Ryman HASHEM | PhD

in linkedin.com/in/rymem   &The Podium Institute
Old Road Campus, Oxford, UK

💼 PROFESSIONAL EXPERIENCE

Present
Jul'24 | **Senior Research Fellow | University of Oxford | The Podium Institute | Prof Constantin Coussios**
- Engineering wearable robotic with AI for Airbag PPE to prevent fall injury.
- Leading collaboration teams for three projects across fields and institutions.
- Developing anatomically correct rectum for testing a novel sesnorised catheter.
- Submitting grand proposals such as MRC call for investigating digestive disease. 🔗 MRC Grant

Jun'24
Jan'23 | **Senior Research Fellow | University College London | WEISS | Prof Daniel Stoyanov**
- Engineered medical robots, significantly advancing the digestive phantoms for surgical training.
- Proposal applications for project findings and future fellowships (Royal Academy of Engineering).
- Energised public understanding of medical robotics through community outreach. 🔗 SURGE III
- Collaborated with clinicians to understand bowel behaviour and specification for phantom projects.

Nov'22
May'21 | **Postdoctoral Fellowship | Cambridge University | BIRL | Prof Fumiya Iida**
- Drove pioneering robotics systems for several academic and industrial partners (e.g. biopsy handling).
- Developed academic and industry experience through collaboration, proposal and journal writing.
- Led the organisation and participated in leading conferences 🔗 internally 🔗 internationally.

Jul'19
Mar'17 | **Graduate Assistant | The University of Auckland | Prof Peter Xu**
- Designed and implemented advanced mechatronic devices, including SLAM robots.
- Enhanced hands-on learning experiences and academic excellence in engineering education.
- Managed and organised workshops and hosted conferences like IEEE AMC 2016.
- Developed public engagement materials for open days and school visits (introductions to robotics).

💼 TEACHING EXPERIENCE

Present
Sep'24 | **University of Oxford | Institute of Biomedical Engineering**
- Leading PhD projects focused on Muscular & Skeletal injury and prevention methods. 🔗 Podium
- Mentoring PhD Project for developing stretchable sensor with novel printing methods.
- Supervising 4th year project for developing adaptable shoe insole, haptic suite, and haptic intubation.
- Supervising 3rd Year "group" project for developing wearable technology and AI for sports safety.

Jun'24
Ma'23 | **University College London | Medical Physics and Biomedical Engineering**
- Established Master's Project 🔗 (Developing Soft Robotics for Resembling the Digestive System).
- Supervised 3rd Year Project 🔗 (Creating a CAD Model of the Large Intestine).
- Supervised 3rd Year Project (FEA Simulation for Soft Robotics Colon Phantom Motility).

Present
May'22 | **The CAMBRIDGE CENTRE for International Research | Robotics**
- Created and delivered weekly online robotics course featuring diverse projects (e.g. Parkinson's study).
- Created an online Soft Robotics course featuring diverse research projects for high school students.
- Delivered Weekly lectures on robotics topics and tools such as MATLAB Simulink.
- Evaluated final outcomes of a research paper that published to journals or conferences (high school).

Nov'22
May'21 | **University of Cambridge | Department of Engineering**
- Lectured 4th Year module, Advanced Robotics (Introduction to Biologically Inspired Soft Robotics).
- Supervised 4th Year Project 🔗 (A Lightweight Soft Robotic Thumb Using SCP Artificial Muscles).
- Marked students progress, reports and final presentations.
- Organised workshops such as summer and winter schools with lab demonstrations and supervisions.

Jul'19 Mar'17	**The University of Auckland	Mechanical and Mechatronics Engineering** ❯ Lectured 4th Year (Honour) module Mechatronics Design (Introduction to Kalman Filter and SLAM). ❯ Supervised 4th Year project ⧉ (Development of omnidirectional robotic with SLAM algorithm). ❯ Analysied resolutions to multifaceted issues that affect students to reach their objectives. ❯ Led labs and TAs for the 3rd Year module Control System ⧉ (PID, Root Locus, Frequency, Stability).

