

Miguel Costa

POSTDOC RESEARCHER · TECHNICAL UNIVERSITY OF DENMARK

Copenhagen - Denmark

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Summary

I'm a Postdoc researcher at the Technical University of Denmark, where I'm currently working on a framework for finding optimal climate adaptation policies through a combination of reinforcement learning and agent-based simulation. Delving deeper, this tool seeks to find dynamic links between flooding events, transport, health, and wellbeing and uncover how optimal adaptation policies can be discovered to maximize societal wellbeing. Previously, I obtained my PhD (*magna cum laude*) in Instituto Superior Técnico, Portugal, where I focused on understanding both objective and subjective urban cycling safety using a machine learning approach. My research focused on understanding and predicting how cyclists' safety is influenced by the context where cyclists cycle and the surrounding built environment.

RESEARCH INTERESTS: INTELLIGENT TRANSPORTATION SYSTEMS / SMART MOBILITY / CYCLING SAFETY / COMPUTER VISION / MACHINE LEARNING / URBAN MOBILITY

Professional Experience

Postdoc Researcher

TECHNICAL UNIVERSITY OF DENMARK, DENMARK

Mar 2024 - Present

- Developing tools that aid climate change adaptation planning under deep climate uncertainty.
- Developing a multi-modular artificial intelligence framework that combines reinforcement learning and transport agent-based modeling using shared socioeconomic pathways to model dynamics effects between transport, health, and wellbeing.

Research Assistant

INSTITUTE FOR SYSTEMS AND ROBOTICS, INSTITUTO SUPERIOR TÉCNICO, PORTUGAL

Jul 2017 - Sep 2018

- Development of a device capable of 3D scanning sidewalks.
- Cycling maneuvers recognition for behavioural analysis.
- Development and implementation of a data acquisition system for counting passengers in a subway train.

Summer Intern

LIFE EMOTIONS, PORTUGAL

Jun 2015 - Jul 2015

- Development of drivers between Control4 domotics hub and other tech devices.
- Integration of set top box for MEO and Vodafone and the connected device bt.tn.

Education

PhD in Transportation Systems (MIT Portugal Program)

INSTITUTO SUPERIOR TÉCNICO (IST), UNIVERSIDADE DE LISBOA, PORTUGAL

Oct 2018 - Feb 2024

Magna Cum Laude (PASS WITH DISTINCTION AND HONOR)

- Dissertation: Objective and Subjective Safety Mapping for Urban Cyclists.
- Framework for automatically and continuously understanding objective and subjective cycling safety using authoritative and volunteered geographical information through a machine learning approach.
- Supervised by Filipe Moura (IST), Manuel Marques (IST), Carlos Lima Azevedo (DTU), and Felix Wilhelm Siebert (DTU)

VISITING PHD STUDENT @ TECHNICAL UNIVERSITY OF DENMARK

May 2022 - Dec 2022

- Impact of built environment on cycling accidents using latent class discrete outcome models.
- Development of an image comparison framework for understanding subjective cycling safety.
- Analysis of perception of cycling safety using eye tracking.

EIT URBAN MOBILITY DOCTORAL TRAINING NETWORK

Jun 2020 - Feb 2024

- Platform for exchanging research to fellow PhD candidates, senior researchers, and practitioners in urban mobility.
- Understanding the value of my research through entrepreneurship, innovation, and business.

Integrated MSc (BSc & MSc) in Electrical & Computer Engineering

INSTITUTO SUPERIOR TÉCNICO, UNIVERSIDADE DE LISBOA, PORTUGAL

Sep 2011 - May 2017

GRADE: 14/20

- Dissertation: Video-Based Risk Assessment for Cyclists.
- Framework for automatically and continuously understanding objective and subjective cycling safety using authoritative and volunteered geographical information through a machine learning approach.
- Supervised by Manuel Marques (IST), and João Paulo Costeira (IST).

ERASMUS+ @ UNIVERSITÀ DI BOLOGNA, ITALY

Sep 2015 - Feb 2016

- Coursework focused on entrepreneurship, innovation, and computer vision.
- App development capable of reading sudoku games and solve them, displaying the final results using augmented reality.

