRI · Eur Heart J Cardiovasc Imag 2023 (Supp 1) · doi.org/10.1093/ehjci/jead119.330
38. Shi X ... **Varela M** ... Ng FS · Information theory-based direct causality measure to assess cardiac fibrillation dynamics · J Royal Soc Interface 2023 · doi.org/10.1098/rsif.2023.0443
37. Martin Isla C ... **Varela M** ... Lekadir K · Deep Learning Segmentation of the Right Ventricle in Cardiac MRI: The M&Ms Challenge-IEEE J Biomed & Health Informatics 2023 · doi.org/10.1109/JBHI.2023.3267857
36. Zaman S ... **Varela M** ... Cole GD · Multiple-image-ranking method to generate high volume training data applied to ventricular slice level classification in cardiac MRI · J Med Artif Intell 2023, 6:4 · doi.org/10.21037/jmai-22-55
35. Li Z ... **Varela M** · PAT-CNN: Automatic Segmentation and Quantification of Pericardial Adipose Tissue from T2-Weighted Cardiac Magnetic Resonance Images · Lect Notes Comp Sci 2023 · dx.doi.org/10.21037/jmai-22-55
34. Herrero Martin C ... **Varela M** · EP-PINNs: Cardiac Electrophysiology Characterisation using Physics-Informed Neural Networks · Front Cardiovasc Med 2022 · doi.org/10.3389/fcvm.2021.768419
33. Galazis C ... **Varela M** · Tempera: Spatial Transformer Feature Pyramid Network for Cardiac MRI Segmentation · Lect Notes Comp Sci 2022, doi.org/10.1007/978-3-030-93722-5_29
32. Uslu F, **Varela M**, Bharath AA · LA-Net: A Multi-task Deep Network For the Segmentation of the Left Atrium · IEEE T Med Imaging 2021 · doi.org/10.1109/TMI.2021.3117495
31. Lalande A ... **Varela M** ... Meriaudeau F · Deep Learning Methods for Automatic Evaluation of Delayed Enhancement-MRI: The results of the EMIDEC Challenge · Med Imag Analys 2022 · doi.org/10.1016/j.media.2022.102428
30. Galazis C ... **Varela M** · Framework for Large-Scale Automatic Curation of Heterogeneous Cardiac MRI (ACUR MRI) · Eur Heart J - Cardiovasc Imag 2021 (Supp 1) · doi.org/10.1093/ehjci/jeab090.131
29. Uslu F, **Varela M** · SA-Net: AA Sequence Aware Network for the Segmentation of the Left Atrium in Cine MRI Datasets · IEEE ISBI 2021 · doi.org/10.1109/ISBI48211.2021.9434147
28. Anjari M ... **Varela M** ... Connor S · Apparent Diffusion Coefficient Agreement and Reliability for the Evaluation of Head and Neck Cancer Post Chemo-Radiotherapy · Dentomaxillofacial Radiology 2021, doi.org/10.1259/dmfr.20200579
27. Lourenco A ... **Varela M** · Left Atrial Ejection Fraction Estimation using SEGANet for Fully Automated Segmentation of CINE MRI · Lect Notes Comp Sci 2021 · doi.org/10.1007/978-3-030-68107-4_14
26. Lourenco A ... **Varela M** & Correia TM · Automatic Myocardial Disease Prediction from Delayed-Enhancement Cardiac MRI and Clinical Information · Lect Notes Comp Sci 2021 · doi.org/10.1007/978-3-030-68107-4_34
25. **Varela M** ... Lee J · High-Resolution CINE MRI Allows Estimation of 3D Regional Atrial Strains · Eur Heart J 2020 (Supp 2) · doi.org/10.1093/ehjci/ehaa946.0244
24. Lourenco A ... **Varela M** · Automatic Estimation of Left Atrial Function from Short-Axis CINE MRI Using Machine Learning · Eur Heart J 2020 (Supp 2) · doi.org/10.1093/ehjci/ehaa946.0229
23. **Varela M**, Roy A, Lee J · A Survey of Pathways for Mechano-Electric Coupling in the Atria · Prog Biophys Molec Bio 2021 · doi.org/10.1016/j.pbiomolbio.2020.09.011

22. Roy A, **Varela M** ... Aslanidi OV. Identifying Locations of Re-Entrant Drivers from Patient-Specific Distribution of Fibrosis in the Left Atrium. PLoS Comp Bio 2020. doi.org/10.1371/journal.pcbi.1008086
21. **Varela M** ... Lee J. Strain Maps of the Left Atrium Imaged with a Novel High-Resolution CINE MRI Protocol. IEEE EMBC 2020. doi.org/10.1109/EMBC44109.2020.9175383