🎓 EDUCATION

Oct'20 Sep'15	**Ph.D., Mechatronics Engineering	The University of Auckland	Prof Peter Xu** ❯ A Biologically Inspired Soft-Bodied Bellows-Driven Stomach Robot : Concept, Design and Validation. ❯ Innovated a biologically-inspired soft robot, closely simulating human gastric functions, which has been recognised through a series of high-impact publications (Soft Robotics, IEEE TMECH).
Apr'15 Mar'14	**ME., Mechatronics Engineering	The University of Auckland	Prof Peter Xu** ❯ Thesis : Design and Development of a Hybrid X-Y Peristaltic Table. ❯ Engineered a novel hybrid robotic system for versatile object transport, enhancing operational efficiency and demonstrating advanced applications of peristaltic movement technology (IEEE AMC'16).
Jul'14 Mar'13	**Diploma in proficiency for Media & Academic Studies	Auckland University of Technology** ❯ Skills for Critical Media, Academic proficiency, and Contemporary Language, New Zealand Reader.
Nov'12 Jul'08	**BSME, Science in Mechatronics Engineering	AMA International University** ❯ Final project : Constructed of filling and capping machine with a pneumatic system (FESTO & SMC). ❯ Internship completed via practical training at Aluminium milling company (GARMCO).

☰ EVIDENCE OF ESTEEM

2025	International collaboration with Prof. Gastone Ciuti (Sant'Anna, Pisa) on soft robotic rectum phantom development and catheter validation, involving current and incoming PhD students.
2025	National collaboration with Prof. Jonathan Rossiter (University of Bristol) on integrating Gut-On-Chip **grant**.
2025	Invited speaker at international workshops including **Hamlyn** symposium and **SoRo** for medicine.
2025	Demonstration of a VR/AR intubation setup during an open day to inspire public interest and **engagement**.
2024	Scientific Entrepreneurship course to translate research into real-world applications. ⧉ MPLS'24
2024	Attended Festival of Early Stage Researchers workshop at UCL for skills and networking. ⧉ FESR'24
2024	Attended neurodiversity seminar, acknowledging past challenges for inclusive workplace design.
2024	Collaborated with an artist to create artwork aimed at raising public awareness. ⧉ SURGE III
2023	Demonstrated medical robotics application in the science of surgery at WEISS centre. ⧉ WEISS
2022	Demonstrated advanced robotics technology at Robot Lab Live, ⧉ a key event of the UK Festival of Robotics.
2022	Introduced, encouraged, and inspired general audience in Cambridge to science and engineering.
2022	Attended courses related to teaching, supervision, and research proposal writing at Cambridge University.
2022	Accomplished 3 months business course for a startup and commercialisation. ⧉ Cambridge business
2022	Delivered guest lecture on Introduction to Bio-Inspired Robotics at ⧉ Cambridge ⧉ Essex.
2021	Organised a robotic workshop for ICRA 2021, online based. ⧉ RoPat21 ICRA workshop
2021	Led the organising and managing of a laboratory space (BIRL).
2018	Organised open days with the aim of fostering interest in science among high school students in NZ.
2016	Doctoral Skills from Robotics and Medicines to Commercialisation). ⧉ MedTech CMDT

🎓 HONORS AND AWARDS

2023	Received Global talent Endorsements from the Royal Academy of Engineering.
2023	Shortlisted for the 21ToWatch people for their commercialisation project in Cambridge. ⧉ 21toWatch
2022	Semi-finalists of the Chris Abell Postdoc Business Plan Competition, Cambridge Enterprise. ⧉ CE
2022	Received a grant from p2i Consortium to participate as a case study for a business model in Paris. ⧉ P2I
2022	Received support from EPSRC IAA to attend the Impulse program for tech innovators. ⧉ Impulse
2022	Received EPSRC Impact Acceleration Account. for the Early Career Researcher Impact Grants 2022.
2018	Selected for a public speech of HealthTech Award for Best Translational Research Project (MedTech CoRE).
2015	Received a full doctoral scholarship grant from The Medical Technologies Centre of Research Excellence.
2015	Received the award of first-class honor in recognition of the master's degree accomplishment.

🖥 Research Grants

Architectured Artificial Muscles for Nature-Inspired Musculoskeletal Robotics ⬀ EPSRC grant   Present

> Developing next-generation humanoid robots using hierarchical artificial muscles inspired by human biomechanics.
> Integrating insights from robotics, biomechanics, and biomaterials to achieve lifelike and sustainable actuation.
> Collaborated with two groups specialising in microbiology and bioengineering.
> Authored and submitted grant proposals **£480K MRC funding**.

Soft Robotic Gut-on-a-Chip for Modelling of Complex Enteric Infectious Diseases ⬀ MRC grant   Present

> Engineering a microscale soft robotic chip mimicking gut biomechanics and physiology.
> Integrating microbiota, epithelial, and vascular components for advanced disease modelling.
> Collaborated with five groups specialising in microbiology, infectious diseases, hydrogel integration, and bioengineering.
> Authored and submitted grant proposals, passed internal challenge **£3.5M MRC funding**.

