europass

Ken Koshy Varghese

Date of birth: 17/09/1994 | **Nationality:** Indian

ABOUT ME

I am a civil engineer holding a Master's degree in Transportation Systems Engineering. With expertise in transportation modelling, traffic engineering, and deep learning, I am currently pursuing a PhD in Transportation Engineering. My research focuses on the application of cutting-edge technologies such as machine learning, deep learning, and reinforcement learning in transportation modelling. I am deeply passionate about driving innovation in transportation systems and solving complex challenges. Let's connect and explore how we can collaborate to shape the future of transportation.

WORK EXPERIENCE

01/01/2022 – CURRENT Rome, Italy

RESEARCHER PHD CANDIDATE SAPIENZA UNIVERSITÀ DI ROMA

- Developed a novel approach for calibrating shortest path on OpenStreetMap (OSM) data by implementing "routing factors" to adjust travel costs across different road types, aligning OSM routes with benchmark routes. Performed a case study on the Rome road network, demonstrating significant reduction in RMSE and validating the model for new random points.
- Pioneered a study predicting road traffic accident severity in Rome, leveraging a comprehensive dataset spanning 2006 to 2022. Employed advanced techniques like one-hot encoding, Synthetic Minority Over-sampling Technique (SMOTE), and conformal prediction to enhance model performance, reliability, and interpretability.
- Developed an innovative method for transport mode detection in urban areas using mobile magnetometer sensor data from metro riders. Implemented a station counter algorithm to accurately count the number of metro stations in trips where GPS, internet, and wireless positioning were unavailable.
- Investigated the impact of spaces and time granularity for demand forecasting, utilizing deep learning models like Long Short-Term Memory (LSTM), Convolution Neural Networks (CNN), and Temporal-Guided Networks (TGNet) with a grid-based tessellation strategy.

22/04/2022 – 01/07/2023 Rome, Italy

SOFTWARE DEVELOPER INTERNSHIP PTV GROUP

- Maintained and gained expertise in the adaptive traffic signal control software, "Balance" and "Epics," developed by PTV Group.
- Assisted in identifying and resolving software bugs to ensure smooth and efficient traffic signal operations.
- Provided exceptional support to clients, addressing their inquiries and concerns promptly and effectively.
- Contributed to a proof of concept assignment with RTA in Dubai, successfully testing and implementing the traffic signal software on real traffic junctions.
- Developed and implemented robust Continuous Integration/Continuous Deployment (CI/CD) pipelines using Jenkins for Balance and Epics softwares.

01/10/2017 – 30/09/2018 Dubai, United Arab Emirates

GRADUATE ENGINEER ECOCOAST CONTRACTING LLC

- Project engineer of 3 large scale projects in the U.A.E. (Saadiyat Island Beach Re-profiling, Hidd Al Saadiyat Yacht Club & Marina Piling, Bluewater Beach Restoration)
- Implemented and monitored project progress and used MS Excel to prepare daily assessment reports.
- Checking technical designs and drawings to ensure that they are followed correctly.
- Managed a team of 15 personnel during construction activities. Observed existing processes, analysed staff performance and addressed deficiencies as per HSE, equipment and labour requirements
- Liaising with consultants and subcontractors for approval of works, inspections and RFI

01/12/2015 – 30/01/2016 Dubai, United Arab Emirates

INTERNSHIP PROJECTS LINK CONSTRUCTION LLC

- Part of one of the biggest Waterfront projects in the Middle East. Project: La Mer Jumeirah; Client: Meras Developers; Consultant: Sogreah Group Artelia.
- Assisted senior QC Eng. in carrying out inspections and preparing Inspection Test Reports (ITR).
- Inspected crown wall, trench filling, armour placement, armour trimming etc. and monitored the on-site processes to meet the required specifications and standards.