20. Uslu F, **Varela M**, Bharath AA. A Semi-Automatic Method to Segment the Left Atrium in MR Volumes with Varying Slice Numbers. IEEE EMBC 2020. doi.org/10.1109/EMBC44109.2020.9175749
19. Roy A, **Varela M**, Aslanidi OV. Image-Based Computational Evaluation of the Effects of Atrial Wall Thickness and Fibrosis on Re-entrant Drivers for Atrial Fibrillation. Front Physiol. doi.org/10.3389/fphys.2018.01352
18. Muffoletto M ... **Varela M** ... Aslanidi OV. Development of a Deep Learning Method to Predict Optimal Ablation Patterns for Atrial Fibrillation. IEEE Conf Comp Bio 2019, 1-4. doi.org/10.1109/CIBCB.2019.8791475
17. Karim R ... **Varela M** ... Rhode K. Algorithms for left atrial wall segmentation and thickness-Evaluation on an open-source CT and MRI image database. Medical Image Analysis 2018. doi.org/10.1016/j.media.2018.08.004
16. **Varela M** ... Aslanidi OV. Novel MRI Technique Enables Non-Invasive Measurement of Atrial Wall Thickness. IEEE T Med Imaging 2017. doi.org/10.1109/TMI.2017.2671839
15. **Varela M** ... Lamata P. Novel computational analysis of the left atrium improves prediction of atrial fibrillation recurrence. Frontiers Physiol 2017. doi.org/10.3389/fphys.2017.00068
14. **Varela M** ... Aslanidi OV. Atrial heterogeneity during atrial fibrillation and anti-arrhythmic drug action: insights from canine atrial models. PLoS Comp Bio 2016. doi.org/10.3389/fphys.2017.00068
13. Soor N ... **Varela M**, Aslanidi OV. Towards patient-specific modelling of lesion formation during radiofrequency catheter ablation for atrial fibrillation. IEEE EMBS 2016. doi.org/10.1109/EMBC.2016.7590746
12. Whitaker J ... **Varela M** ... O'Neill MD. The role of myocardial wall thickness in atrial arrhythmogenesis. Europace 2016. doi.org/10.1093/europace/euw014
11. **Varela M** ... Aslanidi OV. 3D high-resolution atrial wall thickness maps using black-blood PSIR. J Cardiovasc MR 2015. doi.org/10.1186/1532-429X-17-S1-P239
10. **Varela M** ... Hajnal JV. Cerebral Blood Flow Measurements in Infants using Look-Locker Arterial Spin Labelling. J Magn Res Imag 2015. doi.org/10.1002/jmri.24716
9. **Varela M**, Aslanidi OV. Role of Atrial Tissue Substrate and Electrical Activation Pattern in Fractionation of Atrial Electrograms: a Computational Study. IEEE EMBC 2014. doi.org/10.1109/EMBC.2014.6943907
8. Colman MA, **Varela M** ... Aslanidi OV. Evolution and Pharmacological Modulation of the Arrhythmogenic Wave Dynamics in a Canine Pulmonary Vein Model. Europace 2014. doi.org/10.1093/europace/eut349
7. Cooper RJ, **Varela M** ... Hebden JC. MONSTIR II: A 32-Channel, Multispectral, Timr-Resolved Optical Tomography System for Neonatal Brain Imaging. Rev Sci Instrum 2014. doi.org/10.1063/1.4875593
6. Aslanidi OV ... **Varela M** ... Zhang H. Heterogeneous and Anisotropic Integrative Model of Pulmonary Veins: Computational Study of Arrhythmogenic Substrate for Atrial Fibrillation. Interface Focus 2013. doi.org/10.1098/rsfs.2012.0069
5. **Varela M**, Zhao J, Aslanidi OV. Determination of Atrial Myofibre Orientation using Structure Tensor Analysis for Biophysical Modelling. Lect Notes Comp Sci 2013. doi.org/10.1007/978-3-642-38899-6_50
4. Arichi T ... **Varela M** ... Edwards AD. Development of BOLD signal hemodynamic responses in the human brain. Neuroimage 2012. doi.org/10.1016/j.neuroimage.2012.06.054
3. **Varela M** ... Hajnal JV. Mean Cerebral Blood Flow using Phase Contrast MRI in the First Year of Life. NMR Biomed 2012. doi.org/10.1002/nbm.2771
2. Hebden JC, **Varela M** ... Austin T. Diffuse Optical Imaging of the Newborn Infant Brain. IEEE ISBI 2012. doi.org/10.1109/ISBI.2012.6235595
1. **Varela M** ... Larkman DJ. Method for Rapid in Vivo Measurement of Blood T_1 . NMR Biomed 2011. doi.org/10.1002/nbm.1559