





Miguel Xochicale



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RESEARCH INTERESTS

My research interests are in real-time and automatic Signal and Image Processing techniques in the context of Human-Robot Interaction, Movement Variability, Wearables in Medicine, Ultrasound-Guided Interventions, Medical Robotics, Fetal Biomechanics, and Research Software Engineering. I have passion for real-time AI and biomechanics technologies for Healthcare.

EDUCATION


The University of Birmingham Birmingham, UK
Ph.D. in Computer Engineering *Nov 2014 – Nov 2018*
Thesis: Nonlinear Analysis to Quantify Movement Variability in Human-Humanoid Interaction.
Supervisors: Professor Chris Baber and Professor Martin Russell
Thesis submission: 26/10/2018. Passed Viva: 11/01/2019. Awarded PhD degree: 12/07/2019.
Links: Thesis:  Github:  Website: 

Institute of Astrophysics, Optics and Electronics (INAOE) Puebla, México
M.Sc. in Signal Processing *Sep 2004 – Sep 2006*
Thesis: Design of digital filters with fewer multipliers
Supervisor: Dr. Gordana Jovanovic Dolecek
Links: Thesis:  Github: 


Puebla Institute of Technology Puebla, México
B.Eng. in Electronics *Aug 1999 – Sep 2004*
Thesis: Speed control for a two-degrees-of-freedom Robot in LabVIEW.
Supervisor: M.Sc. José Esteban Torres León.
Links: Thesis:  Github: 

PROFESSIONAL EXPERIENCE

King's College London London UK
Research Associate in Real-time AI Ultrasound Imaging *Sep 2021 – Present*

- PI: Dr. Alberto Gomez
- I am scientifically contributing to automatic biometric recognition of Electrocardiography ultrasound data using real-time deep learning techniques and frameworks with Python-based and Qt programming languages via GitHub. Additionally, I am leading the preparation of one proceeding and one manuscript in the area of medical imaging with real-time deep learning techniques. All previous activities in collaboration with renowned clinicians and engineers in KCL, University of Oxford and University of Melbourne. See more at ().

King's College London London UK
Research Associate in Software and Hardware Engineering *Apr 2019 – Aug 2021*

- PI: Prof. Tom Vercauteren
- I pushed forward the state-of-the-art of Ultrasound-Guidance Interventions where was involved in the development of a needle tip tracking system, real-time ultrasound image processing, quality management system (QMS) for clinical translation of medical devices, and public engagement activities. Similarly, I developed validation experiments with linear stages under Windows and GNU/Linux OSs, designed electronic PCBs and design CAD pieces for 3D printing holders, characterised ultrasonic transducers, operate clinical ultrasound devices and contributing to a Python library via GitHub following QMS. All the previous activities in collaboration with an amazing team of renowned clinicians, engineers, QMS specialists and researchers in KCL and UCL. Additionally, I lead the preparation of one manuscript in a high-impact factor journal. See more at ().

INAOE's Robotics Laboratory
Research Assistant in Robotics

Puebla, México
Feb 2013 – Aug 2013

- Advisor: Dr. Angélica Muñoz Meléndez
- I developed a Human-Robot Interaction application for dancing activities based on a Patrolbot mobile robot and a single three-axial accelerometer. (See documents and code: [↗](#)).

Madero University
Teaching Lecturer in Mechatronic Engineering

Puebla, México
Jan 2012 – Jan 2013

- I proposed and supervised the following students projects: Haptic Referee Glove, Lightmetre and Pychometre Sensors, Smart Irrigation, Persistent Of Vision Bicycle Wheel and a Delta Robot Structure (See documents and code: [↗](#)).
- I proposed and designed a Mechatronic Laboratory which includes: (i) a benchmark for laboratories in mechatronics in México and Puebla, (ii) a 3D layout design and (iii) minimal requirements of hardware and software for the laboratory (See documents and layout: [↗](#)).

