

Marco Vinicio Alban-Paccha, PhD

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Academic Experience

- 2022 – present **Postdoctoral Research Associate**
Department of Medicine, University of Cambridge, Cambridge, UK
Pain Group. Supervisor: Geoff Woods
- Application of wearable electronics and mobile apps to understand visceral pain at the ADVANTAGE pain consortium, part of the UK's Advanced Pain Discovery Platform. Tasks include:
- Configuring and administering specialized tools (software and hardware) required for quantitative physiological measurements in healthy volunteers and hospital patients.
 - Developing systems to detect, acquire, store, and analyse patient health data, to dynamically classify their response and correlate it with their pain levels.
 - Developing ML-powered solutions (on-device and cloud-based) to better classify pain and create patient profiles to improve pain prevention and treatment.
 - Interacting with NHS patients to maximize the compliance of wearable sensor usage.
- Department of Engineering, University of Cambridge, Cambridge, UK**
Bioelectronics Laboratory. Supervisor: George Malliaras
- Development of an Organic Electrochemical Transistor-based platform for multi-analyte sweat sensing. Tasks include:
- Designing and characterising OECT-based electrochemical sensors adequate to measure ions, hormones, and neurotransmitters.
 - Integrating the electrochemical sensors with corresponding signal analysis electronics as well as communication and power modules and optimizing for low-cost.
- 2023 – present **Postdoctoral By-Fellow**
Churchill College, Cambridge, UK
Mentor for postgraduate students in the College, providing academic guidance, career advice, and personal support to college students.
- 2022 – present **Associate Lecturer**
The Open University, Milton Keynes, UK
Faculty of Science, Technology, Engineering and Mathematics
- Associate Lecturers support students in the following ways:
- Delivering tuition and feedback to help with learning and assessment preparation.
 - Identifying student needs whether for additional support or advice and guidance.
 - Developing student study skills, including transferable skills related to employability.
 - Monitoring student progress, encouraging engagement in tutorial activities and field work where appropriate.
- 2023 – present **Faculty Mentor**
Cambridge Centre for International Research, Cambridge, UK
Cambridge Future Scholar Programme
- The Future Scholar Programme is an online research-focused programme for students. Tasks include:
- Providing lectures and supervision to students.
 - Guiding students through the process of original research in their chosen discipline.
 - Offering feedback on student work and progress, helping them to refine their research skills and understanding of the subject matter.

Education

- 2018 – 2022 **Doctor of Philosophy Degree in Electrical Engineering**
Korea Advanced Institute of Science and Technology – KAIST, Daejeon, Korea
Integrated Organic Electronics Laboratory – IOEL. Supervisor: Seunghyup Yoo
- Research funds and living expenses secured through the Attachable Photo Therapeutics Centre for e-Healthcare, Ministry of Science and ICT of Korea. Involved in two research topics:
- Wearable Cardiac Sensor Patch for Biopotential Measurement. Tasks included:

- Developed biocompatible micro-structured dry electrodes for bioelectric potentials.
- Designed the circuitry necessary for close-to-heart ECG and PPG measurements.
- Implemented a mobile application to display ECG, PPG and derived calculated measurements in real-time from a close-to-heart sensor.

See-through Phototherapy Platform for Circadian Rhythm Sleep Disorders. Tasks included:

- Developed a transparent light waveguide based on holographic gratings ready to mount on regular glasses.
- Analysed and optimized a plane-to-point waveguide to increase the luminance of an OLED light source.

