

# OMAR COSTILLA-REYES

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## EDUCATION

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- 2018 - Present**      **Brain and Cognitive Sciences, Massachusetts Institute of Technology (MIT), Boston, USA.**  
Postdoctoral research fellow  
Picower institute of Learning and Memory – Miller Lab  
Research project: Neuroscience and artificial intelligence to understand neural cognition.
- 2014 – 2018**      **Electrical and Electronics Engineering, University of Manchester, Manchester, UK.**  
PhD – Machine learning and sensors systems  
*Thesis: Spatio-temporal gait pattern recognition from raw sensor data for healthcare and security.*  
*Department: Sensing, imaging and signal processing laboratory.*
- 2012 – 2014**      **Electrical and Electronics Engineering, University of North Texas, Texas, USA.**  
*Master of Science (honours)*  
*Thesis: Dynamic WIFI fingerprinting indoor positioning system.*  
*Department: Autonomous systems laboratory.*  
*Modules: Bioinformatics (CSCE 6810), Digital signal processing (EENG 5610), Parallel processing (CSCE 5160), System modelling and simulation (EENG 5320).*
- 2007 – 2011**      **Electronics Engineering, Autonomous University of the State of Mexico, Mexico.**  
*Bachelor of Science (honours)*  
*Graduated with academic achievement.*

## PRIZE AND AWARDS

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- 2018      Research work selected for InAbstract 2018: “pick of the very best new research coming from the Faculty of Science and Engineering” Representing the school of EEE. University of Manchester
- 2018      No.1 Popular Journal article at IEEE Transactions of Industrial Electronics, February 2018
- 2017      Top 25 Popular Journal article at IEEE Sensors, January – May 2017
- 2016      Marie Curie young researcher recognition - European science open forum 2016
- 2016      Manchester doctoral college postgraduate researcher - Travel fund award 2016
- 2015      Best student paper award, optical sensors applications - IEEE Sensors Conference 2015
- 2014      International postgraduate fellowship - Secretariat of public education (SEP, Mexico)
- 2014 – 2018      PhD fellowship - CONACYT (Mexico)
- 2012 – 2014      MSc fellowship - CONACYT (Mexico)
- 2014      Charn Uswachoke scholarship award - University of North Texas
- 2013      Multicultural scholarship award - University of North Texas
- 2013      International scholarship award - University of North Texas
- 2013      Dallas entrepreneur professionals - Hackaton winner award 2013
- 2010      Young researcher fellowship - Adolfo Lopez-Mateos UAEM (Mexico)

## GRANTS

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January 2018 - Call for small projects – Data Science Institute, University of Manchester, UK. (£10,000) Project: *Developing novel data science methodology for analysing gait patterns for the early detection of cognitive decline.*

NVIDIA GPU research grant – Project: Neuroscience and artificial intelligence to understand neural cognition (MIT)

## PUBLICATIONS

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### JOURNALS

**Omar Costilla-Reyes, Ruben Vera-Rodriguez, Patricia Scully, and Krikor B Ozanyan.** *Analysis of spatiotemporal representations for robust footprint recognition with deep residual neural networks.* IEEE Transactions on Pattern Analysis and Machine Intelligence. January 2018.

**Omar Costilla Reyes**, Patricia Scully, and Krikor B. Ozanyan. *Thinking and walking: A deep learning approach to detect age-related differences in dual tasks from healthy adults*. PLOS Medicine. March 2018 (under review).

**Omar Costilla-Reyes**, Patricia Scully, and Krikor B Ozanyan. *Deep neural networks for learning spatiotemporal features from tomography sensors*. IEEE Transactions on Industrial Electronics, Aug. 2017.

**Omar Costilla Reyes**, Patricia Scully, and Krikor B. Ozanyan. *Temporal Pattern Recognition in Gait Activities Recorded with a Footprint Imaging Sensor System*. IEEE Sensors Journal, Dec. 2016.