INAOE
Research Internship in Robotics

Puebla, México
Sep 2003 – Mar 2004

- I implemented a speed control for a two-degree-of-freedom robot with microcontrollers PIC 16F84 & 16F877 which communicated via RS-232 to LabVIEW's Virtual Instruments.

**TEACHING AND
SUPERVISION
EXPERIENCE**

King's College London
Supervision

London, UK
Jan 2020 – Present

Student: Thea Bautista
M. Eng. in Biomedical Eng: GAN-based synthetic ultrasound imaging for fetal development
Co-supervisors: H. Kerdegari, L. Peralta-Pereira, and R. Aughwane
Oct 2021 – May 2022

Student: Guilherme Gomes de Figueiredo
Summer Project: synthetic ultrasound imagining with AI
Jun 2021 – Aug 2021

Student: Amal Hussein
Summer Project: Ultrasound-guidance simulator
Jun 2021 – Aug 2021

Student: Alexander Mitton
M.Sc. Project: Vibro-tactile stimulator for dystonia research
Co-supervisors: C. Bergeles, V. McClelland and A. Worley
Jan 2020 – Sep 2020

Student: Alexander Mitton
M.Sc. Project: Vibro-tactile stimulator for dystonia research
Co-supervisors: C. Bergeles, V. McClelland and A. Worley
Jan 2020 – Sep 2020

Teaching Associate

Jan 2020 – Present

- Medical Robotics. Lecturer: Dr. Hongbin Liu
Jan 2021 – Apr 2021
- Medical Robotics. Lecturer: Dr. Christos Bergeles
Jan 2020 – Apr 2020

The University of Birmingham
Teaching Associate

Birmingham, UK
Aug 2014 – Apr 2018

- Engineering Maths 2. Lecturers: Prof. Martin Russell, Dr Carl Anthony
Jan 2018 – Apr 2018
- Engineering Maths 2. Lecturer: Prof. Martin Russell
Aug 2017 – Dec 2017
- Computing for Engineering. Lecturer: Dr Sridhar Pammu
Aug 2017 – Dec 2017
- Matlab Laboratories. Lecturer: Dr Edward Tarte
Jan 2017 – Apr 2017
- Computing for Engineering. Lecturer: Dr Sridhar Pammu
Aug 2016 – Dec 2016
- Small Embedded Systems. Lecturer: Prof. Chris Baber
Aug 2016 – Dec 2016

Supervision

Jun 2018 – Dec 2018

Student: Dinghuang Zhang

M.Sc. Project: Tools for Human-Humanoid Collaboration

Co-supervisor: Chris Baber.

Bilingual High School TECMilenio University Teaching Associate

Puebla, México

Aug 2013 – Dec 2013

- Information Technology [↗](#), Euclidean Geometry [↗](#), and Microsoft Office Access [↗](#)

Universidad Madero

Puebla, México

Teaching Associate in Mechatronic Eng.

Jan 2012 – Dec 2012

- Fundamentals of Automation [↗](#), Industrial Electronics [↗](#), Research Projects [↗](#), Metrology [↗](#), Physics [↗](#), and Computer Integrating Manufacturing, and Power Electronics

Universidad Iberoamericana Puebla

Puebla, México

Teaching Associate in Electronic Eng.

Jan 2007 – Dec 2011

- Stochastic Processes [↗](#), Digital Signal Processing [↗](#), and Analog Filters.

Instituto Tecnológico Superior de Atlixco

Puebla, México

Teaching Associate in Mechatronic Eng.