EDUCATION AND TRAINING

01/01/2022 – CURRENT Rome, Italy

DOCTOR OF PHILOSOPHY-PHD Sapienza Università di Roma

Address Via Eudossiana, 18, 00184, Rome, Italy | **Website** https://www.uniroma1.it/it/

23/09/2018 – 28/07/2021 Roma, Italy

MASTER'S IN TRANSPORT SYSTEMS ENGINEERING Sapienza University of Rome

Projects Done:
1) Viterbo Provincial Public Transportation Plan.
   - Estimation of supply and demand.
   - Creation of O/D matrix.
   - Re-design of existing transit plan and suggested solutions for the critical areas.
2) Signal Setting Design of Via Cristoforo Colombo, Rome
   - On-field survey of traffic flow through the intersections.
   - Calculated saturation flow, lane group capacity, delay, and LOS as per the highway capacity manual.
   - Optimization and Synchronization of the intersections.
3) Railway Engineering
   - Calculations of speed on curves, determination of horizontal and vertical transitions, timetable design, running spaces and times, signal positioning, capacity calculations, stations routes schematization
   - Calculations of slope, force on flanges, loads distribution, vertical accelerations and frequency, traction power, locomotive's mass.

Address Via Eudossiana, 18, 00184, Roma, Italy | **Website** https://www.uniroma1.it/it |

Thesis Demand Forecasting for On-Demand Mobility using Deep Neural Networks

13/08/2013 – 13/04/2017 Kerala, India

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING SCMS School of Engineering and Technology

Address Vidya Nagar, Palissery, Karukutty, Ernakulam, 683 576 , Kerala, India | **Website** https://www.scmsgroup.org/sset/ |

Thesis Carbon Footprint Estimation of a High-Rise Building: Planning Low Carbon Measures.

LANGUAGE SKILLS

Mother tongue(s): **MALAYALAM**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	C1	C1	C1	C1	C1
ITALIAN	A2	A2	A2	A2	A2
HINDI	C1	C1	C1	C1	C1

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

Java Script | Python | Deep Learning (Tensorflow, Pytorch(basic), Jax/Flax(basic)) | Machine learning | Data Analysis Data Validation Data Cleansing | C# (basic) | Reinforcement learning | AutoCAD | Visum and Vissim (Basic)

PUBLICATIONS

2024

Machine Learning-Enhanced Conformal Prediction Approach for Road Traffic Accident Severity Assessment: A Case Study of Rome

- Conducted an in-depth analysis using a dataset spanning from 2006 to 2022.
- Applied advanced techniques including one-hot encoding, Synthetic Minority Over-sampling Technique (SMOTE), and conformal prediction to enhance model performance and reliability.
- Leveraged the Extreme Gradient Boost (XGBoost) algorithm, achieving a notable 77% accuracy rate.
- Utilized SHapley Additive exPlanations (SHAP) for model interpretability, highlighting key factors such as vehicle type, accident nature, and road shape.
- Developed a comprehensive, efficient, and transparent method for predicting road accident severity, providing valuable insights for road traffic safety and preventive strategies.

Mohamed Eldafrawi, Ken Koshy Varghese, Marzieh Afsari, Mahnaz Babapourdijojin, Guido Gentile

2023

Inferring Station Numbers in Metro Trips Using Mobile Magnetometer Sensor via an Unsupervised K-means Clustering Algorithm

- Conducted research on transport mode detection in urban areas using mobile phone sensors, focusing on scenarios where traditional positioning systems (GPS, internet, WiFi) are unavailable.
- Developed and implemented a novel approach to count the number of stations in metro trips using a magnetometer sensor.
- Analyzed data recorded via mobile magnetometer sensors from metro riders in Rome and Stockholm.
- Identified contextual features to recognize acceleration states based on 3D magnetometer data.
- Applied k-means unsupervised classification to categorize different transport modes.
- Designed and tested a station counter algorithm, achieving 86% accuracy in counting metro stations without GPS, internet, or WiFi.

Seyed Hassan Hosseini, Guido Gentile, Ken Koshy Varghese, Lory Michelle Bresciani Ministice

2023

Effect of Spatio-Temporal Granularity on Demand Prediction for Deep Learning Models

- Conducted advanced research on Spatio-temporal demand modeling using large-scale GPS data for transportation systems.
- Investigated the effects of spatial and temporal granularity on prediction accuracy within a Spatio-temporal framework.
- Utilized state-of-the-art deep learning models including Long Short-Term Memory (LSTM), Convolutional Neural Networks (CNN), and Temporal-Guided Networks (TGNet) for forecasting taxi demand in New York City.
- Implemented a grid-based tessellation strategy to model data and assess performance variations across different levels of granularity.