#### INTERNATIONAL CONFERENCES (with research manuscript published)

**Omar Costilla-Reyes**, Patricia Scully, and Krikor B Ozanyan. *Towards floor sensors to flag cognitive decline thresholds*. In Proc. of Movement, Brain, Body and Cognition international conference 2018 (in press).

**Omar Costilla-Reyes**, Patricia Scully, and Krikor B Ozanyan. *Age-sensitive differences in single and dual walking tasks from footprint imaging floor sensor data*. In Proc. of 2017 IEEE Sensors conference, IEEE, 2017.

**Omar Costilla-Reyes**, Zachary Coldrick and Bruce Grieve. *Unsupervised learning for spectral data analysis as a novel sensor for identifying rodent infestation in urban environments*. In Proc. of 2017 IEEE Sensors conference, IEEE, 2017.

**Omar Costilla-Reyes**, Ruben Vera-Rodriguez, Patricia Scully, and Krikor B Ozanyan. *Spatial footstep recognition by convolutional neural networks for biometric applications*. In Proc. of 2016 IEEE Sensors conference. IEEE, 2016.

**Omar Costilla-Reyes**, Patricia Scully, and Krikor B Ozanyan. *Temporal pattern recognition for gait analysis applications using an "intelligent carpet" system*. In Proc. of 2015 IEEE Sensors conference. 2015.

**Omar Costilla-Reyes** and Kamesh Namuduri. *Dynamic wi-fi fingerprinting indoor positioning system*. In Indoor Positioning and Indoor Navigation (IPIN), 2014 International Conference on, pages 271– 280. 2014.

**Omar Costilla-Reyes**, Rajeev Azad, Garima Saxena and Joseph Helsing. *Comparison of Machine Learning Algorithms for Identifying Cancer Types*, MidSouth Computational Biology and Bioinformatics Society, 2014 international conference, 2014.

Patricia Scully, Jose Cantoral-Ceballos, John Vaughan, **Omar Costilla-Reyes**, et all. *iMagiMat Smart Carpet: POF Layer to Detect Gait and Mobility*. in Proceedings of 24th International Conference on Plastic Optical Fibres. Nürnberg, Germany, 24th International Conference in Plastic Optical Fibres (POF 2015), Nuremberg, Germany, 22-24 September.

#### TECHNICAL SKILLS: PROGRAMMING

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Python, C, Java, Latex, MATLAB

#### RESEARCH EXPERIENCE

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2018 Jan – 2018 June      *Research associate, division of neuroscience and experimental psychology, University of Manchester, UK.*  
Project: Developing novel data science methodology for analysing gait patterns for the early detection of cognitive decline.

2016 – 2017                *Agri-Sensor research associate, University of Manchester, UK.*  
Project: Hyperspectral imaging as a novel sensor for identifying and condition monitoring pest infestation in agricultural & urban environments.

Summer 2013             *Research intern, Centre for Engineering and Industrial development (CIDESI), Queretaro, Mexico.*  
Project: Design and development of an inertial system to reduce risk of fracture in pipelines of Mexican Petroleum (PEMEX).

2012 - 2013                *Graduate assistant, Research experience for teacher's program (RET), National Science Foundation, University of North Texas, USA.*  
Supported and supervised K-12 teachers from school districts in North Texas in research projects in sensor networks at the University of North Texas.

- 2012- 2013      *Graduate assistant, Guided Planetary Surface Exploration using Rovers and Wireless Sensor Networks, National Aeronautics and Space Administration (NASA) grant, University of North Texas, USA. Developed a multi-agent cooperation algorithm for a swarm of robots with the Garcia robotics platform.*
- 2013 - 2014      *Graduate assistant, Robocamp, Xbox camp and Android camp, University of North Texas, USA. Assisted and managed high school students in engineering-related projects using robots, Xbox and android applications at a summer camp held at the University of North Texas.*
- Summer 2011      *Undergraduate research intern, Summer undergraduate program in Engineering Research (SUPER), University of North Texas, USA. Project: Vision and perception for robotics systems.*

## RESEARCH PARTNERSHIPS

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*Deep and frequent phenotyping; combinatorial biomarkers for dementia experimental medicine. (UK)*  
 Medical Research Council, grant ref 1511HQ003/J13, 2016. (£6,301,078). PI: Simon Lovestone (University of Oxford)  
 Partnership universities: Oxford, Cambridge, Imperial College London, Manchester, Edinburgh, Newcastle, and more.