- 2016 – 2018 **Master in Engineering Degree in Micro/Nano Systems**
Korea University, Seoul, Korea
 Display and Nanosystems Laboratory – DIANA. Supervisor: Byeong-Kwon Ju
 Research funds secured via the collaboration with Samsung Display. Living expenses funded by the Korean Government through the Global Korea Scholarship.
 Thesis in Electron Injection in Alkali Metals for Organic Light Emitting Diodes, where different alkali metal compounds were characterized as efficient electron injection materials in OLED devices.
- 2006 – 2013 **Engineer (Bachelor) Degree in Mechatronics**
Armed Forces University – ESPE, Sangolquí, Ecuador
 Final Year at the Computer Integrated Manufacture Laboratory – CIM. Supervisor: Alejandro Chacón
 Developed a small-scale SCADA system and documentation for the manufacturing stations in the laboratory. Final Project involved the use of internet2 to remotely operate the laboratory manufacturing stations in collaboration with the Monterrey Institute of Technology and Higher Studies (Monterrey, Mexico).
- 2014 – 2016 **Korean Language Student**
Pai Chai University, Daejeon, Korea
- 2010 **Visiting Exchange Student**
Monterrey Institute of Technology and Higher Studies – ITESM, Monterrey, Mexico
- 2000 – 2006 **Sebastián de Benalcázar High School, Quito, Ecuador**
 IB Diploma Candidate. Certifications in Physics HL, Mathematics SL and Chemistry SL.

Teaching

- 2022 – present **Lecturer, Nanoscale Engineering, The Open University**
 Delivering the ‘Part 3: Health’ lectures for the Nanoscale Engineering Course (18 students for 2022–2023, 20 students for 2023–2024). Providing support and marking of regular evaluations for the course.
- 2023 – present **Lecturer, The Engineering Project, The Open University**
 Providing support and marking of regular evaluations for the project (4 students in 2023 and 6 students in 2024 working on Nanoscale Engineering Projects) in preparation for Graduation.
- 2023 – present **Teaching Assistant, Part IA Computing, University of Cambridge**
 Supporting all first year Engineering Tripos students at the University (300+ students for Michaelmas 2023), as well as marking of the Computing course deliverables.
- 2023 – present **Tutor, Nanotechnology and Nanomaterials, Cambridge Centre for International Research**
Tutor, Sensors in Wearable Technology, Cambridge Centre for International Research
 Designing a course to suit the needs and interests of advanced high school students, providing lectures and supervision, and teaching students the skills required for doing high-level independent research.
- 2022 – present **Supervisor, Part IA Computing, Homerton College, University of Cambridge**
 Supervising all first year Engineering students at Homerton College (22 students for 2022/2023, 18 students for 2023/2024). Supervision is the University of Cambridge name for small group tutorials.
- 2022 **Lecturer, Intelligent Systems, Universidad de las Américas – UDLA, Ecuador**
 Designed the course outline and lecture presentations for the Artificial Intelligence Online Diploma Program.
- 2012 – 2013 **Laboratory Assistant, Computer Integrated Manufacture, University of the Armed Forces – ESPE**
 Supported the CIM Lab students with the PLC programming and Human-Machine Interface design for the course’s Capstone Project.

2011

Laboratory Assistant, Mechatronics Instrumentation, University of the Armed Forces – ESPE

Developed laboratory experiments for undergraduate students about sensor characterisation and data acquisition with LabVIEW.

Publications

1. Sills, V.A., Rennie, K.L., Watson, C.J., Alderton, W., Li, N., Mascolo, C., Martinez-Hernandez, V., Antoniou, A., **Alban-Paccha, M.V.**, Scott, S., Langford, J., Shreves, A.H., Fitzgerald, R. and Flewitt, A. (2024). *Can Cancer be Detected Earlier by Employing Wearable Technologies? Meeting report from the Early Cancer Institute and Precision Health Initiative, University of Cambridge, UK, 20th October 2023*. Journal of Translational Medicine. In Preparation.
2. **Alban-Paccha, M.V.**, Moon, H. and Yoo, S. (2024). *Wearable Cardiac Sensor Patch for Wireless Biopotential Measurement*. IEEE Transactions on Biomedical Circuits and Systems. In Preparation.
3. Serrano, R. R-M., Aguzin, A., Mitoudi-Vagourdi, E., Tao, X., Naegele, T., Jin, A., Lopez-Larrea, N., Picchio, M.L., **Alban-Paccha, M.V.**, Minari, R.J., Mecerreyes, D., Dominguez-Alfaro, A. and Malliaras, G.G. (2024). *3D Printed PEDOT:PSS-based Conducting and Patternable Eutectogel Electrodes for Machine Learning on Textiles*. Biomaterials. Under Review.
4. **Alban, M.V.**, Lee, H., Moon, H. and Yoo, S. (2021). *Micromolding Fabrication of Biocompatible Dry Micro-Pyramid Array Electrodes for Wearable Biopotential Monitoring*. IOP Flexible and Printed Electronics, <https://doi.org/10.1088/2058-8585/ac3561>
5. Lee, H., Lee, W., Lee, H., Kim, S., **Alban, M.V.**, Song, J., Kim, T., Lee, S. and Yoo, S. (2021). *Organic-Inorganic Hybrid Approach to Pulse Oximetry Sensors with Reliability and Low Power Consumption*. ACS Photonics, <https://doi.org/10.1021/acsphotonics.1c01161>

