

Sobia Bano

AI & Data Science Researcher · Energy & Sustainable Buildings · PhD
Candidate, University College Dublin

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Google Scholar



AI & Data Science researcher bridging **advanced machine learning, LLMs and agentic AI systems** with **energy and sustainable-buildings research**. PhD candidate at the UCD Energy Institute building AI-driven methodologies for building life-cycle assessment — integrating LLM-powered knowledge systems, retrieval-augmented generation and predictive modelling with real-world energy and carbon datasets. 219+ citations, 6 publications, and a decade of software engineering experience spanning academic research software and industry product development. Seeking postdoctoral, applied research, or industry AI/data roles in **energy, sustainability and applied AI**.

ADVANCED AI EXPERTISE

Large Language Models (LLMs) Agentic AI Systems Multi-Agent Orchestration Tool-Calling & Agent Loops
Retrieval-Augmented Generation (RAG) GraphRAG & Knowledge Graphs Claude & GPT LLM Integration
Prompt Engineering & Chain-of-Thought Vector Search & Embeddings LLM Evaluation & Fine-Tuning
Semantic Web & Ontologies GIS & Spatial Data Analysis Model Deployment (MLOps) Applied Deep Learning

CORE COMPETENCIES

Machine Learning & Predictive Modelling Data Science (Python, Pandas, NumPy)
NLP & Knowledge-Based Systems Research Software Development Building Life-Cycle Assessment (LCA)
Embodied Carbon & Energy Analytics Urban-Scale Building Energy Modelling
Research Supervision & Academic Mentoring

PROFESSIONAL EXPERIENCE

Research Assistant — AI-Driven Building Energy & Life-Cycle Assessment University College Dublin

ACADEMIA

Jun 2023 – Dec 2025

- Conduct AI-enabled building life-cycle assessments (LCA) for energy and carbon analysis
- Develop machine learning and data-driven models for life-cycle GWP evaluation
- Implement LLM and RAG-based approaches for analysing construction and energy datasets
- Data cleaning, validation and preprocessing in Python (Pandas, NumPy, Jupyter)
- Integrate BIM and AI workflows for energy optimisation and sustainable design

Demonstrator

ACADEMIA

Sep 2023 – Present

University College Dublin

- Modules: Data Analytics for Engineers, Introduction to Engineering Computing
- Communicate complex technical concepts to non-technical audiences, supporting strong learning outcomes

Web Application Developer

RESEARCH SW

Feb 2021 – Present

IBPSA

- Built and maintain conference paper submission & publication platforms
- Structured data handling (JSON, XML, CSV); quality-controlled research outputs

Web Developer

RESEARCH SW

Mar 2020 – Present

European Council on Computing in Construction

- Lead developer for the EC3 conference website
- Support dissemination of research on digital construction & BIM

Private TutorEDUCATIONSep 2019 – May 2023

Self-employed, Ireland

– Mathematics, Science & Computer Science, Primary–
Secondary level (Junior & Leaving Cert)

Software EngineerINDUSTRYJan 2013 – Dec 2016

Self-employed

– Web development, SEO, Android & live-streaming app
development, data analysis

Senior Software EngineerINDUSTRY

Jan 2017 – Dec 2017

ODeal.pk

– Ecommerce site development & management — WordPress,
WooCommerce

LecturerACADEMIAJan 2011 – Dec 2012

Sindh Technical Education & Vocational Training Authority

– Taught Computer Science at college level; IT Lab in-charge

EDUCATION

PhD — AI-Driven Building Life-Cycle AssessmentSep 2023 – Present

University College Dublin

– AI methodologies for building energy & carbon performance
– LLM + RAG integration with EPD, life-cycle & energy datasets
– Decision-support systems for sustainable retrofit strategy

SELECTED PUBLICATIONS – 219+ CITATIONS, GOOGLE SCHOLAR

1. 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. 205 citations
2. Ali, U., **Bano, S.**, Shamsi, M.H., Sood, D., Hoare, C., Zuo, W., Hewitt, N., et al. (2024). Urban residential building stock synthetic datasets for building energy performance analysis. *Data in Brief*, 53. 11 citations
3. **Bano, S.**, Ali, U., Sood, D., O'Donnell, J. (2024). Intelligent Retrofits in Residential Buildings: A Knowledge-Based Approach. *EC3 Conference 2024*.
4. Ali, U., **Bano, S.**, Hoare, C., Shamsi, M.H., Sood, D., O'Donnell, J. (2024). A Graph Based Framework to Support Data-driven Urban Building Energy Simulations. *EC3 Conference 2024*.
5. Ali, U., **Bano, S.**, Shamsi, M.H., Sood, D., Hoare, C., O'Donnell, J. (2023). Residential building energy performance prediction at an urban scale using ensemble machine learning algorithms. *European Conference on Computing in Construction, Greece*.
6. Ali, U., **Bano, S.**, Molinard, N., Sood, D., Shamsi, M.H., Hoare, C., O'Donnell, J. (2023). Data-driven prediction of residential building energy performance at an urban scale through end-use demand segregation. *18th IBPSA Conference — Building Simulation 2023, China*.

HONOURS, AWARDS & CERTIFICATIONS

- ★ PhD Researcher — University College Dublin
Fully-funded scholarship, Sustainable Energy Authority of Ireland (SEAI)
- ★ Construction Life Cycle Assessment Specialist
One Click LCA
- ★ Construction LCA — Embodied Carbon
One Click LCA
- ★ Best Poster Award — IBPSA Ireland 2024
"LLM-Powered Knowledge Base for Building Renovation LCA,"
MTU Cork
- ★ Building LCA for Architects
One Click LCA
- ★ Energy Demand in Buildings
TU Delft, via edX

TECHNICAL SKILLS

LANGUAGES	Python, R, SQL, JavaScript, C++, Java
AI / ML / LLM STACK	TensorFlow, PyTorch, Scikit-learn, XGBoost, LLMs, RAG Pipelines, Prompt Engineering, AI Agents
DATA & TOOLS	Pandas, NumPy, Jupyter, Google Colab, Power BI
DOMAIN / BIM	One Click LCA, Building LCA, Embodied Carbon Assessment, BIM Integration
OTHER	REST APIs, JSON/XML, GitHub, GitLab