

ABOUT ME

Marie Skłodowska-Curie Research Fellow and AI researcher focused on applying artificial and collective intelligence to design intelligent, impactful, and socially empowering solutions. Building on a strong background in large-scale digital systems development, I design and adapt AI methodologies to enhance transparency, efficiency, and sustainability of data and organizational processes. My recent research explores the use of AI and CI to make open data more FAIR by enhancing metadata generation, semantic search mechanisms, interoperability, and user participation within digital ecosystems.

EDUCATION AND TRAINING

[01/02/2022 – 25/11/2025]

PhD in Computer Science (Marie Skłodowska-Curie Fellow)

University of Camerino

City: Camerino | **Country:** Italy | **Thesis:** Towards a FAIR Open Data Ecosystem Using AI and CI

- Developed a multilayered framework to enhance Findability, Accessibility, Interoperability, and Reusability (FAIR) of open data.
- Fine-tuned multiple LLMs (Flan-T5, LLaMA, Mistral, Qwen, DeepSeek, BERT) to automatically generate metadata (keywords, themes, descriptions).
- Implemented semantic search through knowledge-graph-based retrieval and ontology alignment using few-shot prompting.
- Prototyped a collective-intelligence feedback loop enabling community-driven dataset revisioning and sustainable metadata improvement.

[01/08/2016 – 01/05/2019]

Master of Science in Computer Science

National University of Sciences and Technology

City: Islamabad | **Country:** Pakistan | **Thesis:** Estimating Water Quality Using Internet of Things and Machine Learning

- Designed a cost-efficient IoT-based water quality monitoring system using only four low-cost sensors.
- Implemented and compared multiple supervised learning algorithms to predict water quality parameters with high accuracy.
- Demonstrated how affordable IoT and ML integration can support large-scale environmental monitoring.

[31/07/2010 – 31/05/2014]

Bachelor of Science in Computer Science

National University of Computer & Emerging Sciences

City: Karachi | **Country:** Pakistan | **Thesis:** Moving Object Detection, Classification, and Tracking

- Conducted a comparative study of classical computer vision methods for object detection and tracking using static and dynamic scenes.
- Implemented prototype algorithms combining background subtraction, motion estimation, and contour-based tracking.
- Evaluated performance on video datasets to identify trade-offs between accuracy and computational cost, anticipating later deep-learning approaches.

RESEARCH SECOND-
MENTS

- [15/02/2023 – 15/04/2023]

Visiting Researcher - University of the Aegean (UAEGEAN)

Research on AI-based metadata enrichment for open data, including automated keyword extraction to improve dataset findability.
- [08/04/2024 – 10/06/2024]

Visiting Researcher - Regione Marche

Applied PhD research within a public-sector open data office, focusing on automated metadata workflows, semantic interoperability, and data governance.
- [17/06/2024 – 31/07/2024]

Visiting Researcher - University of Zaragoza

Research on collective intelligence and AI-supported feedback mechanisms for open data; contributed to a peer-reviewed ACM journal publication.

WORK EXPERIENCE

University of Camerino

City: Camerino | Country: Italy

- [01/02/2025 – Current]

AI Research Fellow

- Lead research and development under the “AI for SMEs” project, creating applied AI solutions for process automation and business optimization.
 - Collaborate with small and medium enterprises to identify opportunities for AI integration and digital transformation.
 - Design, adapt, and deploy tailored machine learning models and automation workflows that enhance operational efficiency and scalability.
 - Contribute to interdisciplinary projects, translating academic research into practical, industry-ready AI applications.

University of Camerino

City: Camerino | Country: Italy

- [01/02/2022 – 31/01/2025]

Marie Skłodowska-Curie Research Fellow

- Applied artificial intelligence and collective intelligence to enhance FAIRness in open data ecosystems.
 - Finetuned large language models (LLaMA, T5, BERT, Mistral, DeepSeek, Qwen) to automate metadata generation (keywords, thematic categories, and descriptions) for open datasets.
 - Implemented a knowledge-graph-driven semantic search framework on top of the European Data Portal to improve dataset discovery and contextual retrieval.
 - Developed a human-in-the-loop framework that leverages collective intelligence for continuous metadata validation and refinement.
 - Explored ontology mapping and knowledge graph construction to enable semantic interoperability and cross-domain data reuse.
 - Designed feedback and revisioning mechanisms to promote inclusive, collaborative, and sustainable open-data ecosystems.

National Database & Registration Authority

City: Islamabad | Country: Pakistan

- [08/07/2015 – 20/10/2021]

Assistant Director (Software Design)

- Led the design and development of national digital governance systems, including online visa, passport, identity, and voting platforms.
 - Translated institutional requirements from national and international stakeholders into secure, data-driven enterprise applications and dashboards.

- Directed end-to-end project planning, coordination, and implementation to ensure timely and efficient delivery of large public-sector solutions.
- Conducted analytical studies to support policy decisions in initiatives such as the National Health Insurance Program, Tax Profiling, and the Ehsaas Welfare Program.
- Facilitated cross-departmental and inter-agency collaboration to ensure interoperability and reliability across critical digital infrastructures.

Systems Ltd

City: Karachi | **Country:** Pakistan

[11/06/2014 – 26/06/2015] **Software Engineer**

- Developed and maintained enterprise software solutions for multinational clients, ensuring performance, scalability, and adherence to project requirements.
- Collaborated with clients to analyze business needs, system workflows, and functional specifications.
- Contributed to system design and documentation, supporting seamless project delivery and knowledge transfer.
- Implemented application components using Java, .NET, and PL/SQL within existing enterprise frameworks.