Conferences

1. **Alban-Paccha, M.V.**, Teran-Perez, J., Shenker, N., Woods, C.G. and Malliaras, G.G. *Wearable Sensors and Mobile App Data for the Modelling and Classification of Visceral Pain*. Oral presentation at the 9th International Winterschool on Bioelectronics BioEl 2024, Kirchberg in Tirol, Austria, 2024.
2. **Alban, M.V.**, Lee, H., Moon, H. and Yoo, S. *Biocompatible Microneedle Array Dry Electrodes for Bioelectric Potentials Measurement in Organic-Electronic Wearable Health Monitoring Applications*. Best Poster Award Nominee at MRS Fall 2019, Boston, USA, 2019.
3. **Alban, M.V.**, Lee, H., Moon, H. and Yoo, S. *Flexible and Fully Biocompatible Microneedle Array Dry Electrodes for Bio Potentials Measurement in Organic Electronic Wearable Healthcare Applications*. Poster presentation delivered at Electronic Materials and Nano Technology for Green Environment ENGE 2018, Jeju, Korea, 2018
4. **Alban, M.V.**, Choi, J., Jung, S.G., Shim, Y.S., Park, Y.W., and Ju, B.K. *Comparative study of different alkali metal compounds as efficient electron injection materials in OLED devices*. Best Poster Award at the Workshop on Photophysics and Nanomaterials WONPHYS 2017, Varadero, Cuba, 2017.

Invited Talks and Presentations

- October 2023 **Early Cancer Institute, Cambridge, UK**
Presented the talk “Wearable Sensors and Mobile App Data for the Modelling and Classification of Visceral Pain Flares” to an audience of 50, at the “Can Cancer be Detected Earlier by Employing Wearable Technologies?” Workshop.
- July 2023 **Addenbrooke’s Hospital, Cambridge, UK**
Presented the ADVANTAGE consortium research work on wearables and mobile apps for visceral pain to an audience of 50, including NHS clinicians. Talk generated contacts and offers of collaboration with various clinical specialists.
- June 2023 **KAIST, Daejeon, Korea**
Presented the ADVANTAGE consortium research work on wearables and mobile apps for visceral pain and plans for collaboration with the Department of Electrical Engineering of KAIST.
- June 2023 **POSTECH, Pohang, Korea**
Presented the ADVANTAGE consortium research work on wearables and mobile apps for visceral pain and plans for collaboration with the Department of Materials Science & Engineering of POSTECH. This culminated in the visit of Mr Seungjin Chai, doctoral student in POSTECH for a 6-month visit to Cambridge.
- July 2022 **Embassy of the Republic of Korea in Ecuador, Quito, Ecuador**
Presented the academic experience and research results after the competition of the Korean Government Scholarship. Talk generated contacts and interest for future GKS scholars.

- February 2020 **San Francisco de Quito University – USFQ, Quito, Ecuador**
SWIFT Talk. Briefly presented my work and how the school can benefit from the skill transfer of Korea-trained researchers. The talk generated the first contact towards a collaboration MOU between USFQ and KAIST.
- February 2020 **Armed Forces University – ESPE, Sangolquí, Ecuador**
Invited to give a *Masterclass* on the topic of Organic Electronics to professors and senior students at the School of Engineering. The talk generated interest in collaboration for the fabrication of low-cost organic electronics in developing countries.

Funding and Entrepreneurship

As an aspiring leader in research, Dr Alban-Paccha has been instrumental in forming and guiding research teams, generating original ideas, crafting proposals, and securing funding for projects. He has handled both the technical and administrative aspects of many applications, such as writing reports, arranging review meetings, and managing the budget for materials and supplies.