Aug 2006 – Jun 2007

- (01/2007 - 06/2007) Electronics I, Numerical Methods, and Electricity and Magnetism.
- (08/2006 - 12/2006) Electricity and Magnetism, and Electricity and Industrial Electronics

PUBLICATIONS

1. **M. Xochicale** and C. Baber, "Nonlinear methods to quantify movement variability in human-humanoid interaction activities," Mar. 2021. arXiv: 1810.09249 [eess.SP], [Full Manuscript](#).
2. R. Montenegro, E. Corona, D. Badillo-Perez, A. Mandujano, L. Vazquez, D. Cruz, and **M. Xochicale**, "Air4children: Artificial intelligence and robotics for children," in *16th Annual Conference on Human-Robot Interaction (HRI '21)*, Feb. 2021. arXiv: 2103.07637 [cs.R0].
3. **M. Xochicale** and C. Baber, "Towards the analysis of movement variability in human-humanoid imitation activities," in *5th International Conference on Human Agent Interaction (HAI '17)*, Bielefeld, Germany, Oct. 2017, [Poster Paper](#).
4. **M. Xochicale**, C. Baber, and O. Mourad, "Towards the quantification of human-robot imitation using wearable inertial sensors," in *12th Annual Conference on Human-Robot Interaction (HRI '17)*, Vienna, Austria, Mar. 2017, [Poster Paper](#).
5. **M. Xochicale**, C. Baber, and O. Mourad, "Analysis of the movement variability in dance activities using wearable sensors," in *2nd International Symposium on Wearable Robotics (WeRob '16)*, Segovia, Spain, Oct. 2016, [Poster Paper](#).
6. **M. Xochicale**, C. Baber, and O. Mourad, "Understanding movement variability of simplistic gestures using an inertial sensor," in *5th ACM International Symposium on Pervasive Displays (PerDis '16)*, Oulu, Finland, Jun. 2016, [Poster Paper](#).
7. **M. Xochicale** and G. Jovanovic-Dolecek, "A new method for design narrow band lowpass fir filters using a scale function," in *2nd International Conference on Electronic Design (ICED '06)*, Veracruz, Mexico, Nov. 2006, [Conference Paper](#).

POSTERS

1. **M. Xochicale**, "Open-cortex: A continuous integration framework for open scientific communication," in *1st Conference on Reproducibility, Replicability and Trust in Science (RRTS '20)*, Cambridge, England (Virtual Conference), Sep. 2020, [Poster Abstract](#).
2. **M. Xochicale**, "Quantification of dynamic facial expressions with shannon entropy in human-humanoid interaction," in *1st Symposium on Machine Learning and Dynamical Systems (MLDS '19)*, London, UK, Feb. 2019, [Poster Abstract](#).

TALKS

1. **M. Xochicale** and C. Baber, "Nonlinear analysis to quantify human movement variability from time-series data," in *neuromatch 3.0 (NMC3 '20)*, Virtual Conference, Oct. 2020, [Presentation Abstract](#).

2. **M. Xochicale**, "Quantifying movement variability with nonlinear dynamics for human-humanoid interaction," in *25th International Conference on Difference Equations and Applications (ICDEA '19)*, London, UK, Jun. 2019, [Slices abstract](#).
3. **M. Xochicale**, "Quantifying the inherent chaos of human movement variability," in *15th Experimental Chaos and Complexity Conference (ECCC '18)*, Madrid, Spain, Jun. 2018, [Presentation Abstract](#).
4. **M. Xochicale** and C. Baber, "Towards the analysis of movement variability for facial expressions with nonlinear dynamics," in *7th Consortium of European Research on Emotion Conference (CERE '18)*, Glasgow, Scotland, UK, Apr. 2018, [Presentation abstract](#).