## RESEARCH MANAGEMENT EXPERIENCE

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- 2015-2017      *Master's student supervision, University of Manchester.*  
 Supported and supervised master's students research projects at the Electrical and Electronics Engineering school of the University of Manchester. The research projects involved the design of machine learning methodologies for working with multi-sensor tomography data.

## TEACHING EXPERIENCE

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- 2014 - present      *Teaching assistant, School of Electrical and Electronics Engineering, University of Manchester, UK*  
 Modules: *C programming, Control fundamentals, Measurements & Analytical Software (LabVIEW), vertical take-off and landing Control Laboratory, Robotics, Data networking.*
- 2012 - 2014      *Teaching assistant, Department of Electrical and Electronics Engineering, University of North Texas, USA*  
 Modules: *Introduction to Wireless Networks and Communications.*

## LEADERSHIP EXPERIENCE

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- 2017-present      *Director, Machine learning for Mexico, Global Mexican talent network (RGMX).*  
 I lead a group of Mexican scientist and engineers around the world to work and collaborate in projects related to machine learning.
- 2016-2017      *Postgraduate staff student liaison committee representative.*  
 Discussed issues affecting PhD students with the Head of School of the Electrical and Electronics engineering department, University of Manchester. The aim is to improve the experience of post-graduate students.
- 2012-present      *Member, Professional leadership program, University of North Texas.*  
 The purpose of the Professional leadership program is to give students exposure to leadership skills needed to be a servant leader in any of their future endeavours.
- 2013-2014      *Student advisor, Innovation greenhouse, University of North Texas.*  
 Member of the student advisory board. Promoted entrepreneurship and innovation among the students at the University of North Texas.
- 2014-2015      *Vice-president, Dallas chapter, Mexican talent network.*  
 Facilitated the generation of projects in the areas of business development, global innovation, and education in the Dallas-Fort Worth metroplex.
- 2012-2014      *International student ambassador, University of North Texas.*  
 Acted as educational ambassador representing Mexico, UNT & UNT-International to the local community, UNT students, staff, alumni and prospective students.

- 2012-2014 *International peer mentor, University of North Texas.*  
Assisted newly admitted UNT international students in their pre-arrival preparation and to help with their transition into their new environment during the New International Student Orientation.
- 2009-2011 *IEEE student branch chair, UAEM, Mexico.*  
Managed and organized engineering events and workshops for undergraduate students for the school of electrical and electronics department.
- 2009-2011 *Council Member of the school of electrical and electronics department, UAEM, Mexico.*  
Managed student affairs at the school of electrical and electronics department.

## PROJECTS AND WORKSHOPS

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- April 2018 Alan Turing Institute – April 2018 Data Study Group, British Library, London, UK.  
Project: *Developing fair algorithms for artificial intelligence (Accenture Ltd. Challenge)*
- Dec 2017 Alan Turing Institute – December 2017 Data Study Group, British Library, London, UK  
Project: *Can data science help identify potential drivers of extremism? (Cabinet office UK challenge)*
- Nov 2017 IEEE SENSORS Conference 2017 Young research panel discussion, Glasgow, UK.  
Topic: *PhD project management, time management, high quality research, motivation.*
- June 2017 Image competition finalist, Postgraduate summer research showcase, University of Manchester, UK.  
Title: *01100100011010010111001101100011011011101110110011001010111001001111001.*
- March 2017 DIGILAB, University of Manchester, UK.  
*Machine learning workshop.*

