Usman Ali

BS & MS Computer Science · PhD (AI & Data Science) · AI for Sustainability & Energy · Open Science

Dublin, Ireland mail.usmanali@gmail.com ORCID: 0000-0002-4584-4149 Google Scholar
Stamp 4 — eligible to work in Ireland

Computer scientist and data scientist with a BS and MS in Computer Science and over nine years of experience in artificial intelligence, machine learning and large-scale national data analytics applied to sustainability and energy systems. PhD from University College Dublin, thesis centred on AI and data-driven methods applied to national datasets covering 3M+ building records — work that earned the **Best Research Paper of the Year 2023 and 2024** from Energy and Buildings (Elsevier). Currently leading AI and data analytics for Ireland's National Building Renovation Plan at the **Sustainable Energy Authority of Ireland (SEAI)**, while holding an Adjunct Assistant Professor position at **University College Dublin (UCD)** — bridging national policy delivery with academic research. Seven years of university teaching across three institutions. Committed to open, reproducible, FAIR research.

1,727	15	18	30+	7+ yrs	9+ yrs
CITATIONS	H-INDEX	I10-INDEX	PUBLICATIONS	TEACHING	CS/AI RESEARCH

★ **Best Research Paper of the Year 2023 and 2024** (Publisher & Editor-in-Chief Selection, Elsevier *Energy and Buildings*) — "Urban Building Energy Performance Prediction and Retrofit Analysis Using Data-Driven ML Approach," *Energy and Buildings*, Vol. 303, 15 Jan 2024, 113768.

ADVANCED AI EXPERTISE — CORE RECRUITMENT SKILLS

Large Language Models (LLMs) · LangChain & RAG Pipelines · Agentic AI & LLM Integration · Explainable AI (SHAP) · Ensemble ML (XGBoost, LightGBM) · Knowledge Graphs (Neo4j) · GeoComputation & GIS · Azure ML & Cloud MLOps · Time-Series & Uncertainty Quantification · Deep Learning (TensorFlow, PyTorch) · Open Science & Reproducible ML

RESEARCH HIGHLIGHTS

National-Scale AI Framework for Energy Policy (SEAI, 2024–present): Leading AI/ML programme for Ireland's National Building Renovation Plan across 1M+ property records. Core methods: XGBoost, random forest, ensemble ML, Python, Azure cloud, Power BI — all under open science principles.

AI for National Building Energy Analysis: Open-source Python ML frameworks processing 3M+ building data points for energy performance prediction and retrofit decision-support at national scale; validated against physics-based simulation, cited 244+ times (Applied Energy, 2020).

Knowledge Graphs & Graph-Based AI: Designed a Neo4j knowledge graph integrating 8M+ data points across building information, energy simulation records and national datasets.

International AI & Sustainability Collaborations: Led joint research with the University of Pennsylvania (USA) and Ulster University (UK) on AI-driven models for residential energy efficiency and GHG reduction. Funded by SEAI, SFI and the US NSF.

Open Science Practices: All research code on GitHub under open licences; datasets registered with persistent identifiers (DOI via Zenodo); reproducible Jupyter/Python environments published alongside every paper.

PROFESSIONAL EXPERIENCE

Senior Data Analyst — National Energy `INDUSTRY`

Jul 2024 – Present

Sustainable Energy Authority of Ireland (SEAI)

- Lead AI/data analytics for Ireland's National Building Renovation Plan; ML pipelines across 1M+ records on Azure
- XGBoost, random forest & ensemble models for national retrofit prioritisation and decarbonisation impact assessment
- Build open, reproducible analytics infrastructure; collaborate with government and international researchers

Adjunct Assistant Professor `ACADEMIA`

Jul 2024 – Present

University College Dublin

- Supervise PhD/MSc students in ML, AI for energy systems and sustainability data science
- Contribute to postgraduate curriculum; deliver guest seminars on AI methods and open science

Senior Energy Researcher & Data Scientist ACADEMIA 2022 – Present
University College Dublin
- ML frameworks processing 2M+ building data points for national sustainability analysis
- Led NSF-funded collaboration with UPenn and Ulster University; designed Neo4j knowledge graph (8M+ points)

Consultant Data Scientist INDUSTRY 2022 – 2024
Department for the Economy, Northern Ireland
- Multi-scale ML platform for decarbonisation analysis across Northern Ireland; regional policy impact
- Python-based AI decision-support dashboard deployed to government stakeholders

Senior Energy Policy Researcher INDUSTRY 2021 – 2022
SEAI and University College Dublin
- Led review/enhancement of Ireland's national dwelling energy assessment methodology (DEAP)
- Developed PV integration methodology adopted into national BER certification standards

PhD Researcher — Building Energy Systems ACADEMIA 2017 – 2020
University College Dublin
- AI/ML frameworks for national residential building stock — 3M data points, GIS-integrated
- Open-source surrogate ML platform validated against EnergyPlus simulation

Data Analyst INDUSTRY Jan – Dec 2019
Sustainable Energy Authority of Ireland (SEAI)
- ML predictive models for Ireland's national Building Energy Rating (BER) system

Teaching Assistant & Demonstrator ACADEMIA 2017 – 2020
University College Dublin
- Labs/tutorials — Engineering Computing, Advanced Data Structures, Data Analysis

