


# Miguel Xochicale

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King's College London, UK  
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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, 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 with automatic biometric recognition from Cardiac ultrasound data using real-time deep learning techniques. Similarly, I am implementing real-time deep learning frameworks based on python and Qt via GitHub. Additionally, I am leading the preparation of one proceeding and one manuscripts in the areas of medical imaging with real-time deep learning techniques. 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 am 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

Oct 2021 – May 2022

M. Eng. in Biomedical Eng: GAN-based synthetic ultrasound imaging for fetal development

Co-supervisors: H. Kerdegari, L. Peralta-Pereira, and R. Aughwane

Student: Guilherme Gomes de Figueiredo

Jun 2021 – Aug 2021

Summer Project: synthetic ultrasound imaging with AI

Student: Amal Hussein

Jun 2021 – Aug 2021

Summer Project: Ultrasound-guidance simulator

Student: Alexander Mitton

Jan 2020 – Sep 2020

M.Sc. Project: Vibro-tactile stimulator for dystonia research

Co-supervisors: C. Bergeles, V. McClelland and A. Worley

Student: Alexander Mitton

Jan 2020 – Sep 2020

M.Sc. Project: Vibro-tactile stimulator for dystonia research

Co-supervisors: C. Bergeles, V. McClelland and A. Worley

**Teaching Associate**

Jan 2020 – Present

- Medical Robotics. Lecturer: Dr. Hongbin Liu
- Medical Robotics. Lecturer: Dr. Christos Bergeles

Jan 2021 – Apr 2021

Jan 2020 – Apr 2020

**The University of Birmingham**  
**Teaching Associate**

Birmingham, UK  
Aug 2014 – Apr 2018

- Engineering Maths 2. Lecturers: Professor Martin Russell, Dr Carl Anthony
- Engineering Maths 2. Lecturer: Professor Martin Russell
- Computing for Engineering. Lecturer: Dr Sridhar Pammu
- Matlab Laboratories. Lecturer: Dr Edward Tarte
- Computing for Engineering. Lecturer: Dr Sridhar Pammu
- Small Embedded Systems. Lecturer: Professor Chris Baber

Jan 2018 – Apr 2018

Aug 2017 – Dec 2017

Aug 2017 – Dec 2017

Jan 2017 – Apr 2017

Aug 2016 – Dec 2016

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 Hight School TECMilenio University**  
**Teaching Associate**

Puebla, México  
Aug 2013 – Dec 2013

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

**Universidad Madero**  
**Teaching Associate in Mechatronic Eng.**

Puebla, México  
Jan 2012 – Dec 2012

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

**Universidad Iberoamericana Puebla**  
**Teaching Associate in Electronic Eng.**

Puebla, México  
Jan 2007 – Dec 2011

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

**Instituto Tecnológico Superior de Atlixco**  
**Teaching Associate in Mechatronic Eng.**

Puebla, México  
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, [Slides 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<sup>A</sup>T<sub>E</sub>X[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. TensorFlow and PyTorch)[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 segmentation 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: [📺](#) [YouTube](#) 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: @air4chidlren 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