Systems Ltd

City: Karachi | **Country:** Pakistan

[10/12/2013 – 10/04/2014] **Intern**

- Assisted in the design and development of user interfaces for enterprise applications.
- Supported compliance with technical specifications and coding standards.
- Gained hands-on experience in Java development within professional software environments.

PUBLICATIONS

Relevant Publications

- **Ahmed, U.**, & Polini, A. (2025, May). Enhancing Open Data Findability: Fine-Tuning LLMs (T5) for Metadata Generation. In *Conference on Digital Government Research* (Vol. 1).
- **Ahmed, U.**, Alexopoulos, C., Piangerelli, M., & Polini, A. (2024). BRYT: Automated keyword extraction for open datasets. *Intelligent Systems with Applications*, 23, 200421.
- **Ahmed, U. (2023)**. Reimagining open data ecosystems: a practical approach using AI, CI, and knowledge graphs. In *BIR Workshops* (pp. 235-249).
- **Ahmed, U.**, Polini, A., & Ferranti, N. (2025, May). From Speech to Semantics: Enabling Conversational Access to Scholarly Knowledge Graph. In Workshop on Retrieval-Augmented Generation Enabled by Knowledge Graphs (RAGE-KG 2025), co-located with the International Semantic Web Conference (ISWC 2025)
- **Ahmed, U.**, Ochoa-Ortiz, H., Polini, A., & Papageorgiou, G. (2025). Fostering Collective Intelligence in CKAN Open Data Portals: Dataset Revisioning and Feedback Mechanisms. In Proceedings of the 22nd European, Mediterranean, and Middle Eastern Conference on Information Systems (EMCIS 2025)
- Maratsi, M. I., **Ahmed, U.**, Alexopoulos, C., Charalabidis, Y., & Polini, A. (2024, June). Towards Cross-Domain Linking of Data: A Semantic Mapping of Cultural Heritage Ontologies. In *Proceedings of the 25th Annual International Conference on Digital Government Research* (pp. 165-176).
- Alharbi, R., **Ahmed, U.**, Dobriy, D., Łajewska, W., Menotti, L., Saeedizade, M. J., & Dumontier, M. (2023). Exploring the role of generative AI in constructing knowledge

graphs for drug indications with medical context. *Proceedings <http://ceur-ws.org> ISSN, 1613, 0073.*

- Herrera-Murillo, D. J., Ochoa-Ortiz, H., **Ahmed, U.**, López-Pellicer, F. J., Re, B., Polini, A., & Nogueras-Iso, J. (2024). Collective Intelligence in Humanitarian Voluntary Geographic Information: The Case of the HOT Tasking Manager. *ACM Transactions on Computer-Human Interaction*.

Additional Publications

- **Ahmed, U.**, Mumtaz, R., Anwar, H., Mumtaz, S., & Qamar, A. M. (2020). Water quality monitoring: from conventional to emerging technologies. *Water Supply*, 20(1), 28-45.
- **Ahmed, U.**, Mumtaz, R., Anwar, H., Shah, A. A., Irfan, R., & García-Nieto, J. (2019). Efficient Water Quality Prediction Using Supervised Machine Learning. *Water*, 11(11), 2210.
- Herrera-Murillo, D. J., Ochoa-Ortiz, H., **Ahmed, U.**, López-Pellicer, F. J., Re, B., Polini, A., & Nogueras-Iso, J. (2024). Process Analysis in Humanitarian Voluntary Geographic Information: the case of the HOT Tasking Manager. *AGILE: GIScience Series*, 5, 5.

Manuscripts to be Submitted

- **Ahmed, U.**, & Polini, A. (2025). From Tables to Text: Generating Dataset Descriptions from Structured Data with LLMs.
- **Ahmed, U.**, & Polini, A. (2025). Unlocking Findability: Fine-Tuning Large Language Models for Automated Keyword Extraction in Open Data
- **Ahmed, U.**, & Polini, A. (2025). Beyond Labels: Automating Dataset Categorization in Open Data with Fine-Tuned LLMs.

ACADEMIC ENGAGEMENTS AND TRAININGS

Teaching

- *Instructor, Parallel and Distributed Programming (Master's Level)* - University of Camerino (2025)

Academic & Professional Training

- BAI/ZHAW Winter School on Generative AI
- ISWS Summer School on Knowledge Graphs
- OpenGov Summer Schools (2022, 2023, 2024)
- ODECO Online Training Program on Sustainable Open Data Ecosystems
- ODECO On-site Training Weeks (x5) on Sustainable Open Data Ecosystems.
- 13th International School on Digital Innovation and Startup Entrepreneurship (DigiBus 2025)

Online Certifications & Technical Workshops

- *Fine-Tuning Large Language Models* - Coursera (Hands-on Practical Course)
- *Generative AI for Everyone* - Coursera
- *Generative AI with Large Language Models* - Coursera
- *Foundations: Data, Data, Everywhere* - Google
- *Recommendation Systems on Google Cloud* - Google Cloud Training
- *Hands-on Workshop on Data Science in Practice* - Predictive Analytics Lab (Python & Scikit-learn)
- *Introduction to Java Frameworks (Java & Hibernate)* - Systems Ltd Technical Training
- *Introduction to Public Speaking* - Coursera

AWARDS AND FELLOWSHIPS

Marie Skłodowska-Curie Fellowship (Horizon 2020 – MSCA Grant No. 955569)

- Awarded under the *Open Data Ecosystem (ODECO)* project, funded by the European Union's Horizon 2020 research and innovation programme.
- Research focused on enhancing the FAIRness in open data ecosystems using Artificial Intelligence and Collective Intelligence.

HEC Overseas PhD Fellowship (UK)

Competitively awarded national scholarship to pursue doctoral studies in the United Kingdom; subsequently selected for and accepted the Marie Skłodowska-Curie Fellowship under Horizon 2020.