GRANTS, AWARDS AND HONOURS

- King's Public Engagement grant for the project "FETUS: Finding a fETus with an Ultrasound Simulator" led by myself and in collaboration with Fang-Yu Lin and Shu Wang [🔗](#) (07/01/2021 - 07/01/2022)
- Alexander Mitton won the Outstanding Individual Project award for his M.Sc. project, which I was the main supervisor, on designing a wearable, vibrotactile stimulation device for patients with dystonia [🔗](#) (15/10/2020)
- King's Health Partners grant for the project "Sensory system abnormalities in childhood dystonia" lead by Verity McClelland and in collaboration with Carlos Seneci [🔗](#) (14/04/2020 - 9/06/2020)
- My work "Towards Healthy Ageing with Humanoid Robots" was selected for a talk at the second forum of Mexican Talent, Innovation Match MX 2017, [🔗](#) [📺](#) [YouTube](#) 11/01/2017
- I won the best poster award at the XIV Symposium of Mexican Students in the UK at University of Edinburgh [🔗](#) 16-18/06/2016
- My project of a low-cost robot was selected among 125 applications received from 35 countries and presented at the first international public entrepreneurship program in Mexico (MECATE 2015). [🔗](#) [📺](#) [YouTube](#) 20-24/07/2015
- Ph.D. scholarship by the Mexican National Council on Science and Technology. 11/2014-11/2018
- Markovito's team won the first place at the Mexican Tournament of Robotics 2013 in the category at HOME where I presented a Human-Robot Interaction Dance Demo. [📺](#) [YouTube](#) 25-27/05/2013
- M.Sc. scholarship by the Mexican National Council on Science and Technology. 09/2004-09/2006

SKILLS

Programming Python[2014-present], R[2013-present], Robot Operating System (ROS)[2016-present], GNU-Octave (or MatLab)[2009-present], L^AT_EX[2006-present], C and C++[2015-present], Processing[2012-present], the shell[2010-present], GNU-emacs[2010-present], vim[2016-present], pandoc[2017-present], open-source enthusiast at GitHub (@mxochicale)[2015-present], and continuous integration and continuous delivery [2019-present].

Tools GNU/Linux Operating System user (e.g. OpenSuse, Debian and Ubuntu)[2005-present] Single-board computers and microcontrollers (e.g. NVIDIA Jetson Nano, RaspberryPi, Beagle-Bone, Arduino and PIC)[2010-present], Inertial Measurement Units (e.g. calibration, collection and data analysis)[2013-present], Web design (e.g. Github pages, Jekyll)[2015-present], and Graphic design (e.g. Inkscape, GIMP)[2014-present], CAD design (e.g. Autodesk inventor, blender, FreeCAD)[2015-present], Artificial Neural Networks (e.g. PyTorch, and TensorFlow)[2017-present], and 3D printing (e.g., flsun, cura) [2019-present].

Languages Spanish[Native], English[Fluent], Chinese[Beginner]

EXTRA ACTIVITIES

King's College London London, UK
Outreach activities and scientific engagement Sep 2019 – Present

- Organising events in the Early Career Researcher Network of the BMEIS 01-01-2021 - present.
- Participation in the Westminster Enterprise Week to engage students aged 14-18 to Biomedical Engineering 10-11-2021
- Participant in the STEAM WEEK organised by the City Westminster Council to engage students aged 14-18 to STEAM [🐦](#) 23-03-2021
- Alexandra Lautarescu and I organised the Reproducible, Interpretable, Open, & Transparent Science Club at St Thomas' Hospital 02-2020 – 06-2020
- For the event In2ScienceUK, I shared my scientific journey to young scientist on how they can become better scientist. 20-08-2019










- For the New Scientist Live, I showcased software that helps doctors to create 3D models of brain tumors using AI. 09-2019

University of Birmingham

Birmingham, UK




Outreach activities and scientific engagement

Aug 2014 – Jun 2018

- Finalist at the Three Minute Thesis Competition 2018. Video:  and GitHub:  05-2018
- Research Poster Conference for (2015) , (2016) , and (2018) . GitHub: .
- Demoing Human-Robot Activities at the Undergraduate Open Days. GitHub: . 2014–2018
- Coordinator of the Science Seminars for the Mexican Society. GitHub: , Website: . 2017–2018

AIR4Children

México & UK

- Building Artificial Intelligence and Robotics for Children (air4children) with the purpose of teaching AIR to children for free. Twitter: @air4children GitHub: @air4children 2019–Present
- Creation Libre Robotics, a non-profit organization aiming to freely transfer knowledge in Robotics to Mexican children. Website:  2013 – 2017

Developer of the Website "Machine Learning for México"

México & UK

- GitHub: , Website:  2013 – 2018