Teaching

TECHNICAL UNIVERSITY OF DENMARK

Teaching Assistant

2024 Spring **42578 Advanced Business Analytics**, Introduction to Computer Vision

INSTITUTO SUPERIOR TÉCNICO

Teaching Assistant

2019 - 2024 Fall **Transport Demand Modelling (PhD level)**, Discrete Choice Models Module

Publications

JOURNALS

- Costa, M.**, Marques, M., Azevedo, C. L., Siebert, F. W., Moura, F. (N/A). Which cycling environment appears safer? Learning cycling safety perceptions from pairwise image comparisons. [Manuscript under review in IEEE Transactions in Intelligent Transportation Systems].
- Costa, M.**, Siebert, F. W., Azevedo, C. L., Marques, M., Moura, F. (N/A). Understanding perception of cycling safety from street-view images: uncovering non-linear relations to urban factors [Manuscript under review in Accident Analysis & Prevention].
- Costa, M.**, Moura, F., Marques, M., Siebert, F. W., Azevedo, C. L. (N/A). Bridging the Gap: A Scoping Review Exploring the Relationship Between Objective and Subjective Cycling Safety [Manuscript submitted to Transport Reviews].
- 2024 **Costa, M.**, Azevedo, C. L., Siebert, F. W., Marques, M., Moura, F. (2024). Unraveling the Relation between Cycling Accidents and Built Environment Typologies: Capturing Spatial Heterogeneity through a Latent Class Discrete Outcome Model. *Accident Analysis & Prevention*, 200, 107533.
- 2022 **Costa, M.**, Marques, M., Roque, C., Moura, F. (2022). CYCLANDS: Cycling geo-located accidents, their details and severities. *Scientific Data*, 9(1), 1-9.
- Costa, M.**, Félix, R., Marques, M., Moura, F. (2022). Impact of COVID-19 lockdown on the behavior change of cyclists in Lisbon, using multinomial logit regression analysis. *Transportation Research Interdisciplinary Perspectives*, 100609.
- 2021 **Costa, M.**, Marques, M., Moura, F. (2021). A Circuity Temporal Analysis of Urban Street Networks Using Open Data: A Lisbon Case Study. *ISPRS International Journal of Geo-Information*, 10(7), 453.

CONFERENCES (WITH PROCEEDIA)

- 2023 **Costa, M.**, Manuel, M., Siebert, F. W., Azevedo, C. L., Moura, F. (2023). Scoring Cycling Environments Perceived Safety using Pairwise Image Comparisons. In *2023 IEEE International Conference on Intelligent Transportation Systems (ITSC)*. IEEE. Bilbao, Spain.
- 2022 Karina Christ, A., **Costa, M.**, Marques, M., Roque, C., and Moura, F. (2022). Perceiving objective cycling safety: a systematic literature review. In *Transportation Research Arena*. Lisboa, Portugal.
- Karina Christ, A., **Costa, M.**, Marques, M., Roque, C., and Moura, F. (2022). Percebendo a segurança objetiva dos ciclistas urbanos: uma revisão sistemática da literatura. In *10º Congresso Rodoferroviário Português*. Lisboa, Portugal.
- Costa, M.**, Marques, M., Moura, F. (2022). Como é que as redes rodoviárias, pedonais e cicláveis mudam ao longo do tempo? Uma análise da retilinearidade em Lisboa, Portugal. In *10º Congresso Rodoferroviário Português*. Lisboa, Portugal.
- 2019 **Costa, M.**, Cambra, P., Moura, F., Marques, M. (2019). WalkBot: A Portable System to Scan Sidewalks. In *2019 IEEE International Smart Cities Conference (ISC2)* (pp. 167-172). IEEE. Casablanca, Morocco.
- Cambra, P., **Costa, M.**, Marques, M. and Moura, F. (2019). WalkBot – Desenvolvimento de um Equipamento de Avaliação da Qualidade da Infra-estrutura Pedonal com Recurso a Processamento de Imagem Tridimensional. In *Congresso Rodoviário Português*. Lisbon, Portugal.
- 2017 **Costa, M.**, Ferreira, B. Q., Marques, M. (2017). A context aware and video-based risk descriptor for cyclists. In *2017 IEEE 20th International Conference on Intelligent Transportation Systems (ITSC)* (pp. 1-6). IEEE. Yokohama, Japan.