## PRESENTATIONS

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- July 2018 Euroscience Open Forum, ESOF (2018) – Toulouse, France  
Title: *Floor sensors and machine learning to flag cognitive decline thresholds.*
- July 2018 Movement: Brain, body and cognition conference, Harvard University – Medical School, Boston, USA.  
Title: *Towards floor sensors and machine learning to flag cognitive decline thresholds.*
- May 2018 Advances of data science conference 2018, University of Manchester, UK.  
Title: *Analysis of Spatio-temporal Representations for Robust Footstep Recognition with Deep Residual Neural Networks*
- March 2018 NVIDIA GPU Technology conference 2018 – AI & Deep Learning, San Francisco, California, USA.  
Title: *Analysis of multimodal human-generated sensor data: a deep learning approach for early detection of dementia.*
- March 2018 Max Planck Institute for Intelligent Systems – Perceiving Systems Laboratory, Tübingen, Germany.  
Title: *Deep Residual Neural Networks for Robust Footstep Recognition.*
- March 2018 First online symposium – Machine learning for Mexico. Online - Broadcasted worldwide.  
Title: *Machine learning, story, future and implications for Mexico.*
- January 2018 Computer Laboratory Seminar, University of Cambridge, Cambridge, UK.  
Title: *Analysis of Spatio-temporal Representations for Robust Footstep Recognition with Deep Residual Neural Networks.*
- Dec 2017 Data Visualization Summit, Manchester, UK.  
Title: *Visualization of Deep Neural Networks for Learning Spatio-Temporal Features from Tomography Sensors.*
- Nov 2017 IEEE SENSORS Conference 2017, Glasgow, UK.  
Title: *Age-sensitive differences in single and dual walking tasks from footprint imaging floor sensor data.*

- Nov 2017 IEEE SENSORS Conference 2017, Glasgow, UK.  
Title: *Unsupervised learning for spectral data analysis as a novel sensor for identifying rodent infestation in urban environments.*
- Oct 2017 Global Mexican talent network (RGMX), Europe annual meeting, Madrid, Spain.  
Title: *Machine Learning for Mexico*
- Oct 2017 Electrical and Electronics Engineering department colloquium series, University of Manchester, UK.  
Title: *Deep Neural Networks for Learning Spatio-Temporal Features from Tomography Sensors.*
- August 2017 ARM research summit, University of Cambridge, UK.  
Title: *Analysis of spatio-temporal human movement for security and healthcare.*
- July 2017 Industry 4.0 Summit, Manchester, UK.  
Title: *Floor sensor system to detect gait and mobility.*
- July 2017 Early career research conference 2017, Alzheimer Research UK, Manchester, UK.  
Title: *Age-sensitive differences in single and dual walking tasks from footprint imaging floor sensor data.*
- June 2017 Postgraduate summer research showcase, University of Manchester, UK.  
Title: *Spatio-temporal analysis for healthcare applications.*
- June 2017 Second international forum of Mexican talent (IMMX), Mexico City, Mexico.  
Title: *Spatio-temporal analysis of gait for early detection of dementia.*
- May 2017 Advances of data science conference 2017, University of Manchester, UK.  
Title: *analysis of multimodal human-generated sensor data: A deep learning approach for early detection of dementia.*
- May 2017 School of Science and Technology Joint seminar programme, Nottingham Trent University, Nottingham, UK.  
Title: *Seminar on Spatio-Temporal Gait Analysis with Convolutional Neural Networks.*
- March 2017 Data science club meeting, Data science institute, University of Manchester, Manchester, UK.  
Title: *Spatio-temporal analysis of gait with the iMagiMat.*
- Nov 2016 IEEE SENSORS Conference 2016, Florida, USA.  
Title: *Spatial footstep recognition by convolutional neural networks for biometric applications .*
- July 2016 European Science Open Forum (ESOF) 2016, Manchester, UK.  
Title: *What can machine learning infer about the way you walk?*
- June 2016 First international forum of Mexican talent (IMMX), Guadalajara, Mexico.  
Title: *Footstep recognition for biometric applications.*
- June 2016 Postgraduate summer research showcase, University of Manchester, Manchester, UK.  
Title: *Tomography as a machine learning problem: gait analysis.*
- Nov 2015 IEEE SENSORS Conference 2015, Busan, South Korea.  
Title: *Temporal pattern recognition for gait analysis applications using an "intelligent carpet" system.*
- Oct 2014 IEEE Indoor positioning and indoor navigation (IPIN) 2014, Busan, South Korea.  
Title: *Dynamic Wi-Fi fingerprinting indoor positioning system.*
- Oct 2010 IEEE Latin America regional meeting of IEEE branches presidents, La paz, Bolivia.  
Title: *IEEE UAEMex branch*