Ken Koshy Varghese, Sajjad Mahdaviabbasabad, Guido Gentile, Mohamed Eldafrawi

CONFERENCES AND SEMINARS

17/06/2024 – 20/06/2024 Rome, Italy

24th EEEIC International Conference on Environment and Electrical Engineering

The research paper titled "A Framework for Calibrating Shortest Path on Open-source Networks with Routing Services" was accepted and presented for the Special Sessions: Transport systems and sustainable mobility.

07/01/2024 – 11/01/2024 Washington D.C, USA

2024 Transportation Research Board Annual Meeting (TRB 2024)

The research paper titled "Machine Learning-Enhanced Conformal Prediction Approach for Road Traffic Accident Severity Assessment: A Case Study of Rome" was accepted and presented for the Poster Sessions: Safety Performance and Analysis.

14/06/2023 – 16/06/2023 Nice, France

8th International Conference on Models and Tech nologies for Intelligent Transportation Systems (MT ITS)

The research paper titled "Inferring Station Numbers in Metro Trips Using Mobile Magnetometer Sensor via an Unsupervised K-means Clustering Algorithm" was accepted and presented for the Sessions: Public Transport.

19/10/2022 – 22/10/2022 Riga, Latvia

22nd International Multi-Conference Reliability and Statistics in Transportation and Communication

The research paper titled "Effect of Spatio-Temporal Granularity on Demand Prediction for Deep Learning Models" was accepted and presented for the Sessions: AI in Transportation

CERTIFICATES

12/05/2023 – 12/06/2023

Artificial Intelligence A-Z 2023: Build an AI with ChatGPT4

- Theory behind Artificial Intelligence.
- Master the State of the Art AI models.
- Solve Real World Problems with AI.
- Q-Learning.
- Deep Q-Learning.
- Deep Convolutional Q-Learning.
- A3C (Asynchronous Advantage Actor-Critic).

20/03/2023 – 21/03/2023

PTV Academic Exercises – PTV Visum

- PTV Visum GUI overview.
- Creation of network objects.
- Explore the attributes of the network objects.
- Practice inserting travel demand.
- Practice running trip assignment.
- Performing basic analysis of the network.

15/03/2023 – 16/03/2023

PTV Academic Exercises – PTV Vissim

- PTV Vissim GUI overview.
- Intersection geometry: placing Links and Connectors.
- Creating Vehicle types, Classes, and Compositions.
- Placing and configuring static demand.
- Configuring Speed Profiles and Speed Reductions.
- Conflict Areas configuration.
- Signal Control.

11/01/2022 – 01/02/2022

Sequences, Time Series and Prediction

- Learned unique techniques involved when handling sequential time series data.
- Explored recurrent neural networks, a type of model that performs extremely well on temporal data, and several of its variants, including LSTMs, GRUs and Bidirectional RNNs.

14/09/2021 – 01/11/2021

Machine Learning in Production

- Introduction to machine learning production systems focusing on their requirements and challenges.
- Identify the key components of the ML Lifecycle.
- Define “concept drift” as it relates to ML projects.
- Compare and contrast the ML modeling iterative cycle with the cycle for deployment of ML products.
- List the typical metrics you might track to monitor concept drift.

16/01/2021 – 19/01/2021

Clustering Geolocation Data Intelligently in Python

- Clean and preprocess geolocation data for clustering.
- Visualize geolocation data interactively using Python.
- Cluster this data ranging from simple to more advanced methods, and evaluate these clustering algorithms.

VOLUNTEERING

30/09/2020 – CURRENT Rome, Italy

Parrocchia S.S Redentore Mensa(Caritas)

- Aiding in the production and distribution of food and necessary commodities for the homeless and needy.

31/12/2015 – 31/12/2016 Kerala, India

Helping Hands Organization

- Assisted in building shelter homes for the homeless.
- Headed the organizing committee responsible for inspiring, motivating and lifting the spirits of orphans and abandoned elderly.

03/04/2013 – 03/04/2013 Dubai, United Arab Emirates

Dubai Clean-up drive volunteer

- Volunteered for the 3R (Reduce, Reuse and Recycle) movement and helped city council in cleaning up the public area.