Lecturer — 8 Modules, Full Responsibility ACADEMIA 2013 – 2015
University of Management and Technology (UMT), Lahore
- AI, Databases, Software Engineering, Data Structures, OOP — cohorts of 40–80 students

Senior Research Associate ACADEMIA 2008 – 2016
Lahore University of Management Sciences (LUMS)
- Smart Grid energy management; AI for energy-demand forecasting

EDUCATION

PhD — Machine Learning & Data Science 2017 – 2020
University College Dublin
- Thesis: "A Data-Driven Approach for Multi-Scale Building Energy Modeling for Analysis, Planning and Support Decision Making." Supervisors: Prof. James O'Donnell, Prof. Eleni Mangina

MS — Computer Science 2011 – 2013
Lahore University of Management Sciences (LUMS), Pakistan
- AI, machine learning, data mining, software engineering, algorithms

BS — Computer Science 2004 – 2008
International Islamic University, Islamabad, Pakistan
- Algorithms, data structures, AI, databases, software engineering, OOP

SELECTED PUBLICATIONS — 1,727+ CITATIONS, GOOGLE SCHOLAR

1. Ali, U., Shamsi, M.H., Hoare, C., Mangina, E., O'Donnell, J. (2021). Review of urban building energy modeling (UBEM) approaches, methods and tools using qualitative and quantitative analysis. *Energy & Buildings, 246.* **458 citations**

2. Ali, U., Shamsi, M.H., Bohacek, M., Hoare, C., Purcell, K., Mangina, E., O'Donnell, J. (2020). A data-driven approach for multi-scale GIS-based building energy modeling for analysis, planning and support decision making. *Applied Energy, 279.* **244 citations**

3. Ali, U., Hewitt, N., Bano, S., Shamsi, M.H., Sood, D., Hoare, C., Zuo, W., O'Donnell, J. (2024). Urban building energy performance prediction and retrofit analysis using data-driven machine learning approach. *Energy and Buildings, 303.* **208 citations · Best Paper 2023–24**

4. Ali, U., Shamsi, M.H., Bohacek, M., Hoare, C., Purcell, K., Mangina, E., O'Donnell, J. (2020). A data-driven approach to optimize urban scale energy retrofit decisions for residential buildings. *Applied Energy, 267.* **162 citations**

5. Ali, U., Shamsi, M.H., Hoare, C., Mangina, E., O'Donnell, J. (2019). A data-driven approach for multi-scale building archetypes development. *Energy and Buildings, 202.* **162 citations**

6. Shamsi, M.H., Ali, U., Mangina, E., O'Donnell, J. (2021). Feature assessment frameworks to evaluate reduced-order grey-box building energy models. *Applied Energy, 298.*

7. Hoare, C., AlQazzaz, T.B.M., Ali, U., Hu, S., O'Donnell, J. (2023). Development of a National Scale Digital Twin for Domestic Building Stock. *Elsevier.*

8. Ali, U., Bano, S., Shamsi, M.H., Sood, D., Hoare, C., Zuo, W., Hewitt, N., O'Donnell, J. (2024). Urban residential building stock synthetic datasets for building energy performance analysis. *Data in Brief, 53.* **11 citations**

9. Ali, U., Shamsi, M.H., Hoare, C., O'Donnell, J. (2019). Application of intelligent algorithms for residential building energy performance rating prediction. *16th IBPSA Building Simulation 2019.*

Full list of 30+ publications on Google Scholar and ORCID.

HONOURS, AWARDS & FUNDING

- **Best Research Paper of the Year 2023 & 2024**
  Energy and Buildings (Elsevier) — Publisher & Editor-in-Chief Selection
- **Top Cited Paper Award (2020)**
  UCD School of Engineering
- **Research Funding**
  SEAI, Science Foundation Ireland (SFI), US NSF, Dept. for the Economy (NI)
- **2nd Prize — UCD Research Communicating Impact**
  Data Visualisation category
- **2nd Prize (USD 500) — SOFTEC**
  13th National & 4th International Software Exhibition
- **Google Project Management Specialization**
  Google Certification, 2023

TECHNICAL SKILLS

CORE LANGUAGES	**Python (advanced)**, R, SQL, Java, C++, MATLAB, Bash
AI / ML & LLM STACK	scikit-learn, XGBoost, LightGBM, TensorFlow, PyTorch, **LangChain, RAG pipelines, LLM integration**, SHAP
CLOUD & DATA ENG.	Azure (DevOps, Data Factory, Databricks, Azure ML), Docker, GitHub Actions, AWS, GCP
GEO & DOMAIN	GeoPandas, QGIS, ArcGIS, EnergyPlus, DesignBuilder, DEAP, Revit
DATABASES & GRAPH AI	**Neo4j (knowledge graphs)**, MongoDB, MySQL, PostgreSQL, SQL Server, Microsoft Fabric
OPEN SCIENCE / DEV	Git/GitHub, Zenodo, ORCiD API, conda/pip, Django, Flask, Streamlit, Jupyter

PROFESSIONAL SERVICE

Peer Reviewer — *Energy and Buildings, Applied Sciences, Nature Energy*. Mentor, SEAI Data Analytics Community of Practice. Co-supervisor of MSc/PhD students in ML and AI for energy systems at UCD. International presenter — IBPSA, EC3, CLIMA, SimBuild, BSO, CISBAT.