As Co-Investigator

- 2023 CAPE Grand Challenge – Systems and Devices for Healthcare 2023 (PI: George Malliaras). GBP 50,000.00 supported by Haleon from 12/2023 to 04/2024.

Awards and Scholarships

- 2018 **Doctoral Research Scholarship, Department of Electrical Engineering, KAIST**
Elected by the governing body of the Department for academic excellence. Awarded 4 years full-time travel/living support for Doctoral degree studies.
- 2014 **Global Korea Scholarship**
1 in 6 awards for the 2014 program, selected by the Ministry of Education of Korea. Awarded 3 years full-time travel/living support for Korean language training and master's degree studies.
- 2010 **ITESM Travel Award for Exchange Program**
Elected by the International Outreach Department of the Armed Forces University - ESPE. Awarded tuition and travel expenses for one exchange term at the Monterrey Institute of Technology and Higher Education, Mexico.
- 2005 **National Mathematics Competition**
Senior Category: Top 5

Service and Engagement

- 2023 – present **Churchill College, Cambridge, UK**
Mentor for postgraduate students at the College.
- 2023 – present **Flexible and Printed Electronics, Institute of Physics**
Peer-reviewer of papers for the journal.
- 2023 – present **Nanotechnology, Institute of Physics**
Peer-reviewer of papers for the journal.
- 2023 **IEEE International Conference on Flexible and Printable Sensors and Systems**
Peer-reviewer of papers for the conference.
- 2019 – 2020 **Electrical Engineering International Students Council, KAIST, Daejeon, Korea**
Council Head. Organized events for the international community of students in KAIST campus.
- 2017 – 2018 **School of Engineering International Students Group, Korea University, Seoul, Korea**
Vice-President. Organized events for the international community of students in Korea University campus.
- 2017 – 2018 **Ecuadorian Residents in Korea Association, Seoul, Korea**
Co-Founder and President. Collaborated with the organization of the legal framework for the Association to be recognized by the Korean Government, as well as represented the Ecuadorian community in diverse events.

Student Guidance

As a Postdoctoral Research Associate, Dr Alban-Paccha has been a key mentor and collaborator for many students in Prof George Malliaras' group, ranging from undergraduates to visitors. He has not officially co-advised any of these students on their thesis and dissertations, but his influence and support are evident in their publications during their research

appointments in the group. He has contributed to shaping the research directions, guiding the work, advising, and assisting students with experiments and data analysis throughout their research activities that led to those publications, where he is listed as a co-author. His guidance has been essential for achieving the educational mission and research goals of the group, and for helping the students advance their careers after their appointments or graduation.

Doctoral Candidates

2022 – present Luke Gatecliff. Project: OECT-based Ion Sensors for Athletics and Healthcare

2023 – present Christopher Slaughter. Project: Biopotential Foetal Movement Measurement Platform

4th Year Students (Master’s degree Candidates)

2023 – present Gemma Jacobson. Project: Cuffless Biopotential-Based Blood Pressure Estimation

Visitor Students/Researchers

2023 Seungjin Chai, POSTECH, Korea

Research, IT and Other Skills

- Fluency in English and Spanish languages. Proficiency in Korean language. Basic understanding of Japanese and Portuguese languages.
- Analytical, collaborative, and results driven. Demonstrated research expertise in electronic and biomedical device design and manufacture. Strong communication, presentation, and documentation skills.
- Expertise with electronic/electromechanical/mechatronic systems, sensors/signal processing, communication protocols and low-power electronics.
- Experimental Techniques: Photolithography, Furnace Annealing, Plasma Treatment, Sputtering, Thermal Evaporator, SEM, AFM, Surface Profiler.
- Strong Computer Assisted Design skills: SolidWorks, AutoCAD, Inventor, COMSOL. Electronic Design and Analysis skills for PCB fabrication: Eagle, Altium Designer and Proteus Suite.
- Computer Skills: Linux/Windows, Office, HTML/CSS/JS, LaTeX, C/C++, Java, Python, LabView, MATLAB, etc.