Juan Esteban Lamilla Cuellar

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Profile

Data Scientist specialized in applying advanced geospatial analysis to improve urban environments. Highly experienced with Python programming, machine learning, and geographical information systems (GIS). Demonstrated skills in predictive modelling through a MSc. in Urban Spatial Science at the University College London (UCL), developing deep learning tools for the United Nations, and conducting global research on infrastructure resilience.

Education

MSc. Urban Spatial Science — with Distinction Sept. 2023 – Sept. 2024
University College London (UCL) *London, UK*

- **Courses include**: Urban Systems Theory, Data Science for Spatial Systems, Urban Simulation.
- Completed both the Modelling & Simulation and Data Visualisation pathways.

Honours BSc. in Geographic Information Systems (GIS) Sept. 2018 – June 2023
University of Toronto - Major GPA: 3.95 *Toronto, Canada*
Minors in Mathematical Sciences and Business

- **Courses include**: Spatial Data Science, Data Structures & Analysis, Computer Organization & Architecture, Geographic Information Analysis & Processing.

Professional Experience

Research Associate (Data Science) Dec. 2023 – Present
Alliance to Feed the Earth in Disasters (ALLFED) *Remote*

- Transitioned from intern role in order to lead and manage multiple research projects on global water infrastructure vulnerability while fostering collaboration with a multidisciplinary team of international researchers.
- Developed a novel methodology leveraging climate modelling data alongside geostatistics and mathematical modeling techniques with Python, resulting in identification of 5 to 9 million km of vulnerable water infrastructure.
- Drafted scientific manuscript, communicating research findings on a global scale and informing policy decisions for disaster resilience with impact potentially reaching over 2 billion individuals across 86 countries.
- Created webpages and online dashboards for sharing spatiotemporal data throughout the organization utilizing HTML/CSS/JavaScript (Leaflet) and Python (Streamlit).
- Recognized for experience in spatial analysis, becoming source for spatial analysis and cartography within the research team, helping design company-wide spatial data guidelines and standards, and producing maps for academic publication (ArcGIS, Python, QGIS).
- Worked collaboratively with the University of Canterbury Department of Engineering, providing geospatial technical, programming, and research support for graduate students.

Data Science Intern Oct. 2023 – Dec. 2023

Student Employee at Mining Operations May 2020 – Feb. 2022 (Seasonal)
Rio Tinto – Iron Ore Company of Canada *Labrador City, Canada*

Lead Python Developer Sept. 2019 – Oct. 2020
Toronto Overwatch Community League *Toronto, Canada*

- Developed automated Python program (w/ *Heroku* & *PostgreSQL*) to track and display comprehensive statistics for a 300+ participant esports league, employing OOP principles for managing extensive datasets.

Teaching Experience

Teaching Assistant Sept. 2022 – June 2023

University of Toronto – Institute for Management & Innovation (IMI) *Toronto, Canada*

- Assisted in grading assignments and leading discussion sessions for undergraduate courses, providing academic support to both students and faculty in classes upwards of 200 students.
- Utilized Learning Management System (Canvas) to organize course resources, post assignments, and provide timely feedback to students, ensuring seamless virtual course administration.

Technology and Programming Tutor June 2022 – Present

Varsity Tutors *Remote*

- Delivered personalized online instruction in Python programming, computer science, web development, game development, math, and more to a diverse range of students, including children, young adults, and adult professionals.
- Tailored lesson plans to meet the unique learning goals of each student, fostering skill advancement in coding and technical subjects for both beginners and experienced learners.

Section Leader June 2021 – August 2022 (Seasonal)

Code in Place – Stanford University *Remote*

- Prepared and taught a weekly discussion section of 10-15 students to supplement professors' lectures in an introductory online Python programming course, building relations and utilizing skills in people management.
- Reviewed students' work, assignments, and eventually their final projects. Giving advice and suggestions to lead students towards success while helping them learn the material.

Cross Country Ski Instructor 2014 – 2018 (Seasonal)

Strathcona Wilderness Centre *Strathcona County, Canada*

MSc. Dissertation

- **Title**: *Anticipating Precarious Areas in Tegucigalpa: A Temporal Unsupervised Deep Learning Satellite Approach*

  Objective: Working alongside the United Nations Innovation Technology Accelerator for Cities (UNITAC), developed a data pipeline utilizing unsupervised deep learning and satellite imagery to map and predict the formation of precarious areas in Tegucigalpa, Honduras. This project aims to support targeted interventions in areas vulnerable to inadequate infrastructure and natural disasters.

  Technical Approach

  * Implemented convolutional neural network architecture for feature extraction from satellite image tiles, followed by testing of various clustering methods to classify urban land cover types over a multi-year period.
  * Created the **ELOISA Python library** to automate data processing, feature extraction, clustering, and temporal analysis, leveraging Google Earth Engine for potential global applications.