## RESEARCH REVIEW

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- 2017 - present Reviewer for IEEE Transactions on Industrial Electronics (TIE) Journal.  
2016 - present Reviewer for IEEE Sensors Journal.  
2016 - present Reviewer for Neural Information and Processing Systems (NIPS) conference.

## ENTREPRENEURSHIP ACTIVITIES

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- March 2017 & 2018      *Venture further competition finalist*, University of Manchester, UK.  
Premier business start-up competition at the University of Manchester, participated with the project: "*Sense my footsteps!*"
- August 2017              *Enterprise summer school*, University of Manchester, UK.  
The Manchester Enterprise School is a four-day residential enterprise activity at Lake Windermere, England. The aim is to let researchers compete in teams to create a business case for a local idea.
- April 2017                *Precure program*, University of Liverpool, Liverpool, UK.  
Lead participant in an entrepreneurship program based at the University of Liverpool to validate an entrepreneurship idea in the marketplace. Received coaching and resources at the program.
- April 2015                *Engineering Young Entrepreneur Scheme*, Nottingham, UK.  
Participated in a 3-day residential training experience for research students that introduces participants to what is involved in setting up a technology start-up.

## SCIENCE VOLUNTEERING AND OUTREACH

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- 2014-present            *Science, Technology, Engineering and Mathematics (STEM) Ambassador*, Manchester, UK.  
I perform scientific demonstrations and give talks to young children to inspire them to pursue scientific careers.
- 2017                        *Open-Labs science volunteer*, University of Manchester, Manchester, UK.  
Showcased and demonstrated the operation of an intelligent floor sensor system to the general public and its relationship to machine learning.
- 2017                        *Talk and workshop: "Pale blue dot"* at ciudad Perdida (local shelter), Mexico City.
- 2017                        *CHAIN:17 speaker*, Manchester, UK.  
Career and networking event for young engineers. I presented my story as a scientist to inspire young engineers to pursue research careers. I also demonstrated science experiments at the STEM booth.
- 2017                        *Science demonstrator*, Community Festival, University of Manchester, UK.  
Demonstrated to the local Manchester community research on machine learning and engaged with them first-hand on a variety of scientific topics.
- 2013                        *Social science exhibitor*, Perot Museum of Nature and Science, Texas, USA.  
Presented a live demonstration of Autonomous Robots with vision and proximity sensors.

## RESEARCH DEVELOPMENT

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- May 2017                *The resilient researcher*, University of Manchester, UK.  
3-day workshop on how to develop as a researcher, explore the principles of resilience and examine tools to help develop and maintain a positive mindset.
- April 2015                *Manchester GRADschool*, University of Manchester, UK.  
Title: Communicating effectively: You, your team and your research. 3-day workshop on personal communication skills, for communicating with your team or collaborators, and for the communication of your research.

## OTHER ACTIVITIES

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2014-2017                      *Run leader and parkrun leader, University of Manchester running club.*  
I have a leadership in running fitness (LIRF) certification to coach students at the University of Manchester in running training and activities.

## REFERENCES

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Krikor Ozanyan

Email: [k.ozanyan@manchester.ac.uk](mailto:k.ozanyan@manchester.ac.uk)

Professor of Photonic Sensors and Systems

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Professor of Dementia in Aging and Psychiatry, Division of Neuroscience and Experimental Psychiatry

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Senior Lecturer in Sensor Instrumentation

School of Chemical Engineering & Analytical Science

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