Accelerate the diagnosis of cancer by automating the biopsy process ⬀ Automation   '22 - Present

> Acquired a **£25k EPSRC IAA-funded project** to automate the embedding of patient tissue into wax blocks.
> Collaborated with NHS pathologists, advancing the project to TRL3 and setting the stage for commercialisation.
> Authored and submitted grant proposals for additional **£100k EPSRC funding**.

P2i : In Action events to learn about innovation and entrepreneurship ⬀ P2i   ⬀ Workshop   '22

> Secured a grant from the p2i Consortium to participate as a business model case study in Paris.
> Engaged with startup founders at the workshop, sharing insights and strategies for effective commercialisation.

🖥 Robotic Projects

Development of a rectum phantom ⬀ Medical robotics at HBL   '25 - Present

> Led collaboration to develop a rectum robot that present bowel movement of emptying feces with soft robotics methods.
> The robot will be used to test a novel sensorised catheter for mapping rectal behaviour in patients with muscle deficiency.
> Collaborated with surgeons for clinical relevance of the robot and identify key challenges.
> The phantom will be merged later with large intestine robot for a comprehensive model of the large bowel.

Development of a large intestine phantom ⬀ Medical robotics at WEISS   '23 - Present

> Led the development of an intestinal robot, pioneering peristaltic wave for surgical training and medical research.
> Utilised Finite Element Analysis (FEA) for robust design and functionality enhancement.
> Collaborated with Gastroenterology experts to ensure clinical relevance and applicability of the robotic system.
> Currently collaborating with **Odin** to develop a phantom with polyps for validating their machine learning model.

Physical simulation of patients for medical training (EPSRC EP/T00519X/1) ⬀ Robotic patient   '21 - '22

> Pioneered the development of a soft robot that mimics human organ responses to palpation for initial diagnostics.
> Integrated advanced sensors and responsive materials to realistically simulate the tactile feel of human organs.
> Advanced the soft robotics technology, enhancing tools for medical training and medical devices examinations.
> Collaborated with medical experts to ensure the device's effectiveness and applicability in clinical training scenarios.

Embodied intelligence behaviour in sot robotics actuators ⬀ Robotics intelligence   '21 - '24

> Conducted extensive research in embodied intelligence like underactuated systems, adaptivity, and self-organisation.
> Investigated the physics of underactuated soft fingers to enable bidirectional bending.
> Developed advanced soft robotics technologies, contributing to the field's understanding and applications.
> Documented and published research outcomes in leading scientific journals, promoting knowledge in soft robotics.

Biomimicking the digestive systems motility ⬀ Bio-Robotics   '16 - '20

> Conceptualised and developed robotic systems and sensors for simulating the oesophagus and stomach organs.
> Led the supervision of a PhD student working on control methods for the stomach robot.
> Expanded the research focus beyond the digestive system towards robotic manipulation.
> Extended the methods for application in other phantom developments, such as the rectum phantom.