CONFERENCES

- 2023 **Costa, M.**, Manuel, M., Siebert, F. W., Azevedo, C. L., Moura, F. (2023). Understanding Perception of Cycling Safety through Pairwise Image Comparisons. *International Cycling Safety Conference 2023*. The Hague, The Netherlands.
- Costa, M.**, Siebert, F. W., Manuel, M., Azevedo, C. L., Moura, F. (2023). Understanding cyclists' perception of safety using eye tracking. *Grupo de Estudos de Transportes 2023*. Oeiras, Portugal.

- 2022 **Costa, M.**, Manuel, M., Siebert, F. W., Azevedo, C. L., Moura, F. (2022). Objective and Subjective Risk Mapping for Urban Cyclists. EIT Doctoral Training Network Annual Forum 2022. Barcelona, Spain.
- Costa, M.**, Manuel, M., Siebert, F. W., Azevedo, C. L., Moura, F. (2022). Cycling Safety Data Augmentation in the Urban Environment: A Barcelona Case Study. International Cycling Safety Conference 2022. Dresden, Germany.
- Costa, M.**, Manuel, M., Siebert, F. W., Azevedo, C. L., Moura, F. (2022). Objective and Subjective Risk Mapping for Urban Cyclists. Grupo de Estudos de Transportes 2022. Porto, Portugal.
- 2021 **Costa, M.**, Manuel, M., Moura, F. (2021). Objective and Subjective Risk Mapping for Urban Cyclists. EIT Doctoral Training Network Annual Forum 2021. Munich, Germany.
- Costa, M.**, Félix, R., Manuel, M., Moura, F. (2021). Impact of COVID-19 lockdown on the Behavior Change of Cyclists in Lisbon, using multinomial logit regression analysis. Transportation Research Board Annual Meeting 2021. Washington DC, USA.
- Costa, M.**, Manuel, M., Moura, F. (2021). Objective and Subjective Risk Mapping for Urban Cyclists. EIT Doctoral Training Network Annual Forum 2020. Munich, Germany.
- 2019 **Costa, M.**, Cambra, P., Manuel, M., Moura, F. (2019). Bike Rider - Sensorial Mapping of Cyclable Paths. Velo-City 2019 'Cycling for the Ages'. Dublin, Ireland.
- 2018 **Costa, M.**, Cambra, P., Manuel, M., Moura, F. (2018). WalkBot: A Portable System to Scan Sidewalks. LARSyS 2018 Annual Meeting. Lisbon, Portugal.
- Costa, M.**, Manuel, M., Moura, F. (2018). Smartbike: Cyclists' Perception of Risk. LARSyS 2018 Annual Meeting. Lisbon, Portugal.
- 2017 **Costa, M.**, Manuel, M., Moura, F. (2017). A Context Aware and Video-Based Risk Descriptor for Cyclists. Ciência 2017 – Meeting with Science and Technology. Lisbon, Portugal.
- 2016 **Costa, M.**, Manuel, M., Moura, F. (2016). Mobility in Cities: Assessing Experiences Using a Smartphone. Ciência 2016 – Meeting with Science and Technology. Lisbon, Portugal.

MSC THESIS

- 2017 **Costa, M.** (2017). Video-Based Risk Assessment for Cyclists. M.S. thesis, Dept. Elect. And Comp. Eng., UTL, IST, Lisbon

Selected Projects

Smartbike

[USERS.ISR.IST.UTL.PT/ MANUEL/SMARTBIKE/](https://users.isr.ist.utl.pt/~manuel/smartbike/)

Mar 2016 – Sep 2018

Development of different metrics to assess the risk perception of a cyclist when riding a bike in an urban scenario. In this domain, the trajectory of the cyclist is considered, as well as other stationary or moving objects in its vicinity, its change in speed, acceleration and its geographic positioning (given by the smartphone) and the effort/stress of the rider, by analyzing their heart rate variability in an ECG.