  Key Findings

  * Identified spatial autocorrelation patterns in urban clusters, showing promise for unsupervised detection of precarious regions.
  * Achieved significant spatial clustering despite computational constraints, with future potential for improved precision through model refinement.

  Impact and Future Potential

  * Demonstrates a scalable approach to identifying vulnerable urban regions across multiple geographies.
  * Provides actionable insights to aid local governments and humanitarian organizations in resource allocation, supporting UN-Habitat and UNDP efforts to monitor and assist precarious urban settlements globally.

Research in Progress

Assessing the Vulnerability of the Global Underground Water Supply Network to Nuclear Winter Conditions Nov. 2023 - Present

- Used climate modeling and geospatial satellite analysis of water networks to assess risks from abrupt cooling events, like nuclear winter, identifying regions where up to 9 million kilometers of pipelines could freeze.

Nuclear Winter Subterranean Infrastructure Protection Apr. 2024 - Present

- Strategies to mitigate risks from nuclear winter on subterranean infrastructure, using COMSOL Multiphysics for heat transfer modeling and GIS for infrastructure analysis, focusing on scalable solutions to prevent pipe freezing.

Stalks, Stems, Leaves - Assessing the Potential to Sustain Global Ruminant Populations from Agricultural Residue Inventories. Sept. 2024 - Present

- Developing cloud geospatial model (Google Earth Engine) to assess feasibility of sustaining global ruminant populations on agricultural residues, evaluating potential to divert livestock feed to humans and increase food availability during global catastrophes.

Sample of Other Projects

Comprehensive portfolio with additional projects available here: **juaneslamilla.github.io**

Predicting Air Quality in London | *Python, TensorFlow, Scikit-Learn* Mar. 2024

- Increased spatio-temporal resolution of air quality data by nearly 350% through the innovative use of models including PLS, SARIMAX, and LSTM networks, and spatial analysis techniques like Moran's I and Geographically Weighted Regression (GWR).
- Winner of Centre for Urban Science and Progress (CUSP) London Data Dive - Best Technical Contribution Award.

Land Cover Classification Model for Cuba | *Python, Random Forest, XGBoost, CNN, Keras* Mar. 2024 – Apr. 2024

- Developed a machine learning pipeline using satellite data to classify and monitor land cover in Cuba, achieving 95% accuracy with a CNN model, surpassing global models in precision and F1-score.
- Applied the model to analyze land cover changes over 10 years, providing insights into environmental shifts such as the correlation between forest cover fluctuations and economic downturns.

Classified Sprawl Analysis | *ERDAS Imagine, Google Earth Engine, JavaScript* Nov. 2022 – Dec. 2022

- Utilized ERDAS Imagine and GEE (JavaScript) on Landsat imagery to create NDBI maps for building land cover classes across a 20 year timespan in Guelph, CA & Winterthur, CH.
- Leveraged threshold segmentation based approach alongside supervised classification and post-classification change detection maps with overall classification accuracy of 88-92%.

Volunteering

Vice President Finance Sept. 2021 – Aug. 2022

Latin American Students Association – University of Toronto *Toronto, Canada*

- Utilized business analysis and conflict management skills to advise members on finances, preparing annual budgets and biannual audits, resulting in a 24% budget surplus margin, a significant improvement from previous deficits.

Professional Development

Professional Certificate in Data Science Jan. 2021 – Dec. 2021

Harvard University – 9 Course / 1-year program *Remote*

- R programming skills alongside statistical concepts such as probability, inference, modelling, and machine learning.

Tech Fluency, Skills, and Tools

Languages: English (Native Proficiency), Spanish (Native Proficiency), French (CECR language level B1)

Programming: Python (7 years), R (5 years), JavaScript (3 years), HTML/CSS, Swift, Java, Kotlin, C, C++

GIS Tools: ArcGIS Pro/Online/Desktop (5 years), Google Earth Engine (3 years), GRASS, QGIS, GeoDa, FME

AI & ML: Keras, Tensorflow, PyTorch, Scikit-Learn — **Database**: SQL (3 years), Firebase, GCP

Tools: Linux/Unix, Git/Github, Tableau, Adobe CC, MS Office (Excel, PowerPoint), Google Workspace (Docs, Sheets)

References

Dr. Esra Suel

Associate Professor — *University College London (UCL) - Center for Advanced Spatial Analysis*

Senior Scientist — *ETH Zurich - Future Cities Lab*

- Email: e.suel@ucl.ac.uk

Dr. David Denkenberger

Associate Professor — *University of Canterbury - Faculty of Engineering*

Director & Co-founder — *Alliance to Feed the Earth in Disasters (ALLFED)*

- Email: david.denkenberger@canterbury.ac.nz

Michael Hathorn

Data Scientist — *United Nations Innovation Technology Accelerator for Cities (UNITAC)*

- Email: michael.hathorn@un.org