📖 PUBLICATIONS : JOURNALS

2025	Hashem, R., Stilli, A. & Stoyanov, D. Development of A Soft Robot Biomimcking Large Intestine Motility. R-AL. In progress (Aug 25).
2025	Hashem, R., Awad, A., Stilli, A., Xu, W. & Stoyanov, D. Assessing a New Drug-Delivery Capsule Using a Robot that Mimics the Human Stomach. Soft Robotics. In progress (Sep 25).
2025	Liang, Z., Hashem, R., Lu, L., Abdelaziz, M., Bandula, S., Groenhuis, V., Stoyanov, D. & Stilli, A. A Low-Cost High-Performance MR Safe Pneumatic Stepper Motor. IEEE TMECH. Submitted.
2024	Liang, Z., Lindenroth. L., Hashem, R., Bandula. S., Stoyanov, D., & Stilli, A. Magnetic Resonance Imaging-Guided Needle Insertion Robots : A Review of Systems for Liver and Kidney Interventions. **IEEE RAM.**
2023	Kazemi, S., Hashem, R., Stommel, M., Cheng, L. & Xu, W. Biomimetic Closed-loop Control of a Novel Soft Gastric Simulator Toward Emulating Antral Contraction Waves. **Soft Robotics.**
2022	Thilina, D. Lalitharatne, Costi, L., Hashem, R., Fumiya Iida et al. Face Mediated Human-Robot Interaction for Remote Medical Examination. **Scientific Reports.**
2022	Hashem, R., Kazemi, S., Stommel, M., Cheng, L. & Xu, W. SoRSS : A Soft Robot for Bio-mimicking Stomach Anatomy and Motility. **Soft Robotics.**
2022	Kazemi, S., Hashem, R., Stommel, M., Cheng, L. & Xu, W. Experimental Study on the Closed-Loop Control of a Soft Ring-Shaped Actuator for In-vitro Gastric Simulator. **IEEE TMECH.**
2021	Hashem, R., Kazimi, S., Stommel, M., Cheng, L. K. & Xu, W. A Biologically Inspired Ring-Shaped Soft Pneumatic Actuator for Large Deformations. **Soft Robotics.**
2021	Costi, L., Scimeca, L., Maiolino, P., Lalitharatne, T. D., Nanayakkara, T., Hashem, R., & Iida, F. Comparative analysis of model-based predictive shared control for delayed operation in object reaching and recognition tasks with tactile sensing. **Frontiers in Robotics and AI.**
2021	Bhattacharya, D., Hashem, R., Cheng, L., & Xu, W. Nonlinear Model Predictive Control of a Robotic Soft Esophagus. **IEEE TIE.**
2020	Hashem, R., Stommel, M., Cheng, L. K. & Xu, W. Design and Characterization of a Bellows-Driven Soft Pneumatic Actuator. `IEEE TMECH.`
2020	Dang, Y., Liu, Y., Hashem, R., Bhattacharya, D., Allen, J., Stommel, M., Cheng, L.K. & Xu, W. SoGut : A Soft Robotic Gastric Simulator. **Soft Robotics.**

📖 PUBLICATIONS : CONFERENCES

2025	Li, J., Hashem, R., & He,L. Enhancing Pediatric Intubation Training with Mixed Reality : A Sensorized and Eye-Tracking Approach. Advanced Robotics (Nov)
2025	Liang, Z., Hashem, R., Stilli, A.& Stoyanov, D. Advancing DANIR : A 5-DoF MR-Safe Double-Arch Needle Insertion Robot for Abdominal Percutaneous Interventions. EMBC. Accepted.
2025	Wing, O., Hashem, R., & He, L. A Modular Dual-Mode Haptic Actuator for Low and High Frequency Feedback. **RoboSoft.**
2024	Liang, Z., Lu, C., Yang, H., Hashem, R., Abdelaziz, M., Lindenroth, L., Bandula, S., Stoyanov, D., & Stilli, A. A Novel MR Safe Double-Arch Needle Insertion Robot with Scissor-Folding Mechanism for Abdominal Interventions. **IROS.**
2024	Hashem, R., Howison, T.,Stilli, A., Stoyanov, D., Xu, W. & Iida, F. Harnessing Symmetry Breaking in Soft Robotics : A Novel Approach for Underactuated Fingers. **IROS.**
2023	Sirithunge, C., Hashem, R., & Iida, F. Estimation of Soft Body Deformation by Using Light. **TAROS.**
2023	Gilday, K., Hashem, R., Abdulali, A., & Iida, Fumiya. The Xeno-Tongue Gripper : Granular Jamming Suction Cup with Bellow-Driven Self-Morphing. **RoboSoft.**
2023	Tano, N., Hashem, R., Hardman, D.,& Iida, F. Variable Response Characteristics of a Soft Sensorized Hydrogel Using Mesoscale Cellular Structures. **RoboSoft.**
2023	Hardman, D., Hashem, R., & Iida, F. Composite Stretchable Sensors for the Detection of Asymmetric Deformations in a Soft Manipulator. **RoboSoft.**
2022	Hashem, R. & Iida, F. Embedded Soft Sensing in a Soft Ring Actuator for Aiding with the Self-Organisation of the In-Hand Rotational Manipulation. **RoboSoft.**
2022	Hashem, R. & Iida, F. Embedded Soft Sensing in a Soft Ring Actuator for Aiding with the Self-Organisation of the In-Hand Rotational Manipulation. **RoboSoft.**
2017	Hashem, R., Xu, W., Stommel, M., & Cheng, L. K. FEA evaluation of ring-shaped soft actuator for stomach robot. **RiTA.**
2016	Hashem, R., Xu, W., Stommel, M., & Cheng, L. Conceptualisation and specification of a biologically-inspired, soft-bodied gastric robot. **IEEE M2VIP.**

📖 Publications : Conferences

2016   Hashem, R., Smith, B., Browne, D., Xu, W., & Stommel, M. Control of a soft-bodied xy peristaltic table for delicate sorting. **IEEE AMC.**

2016   Dirven, S., Stommel, M., Hashem, R., & Xu, W. Medically-inspired approaches for the analysis of soft-robotic motion control. **IEEE AMC.**

📖 Publications : Chapters

2025   Dang, C., Hashem, R. & Xu, W. Soft Robotics Techniques for Industrial Applications : Food Industry. Soft Robotics Letter. In Progress (expected submission, Dec).

