

ERDEM KUS

AI Researcher & Engineer · GenAI, Quantum Machine Learning and Optimisation

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RESEARCH PROFILE

AI Engineer and researcher with expertise spanning machine learning research and production AI systems. My research focuses on cost-aware active learning, algorithm selection and combinatorial optimisation, while my industry experience includes GenAI and retrieval systems serving 1,000+ users across 1M+ documents. I develop new machine-learning methods and translate them into scalable, production-oriented AI systems.

EDUCATION

PhD in Computer Science

Sep 2022 – Aug 2026

University of St Andrews · St Andrews, UK

- **Thesis:** Frugal Algorithm Selection: Cost-Aware Active Learning for Efficient Training Data Collection in Algorithm Selection (expected award: August 2026).
- Addressed the high cost of training-data labelling in algorithm selection by developing cost-aware active learning methods that account for both epistemic uncertainty and the computational cost of obtaining labels.
- Developed surrogate models for timeout and labelling-cost prediction, combining them with uncertainty estimates in a multi-objective acquisition framework to achieve strong cost-performance trade-offs.
- Evaluated 28 strategies across 16 ASLib scenarios, achieving up to **90%** lower labelling cost while maintaining competitive algorithm-selection performance.
- Orchestrated large-scale Slurm-based experiments across three national HPC systems (Cirrus, MedicineBow and Hypatia), totalling approximately **175+ CPU-years** of computation.

MSc in Artificial Intelligence, GPA: 4.00/4.00

Sep 2020 – Jul 2022

Bahcesehir University · Istanbul, Türkiye

- **Thesis:** Hybrid Fairness for Fair Decision-Making, formulating fairness as a multi-objective optimisation problem that jointly considers group- and individual-level fairness rather than relying on a single fairness metric, and achieving improved fairness-accuracy trade-offs on the COMPAS dataset.

ACADEMIC & RESEARCH EXPERIENCE

Research Fellow, AI for Academic Synergy

Nov 2025 – Present

University of St Andrews · St Andrews, UK

- Developing a GenAI-based academic collaboration and funding-discovery platform for **2,300+** researchers within a £3M Wellcome Trust-funded program in collaboration between the Universities of St Andrews, Edinburgh and Glasgow.
- Built LLM-based pipelines to construct researcher personas capturing research keywords, methodologies, study areas, study subjects, and potential future interests from structured and unstructured academic data.
- Designed persona-based matching methods to recommend potential research collaborators, generate potential joint research proposal directions, suggest relevant funding opportunities to researchers, and identify suitable researchers for specific funding calls.
- Designed an evidence-level provenance framework linking AI-generated recommendations to supporting researcher profiles, publications and source data.

SELECTED PUBLICATIONS

Kus, E., Kotthoff, L., Akgun, O., Dang, N., & Miguel, I. (2026). *Frugal Algorithm Selection for Combinatorial Search*. **Journal of Artificial Intelligence Research (JAIR)**. doi.org/10.1613/jair.1.21266

Kus, E., Kotthoff, L., Akgun, O., Dang, N., & Miguel, I. (2026). *On the Effect of Training Data Selection in Automated Algorithm Selection*. **Principles and Practice of Constraint Programming (CP 2026)**. doi.org/10.4230/LIPIcs.CP.2026.38

Kus, E., Akgun, O., Dang, N., & Miguel, I. (2024). *Frugal Algorithm Selection*. **Principles and Practice of Constraint Programming (CP 2024)**. doi.org/10.4230/LIPIcs.CP.2024.38

Kus, E., Akgun, O., Dang, N., & Miguel, I. (2024). *Cost-Efficient Training for Automated Algorithm Selection*. **AutoML 2024 Workshop**. openreview.net/forum?id=BJEQvOAxrP

AWARDS, SCHOLARSHIPS & RESEARCH FUNDING

- **Handsel Scholarship**, University of St Andrews, for academic excellence and research potential.
- **Outstanding Achievement / Academic Excellence Scholarship**, Bahcesehir University.
- Contributed to the successful funding application for a **£3M Wellcome Trust-funded** multi-university programme involving the

SELECTED TALKS

- **Invited Seminar**, Okinawa Institute of Science and Technology (OIST), Japan, Jul 2026: *Frugal Algorithm Selection for Combinatorial Search and its Adaptation to Frugal Training of Noise-Aware Quantum Neural Networks*.
- **Conference Talk**, FLoC / CP 2026, Lisbon, Portugal, Jul 2026: *On the Effect of Training Data Selection in Automated Algorithm Selection*.
- **Conference Talk**, CP 2024, Girona, Spain, Sep 2024: *Frugal Algorithm Selection*.
- **Workshop Poster**, AutoML 2024, Paris, France, Sep 2024: *Cost-Efficient Training for Automated Algorithm Selection*.
- **Invited Talks**, NoBel AI Community, Nokia Bell Labs, Antwerp / Virtual: *Quantum Machine Learning, QUBO Formulations and Hamiltonian-Based Optimisation* (Jan 2023); *Fair AI and Hybrid Group/Individual Fairness* (Jul 2021).

