

# Miguel Espinosa

PHD STUDENT

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My research lies in the intersection of Computer Vision and Earth Observation. Mainly, I am interested in diffusion models for EO. Other topics include: self-supervised methods for data fusion, representation learning, and adapting foundational models for large domain shifts.

## Education

### PhD in Deep Learning for Earth Observation

UNIVERSITY OF EDINBURGH

Edinburgh, UK

October 2022 - present

- *Diffusion Models in Earth Observation* (supervised by Elliot J. Crowley)
- Part of [SENSE CDT](#) (Center for Doctoral Training in Satellite Data in Environmental Science)

### MSc in Artificial Intelligence

POLYTECHNIC UNIVERSITY OF MADRID · 1ST CLASS HONOURS (~ 93%) [\[FULL TRANSCRIPT\]](#)

Madrid, Spain

September 2021 - June 2022

- **Research:** Collaboration with the *Computer Vision and Aerial Robotics* research department on the improvement of “Facial landmarks detection with deep learning”.
- **Courses:** deep learning, computer vision, multi-agent systems, evolutionary computation, metaheuristic-based intelligent search, autonomous robots, simulation methods

### Artificial Intelligence Course

SAMSUNG INNOVATION CAMPUS [\[CREDENTIALS\]](#)

Madrid, Spain (remote)

May 2021 - July 2021

- **Modules:** Python, libraries, statistics, machine learning (regression, classification, nlp, pca, deep learning)

### BSc in Computer Science (Bilingual)

UNIVERSITY CARLOS III OF MADRID · 1ST CLASS HONOURS (~ 87%) [\[FULL TRANSCRIPT\]](#)

Madrid, Spain

September 2017 - May 2021

- **Final graduation:** “Self-awareness in a UAV swarm for the complete coverage of its surroundings” (97%)
- **Courses:** machine learning, neural networks, genetic algorithms, advanced theory of computation, discrete maths, statistics, linear algebra, calculus, differential calculus, data structures, logic, artificial intelligence

## Experience

### Canon Medical Research Europe Ltd.

AI RESEARCH INTERN

Edinburgh

June 2022 - August 2022

- *Research in NLP for Clinical Temporal Relation Extraction.*
- Data analysis, exploration, design and implementation of ML models for the extraction of temporal relations from non-structured clinical text.

### MeVitae

ALGORITHM DEVELOPER INTERN

Oxford (remote)

July 2021 - September 2021

- *Research in ML for natural language (NLP) to solve open-ended problems.*
- Optimisation of the address detection and redaction in the CV pipeline. Intensive research on state-of-the-art methods for address extraction and NLP text processing. Provided valuable information for the company with detailed presentations and weekly reports. Carried out the implementation of an efficient solution in C#.
- Responsible for the entire process, from idea origination and research, to implementation and putting into production. Received close mentorship from experienced professionals.

### Huawei Technologies R&D (UK) Ltd.

RESEARCH INTERN

Edinburgh Research Center (remote)

June 2020 - September 2020

- *Responsible for analysis of the DL framework built on Julia programming language.*
- Contribution to MindSpore DL framework and its integration with Julia as front-end language. Specifically, worked in accomplishing source-to-source code generation for the forward and backwards pass with automatic differentiation.
- Carried out research in reinforcement learning, providing in-depth analysis and insights in this field of study. Received close mentorship from experienced professionals.

## Publications

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### Generate Your Own Scotland: Satellite Image Generation Conditioned on Maps

[pdf] [code]

NEURIPS 2023 WORKSHOP ON DIFFUSION MODELS

- Pretrained diffusion models can be conditioned on cartographic data to generate realistic satellite images.
- We explore the use of historical maps (1888) to generate

### Self-awareness for complete coverage metrology using autonomous systems

[pdf] [code]

2022 IEEE INTERNATIONAL WORKSHOP ON METROLOGY FOR AEROSPACE

## Projects

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### Exploring Siamese Networks for Facial Landmark Detection

[pdf]

MSc THESIS

- Robustly retrieve high-level concepts, such as landmarks, from facial images.
- Research supervised siamese learning to improve facial landmark detection accuracy.

### Self-awareness in a swarm of drones for the complete coverage of its environment

[pdf] [code]

BSc UNDERGRADUATE THESIS

- Study, implement and test a distributed algorithm based on the anti-flocking meta-heuristic.
- Research the concept of self-awareness and the emergence of a complex intelligent behaviour born out of individual self-organized agent interactions.

## Awards

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### Jose Cuenca Excellence Award

Madrid, Spain

POLYTECHNIC UNIVERSITY OF MADRID

April 2022

- Distinction (with financial reward) awarded to 5 students with highest academic records in the MSc degree.

### Research Fellowship

Madrid, Spain

POLYTECHNIC UNIVERSITY OF MADRID

January 2022 - May 2022

- Collaboration with the *Computer Vision and Aerial Robotics* research department.

### Excellence Grant (x2)

Madrid, Spain

COMUNIDAD DE MADRID

2019-2020 | 2020-2021

- University students with excellent academic achievement.
- Requirements: average grade higher than 8.15, pass all subjects in the ordinary call

## Languages

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**Spanish** Native

**Catalan** Native

**English** Proficient, fluent

IELTS - 7.5 (Overall Band Score)

[certificate]

Duolingo English Test - 145

[certificate]

## Technical Skills

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**Languages** Python (Numpy, Matplotlib, Scikit-learn, Pandas), Java, C++, Shell

**Frameworks** PyTorch, Tensorflow

**Other** Git version-control, Latex, Linux OS, Django

## Transferable Skills

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**Team work** Worked on joint projects during my internships and my BSc.

**Activity leader** Volunteered the past 6 years in leisure activities and summer camps as organizer, instructor and group leader.

**Music** Play the piano. It opens up my mind and improves my creativity. I have composed some songs of my own.