WalkBot

[USERS.ISR.IST.UTL.PT/ MANUEL/WALKBOT/](https://users.isr.ist.utl.pt/~manuel/walkbot/)

May 2017 – Dec 2018

Development of a device capable of automatically digitalize and map a network of sidewalks in a city. This mapping allows for the development of support applications for guiding pedestrians in cities with various mobility needs. This project was funded by Thales Technov 1st Edition.

Bike Rider

[USHIFT.TECNICO.U LISBOA.PT/BIKERIDER/](https://users.isr.ist.utl.pt/~manuel/bikerider/)

Mar 2018 – Oct 2018

Development of a cyclable network sensorial supported on data captured by cyclists. To create this map we perform cycling maneuvers recognition from inertial data captured by a smartphone. This project was funded by Thales Technov 2nd Edition.

Public Transportation Passenger Tracking & Counting

CONTACT PROF. JOÃO PAULO COSTEIRA (JPC@ISR.TECNICO.U LISBOA.PT)

Mar 2017 – Oct 2018

Tracking and counting passengers system developing. Project part of an audit of a public transportation company for a Portuguese transportation national authority. 3D cameras were used to capture real-time video and automatically track entering or exiting passengers. Data from 10 RGBD cameras was stored and edge-processed inside the vehicle.

Step Home

CONTACT PROF. FILIPE MOURA (FMOURA@TECNICO.U LISBOA.PT)

May 2018 – Dec 2018

Development of a system capable of guiding people suffering from some sort of neurodegenerative disease to a place they know (a reference point which can be their home, a coffee place they know, a doctor) or to a relative. This project was funded by Thales Technov 4th Edition.

Honors & Awards

DOMESTIC

Services

REVIEWING FOR SCIENTIFIC PUBLICATIONS

Journal, **Big Earth Data**, (2024)
 Conference, **Transportation Research Board Annual Meeting**, (2021, 2022, 2023)
 Journal, **Transportation Research Record**, (2022)
 Journal, **IEEE Transactions on Intelligent Transportation Systems**, (2019)

Skills

DEVELOPMENT

Programming Python, Matlab, C++, C, Java, Dart
Web/Database HTML, JavaScript, CSS, PHP, MySQL
Statistical Software IBM SPSS, NLogit
General \LaTeX , Microsoft Word, Excel, PowerPoint, Project, Visio

LANGUAGES

Portuguese Native
English Fluent
Italian Intermediate (speaking)

Extracurricular Courses & Programs

EIT Doctoral Training Network

2020 - 2023

INDIVIDUAL COURSES

Discrete Choice Modeling (2023); Mobility Data Analysis (2022); Entrepreneurship I (2020), II (2021) & III (2022); Sustainable Mobility Strategies (2021); Critical Thinking (2021); Systems Thinking (2021); Communicating Your Ideas - Meeting The Editor (2021); Transforming Urban Mobility: Introduction Of Transport Planning For Sustainable Cities (2020)

2015 CERN Spring Campus

May 1 - 4, 2015

SUMMER SCHOOL

Information Technology; Team work; Science and society; Entrepreneurship; Project Management; Writing a Curriculum Vitae; Job Interview Techniques

Summer residential programme at Churchill House School of English Language

Jul 18 - Aug 1, 2010

SUMMER SCHOOL

English

Volunteering

TreeTree2 - Academia de Verão

ARTICLE REVIEW MONITOR

- Responsible for guiding students aged 15-17 in a scientific review process.

Web Summit

RESPONSE TEAM

- Responsible for registering and guiding attendees during Web Summit.

Banco Alimentar Contra a Fome

FOOD COLLECTION VOLUNTEER

- Responsible for collecting food in a supermarket in Lisbon for a food bank.