INDUSTRY EXPERIENCE

GenAI Engineer and Quantum Machine Learning Specialist

Apr 2020 – Jun 2026

Nokia · Istanbul, Türkiye / Global

- Designed and developed **NICO**, an enterprise GenAI/RAG platform for network-support engineers, replacing manual searches across technical guides and Jira tickets that could contribute to issue-resolution cycles of up to a month. The platform provides intelligent retrieval over **1M+** documents and serves **1,000+** global users.
- Architected and developed end-to-end enterprise RAG systems integrating LLMs with internal knowledge sources, vector search and relational data using LangChain, Qdrant, Redis and SQL databases.
- Architected and developed multi-agent workflows for tool selection, task routing and multi-step reasoning, including ReWOO-style plan-then-execute architectures, using LangGraph and MCP to integrate LLM agents with enterprise systems and specialised tools.
- Built production AI services for retrieval, reranking and agentic orchestration, exposing capabilities through FastAPI-based services and deploying them on Azure with MLflow-based experimentation and Prometheus/Grafana monitoring.
- Led end-to-end quantum and quantum machine learning initiatives at Nokia, assessing industrial use cases for quantum suitability and managing the full lifecycle with D-Wave, from problem formulation and QUBO/Ising modelling to algorithm evaluation and deployment on the D-Wave Leap platform.
- Served as a global Nokia mentor, providing guidance to engineers and managers across AI, GenAI, quantum machine learning, AI research, gender equality and fairness.

Backend / Artificial Intelligence Engineer

Oct 2019 – Mar 2020

Cliexa · Istanbul, Türkiye

- Contributed to a mobile healthcare platform designed to simplify lengthy patient intake and medical-history collection workflows in the US, enabling patients to capture prior conditions, complications and other clinical information digitally.
- Designed and developed backend APIs and data-processing pipelines supporting the mobile application and integration of patient-generated health data.
- Developed machine-learning models for early diagnosis and clinical decision support using patient history and wearable health data.

RESEARCH METHODS AND TECHNICAL SKILLS

- **Research Methods**: Active Learning, Algorithm Selection, Uncertainty Quantification, Surrogate Modelling, Statistical Machine Learning, Multi-Objective Optimisation, Experimental Design, Non-parametric Statistical Testing.
- **Statistical & Surrogate Modelling**: Kriging / Gaussian Process Regression, Polynomial Chaos Expansion (PCE), Sparse Kriging, Random Forest Surrogates, Copula-based Modelling.
- **Machine Learning Frameworks**: PyTorch, TensorFlow, Keras, scikit-learn.
- **Information Retrieval**: Retrieval-Augmented Generation, Semantic Search, Vector Retrieval, Reranking, Embeddings.
- **GenAI & Agentic Systems**: LangChain, LangGraph, MCP, ReWOO, Multi-Agent Orchestration, Agentic Planning, Tool Selection.
- **Optimisation & Quantum Machine Learning**: Combinatorial Optimisation, QUBO/Ising Modelling, Quantum Annealing, D-Wave, Qiskit, PennyLane, Noise-aware QNNs.
- **Engineering & Infrastructure**: Python, FastAPI, SQL, Redis, Azure, AWS, Slurm.
- **Experimentation & Observability**: MLflow, Prometheus, Grafana.

TEACHING EXPERIENCE

Graduate Teaching Assistant

2023 – 2025

University of St Andrews · St Andrews, UK

- Delivered laboratory teaching, tutorials and student support for undergraduate courses in Object-Oriented Programming and Programming with Data.
- Guided students through programming exercises, debugging, software design, and data processing tasks, and contributed to assessment and marking.

ACADEMIC SERVICE

- **Conference Reviewer:** AutoML Conference (2026).
- **Journal Reviewer:** Information Sciences, Elsevier (2025–present); IEEE Transactions on Artificial Intelligence (2024–present); Engineering Applications of Artificial Intelligence, Elsevier (2023–present).

REFERENCES

Professor Ian Miguel, Head of School, School of Computer Science, University of St Andrews. ijm@st-andrews.ac.uk

Professor Lars Kotthoff, Johann and Gaynor Rupert Chair in Artificial Intelligence, University of St Andrews. lk223@st-andrews.ac.uk

Dr Ozgur Akgun, Director of Impact, School of Computer Science, University of St Andrews. ozgur.akgun@st-andrews.ac.uk

Dr Nguyen Dang, Lecturer, School of Computer Science, University of St Andrews. nttd@st-andrews.ac.uk