2025   Hashem, R., Stilli, A., Stoyanov, D. & Iida, F. Embodied Cognition : Tracing the Pathways of the Gut-Brain Axis. Embodied Intelligence. In Progress (expected submission, Oct 25).

2022   Hashem, R., & Iida, F. Bio-Inspired Robots Imitating Human Organs with Embodied Intelligence Behaviour. **Embodied Intelligence.**

📖 Selected Papers

1. Harnessing Symmetry Breaking in Soft Robotics : ⤴ This   paper introduces a pioneering method for in-hand manipulation using symmetry breaking in soft underactuated fingers. The work demonstrates how morphological intelligence and self-organization can replace complex control strategies, allowing bidirectional object rotation using a single input. This study simplifies actuation in dexterous soft manipulators and bridges morphology-based design with intelligent control—paving the way for more efficient, adaptive, and bio-inspired robotic hands.

2. Face Mediated Human-Robot Interaction for Remote Medical Examination : ⤴ This   paper exemplifies the interdisciplinary and collaborative nature of robotics research. It combines elements of computer vision, machine learning, and robotics to improve remote medical examinations, and involves collaboration among researchers from different backgrounds and expertise.

3. SORSS : A Soft Robotic Stomach Simulator for Medical Training : ⤴ This   paper presents a soft robotic stomach simulator for medical testing and training, demonstrating the potential of soft robotics in creating realistic and effective training tools.

4. Design and characterization of a bellows-driven soft pneumatic actuator : ⤴ This   paper introduces a new type of soft pneumatic actuator, contributing to the development of more versatile and adaptable robotic systems.

5. SoGut : A soft robotic gastric simulator : ⤴ This   paper presents a novel soft robotic gastric simulator, advancing the field of medical robotics and potentially revolutionizing medical training and treatment. These publications were chosen based on their novelty, methodological rigor, and potential impact on the field of robotics. They demonstrate a high-quality research.

▤ Skills

Academic research	Explored novel robotic solutions, published several high-impact journals and conferences, acquired grant funding from EPSRC, organised many events, and managed labs.
Robots development	Project development, embedded systems design, vision systems and sensors, PCB layout (Eagle), data collection and analysis, hardware evaluation, control systems, 3D printing and laser cutting, electro-pneumatic systems (SMC and FESTO), health and safety documentations.
Software handling	Microsoft office, C++/C, Java, Python, Processing, MatLab (Simulink & Multibody), Arduino, Atmel studio, Visual Basic, AutoCAD (Creo & SolidWork), LabVIEW (MyRIO), PLC (FESTO), Finite Element Analysis (Abacus), Adobe illustrator, LaTeX, Inkscape, basic ROS2, Universal robots.
Communication	Co-operative team member and excellent communication skills gained from attending skill improvements classes, and from experience through teaching and collaborations.

❝ References

Prof Fumiya Iida
Professor in Robotics
Information Engineering,
University of Cambridge,
Trumpington St, Cambridge.
@   fi224@eng.cam.ac.uk

Prof Daniel Stoyanov
Professor in Robot Vision
Computer Science,
University of College London,
Charles Bell House, London.
@   danail.stoyanov@ucl.ac.uk

Prof Constantin Coussios
Director
Engineering Science, IBME,
University of Oxford,
Old Road Campus, Oxford.
@   constantin.coussios@eng.ox.ac.uk

Prof Agostino Stilli
Associate Professor
MEDICAL PHYSICS,
UNIVERSITY OF COLLEGE LONDON,
CHARLES BELL HOUSE, LONDON.
@ a.stilli@ucl.ac.uk

Prof Liang He
Associate Professor
ENGINEERING SCIENCE, IBME,
UNIVERSITY OF OXFORD,
OLD ROAD CAMPUS, OXFORD.
@ Liang.he@eng.ox.ac.uk

Prof Thomas Thuruthel
Assistant Professor
COMPUTER SCIENCE,
UNIVERSITY COLLEGE LONDON, EAST,
GOWER STREET, LONDON.
@ t.thuruthel@ucl.ac.uk