Benaissa Dekhici

Researcher in Bioenergy \ Data-Driven Innovations

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About Me

*Research Engineer specializing in the intersection of **Machine Learning**, **Control Engineering**, and **Bioenergy Systems**. Ph.D. in Automatics with a focus on data-driven modeling and model order reduction for biological processes. Experienced in building robust, reproducible simulation frameworks and collaborating with interdisciplinary teams (chemists/biologists) to optimize anaerobic digestion systems. Seeking to leverage expertise in Python, PyTorch, and optimization algorithms to solve sustainability challenges in a Research Engineer (ML) role.*

Work Experience

Feb 2024–Present

PDRA in Bioenergy Process Optimisation and Control, *University of Surrey*, England, UK

- Developing and evaluating machine learning models (Gaussian Processes, LSTM, neural networks) for biogas production prediction
- Implementing physics-informed ML approaches combining mechanistic models with data-driven techniques
- Building robust, reproducible simulation frameworks in Python for bioenergy process optimization
- Collaborating closely with chemists and biologists to translate scientific questions into ML solutions
- Designing experiments, analyzing results, and validating findings with scientific rigour

2024–Present **Research Engineer** \

- Developing and deploying ML models and LLM-based AI agents for real-time AD process decision support
- Building physics-based simulation software integrated with ML optimization algorithms
- Designing and implementing cloud-deployed applications (Azure, AWS) with database and user management systems
- Creating web-based user interfaces for scientists to interact with ML models and run experiments
- Implementing end-to-end ML pipelines from research prototype to production-ready tools
- Collaborating with interdisciplinary teams to validate models against real experimental data

- Developing and deploying ML models and LLM-based AI agents for real-time AD process decision support
- Building physics-based simulation software integrated with ML optimization algorithms
- Designing and implementing cloud-deployed applications (Azure, AWS) with database and user management systems
- Creating web-based user interfaces for scientists to interact with ML models and run experiments
- Implementing end-to-end ML pipelines

Sept 2020–Jun 2021 **Teaching Assistant**, *University of Tlemcen*, Tlemcen, Algeria
- Courses: Linear Multivariable Systems, Nonlinear Systems, Optimal Control
- Supervised undergraduate and graduate students in advanced control theory

Sept 2019–Jun 2020 **Teaching Assistant**, *University of Tlemcen*, Tlemcen, Algeria
- Courses: Multivariable Systems, Nonlinear Systems
- Developed practical laboratory exercises and assessment materials

Jun 2019–Sept 2019 **Trainer/Teacher**, *FROMAC Academy*, Tlemcen, Algeria
- Subject: Automatics and Industrial Data Processing
- Delivered professional training programs to industry professionals

May 2017–Jun 2019 **Research Support State Engineer**, *Research Center in Industrial Technologies, CRTI*, Algiers, Algeria
- Responsible for drone systems development (hardware and software)
- Led interdisciplinary teams in UAV technology advancement
- Contributed to multiple research publications and technical reports

Sept 2016–Oct 2016 **Trainee as Automation Engineer**, *LATAFNA Mill*, Tlemcen, Algeria
- Gained hands-on experience in industrial automation systems
- Worked on process control and optimization projects

Since 2018–Present **Researcher**, *Tlemcen Automatics Laboratory LAT*, Tlemcen, Algeria
- Active member contributing to laboratory research initiatives
- Collaborating on national and international research projects

Education

2018–2024 **Ph.D. in Automatics**, *University of Tlemcen*, Tlemcen, Algeria
Thesis: "Data-Driven Modeling, Order Reduction and Control of Anaerobic Digestion Processes"
Supervisors: Prof. Boumediene Benyahia & Prof. Brahim Cherki
Co-direction: LBE-INRAE Narbonne, France
International Mobility:
- Bilateral Student at University of Trento (Aug 2022–Jul 2023)
- International Credit Mobility Student at University of Trento (Aug 2021–Jul 2022)

2013–2015 **M.Sc. in Automatics and Industrial Data Processing**, *University of Tlemcen*, Tlemcen, Algeria
Thesis: "Commande d'un Quadrirotor Parrot Bebop Drone"
Supervisors: Dr. Mokhtari Mohammed Rida & Prof. Brahim Cherki

2009–2013 **B.Sc. in Automatics**, *University of Tlemcen*, Tlemcen, Algeria

Research Projects

Feb 2024–Present **Rapid Digitalisation of Bioenergy for Higher Efficiency and Profit**, *UKRI Supergen Bioenergy Impact Hub*
advanced optimization frameworks to transform the bioenergy industry into a data-driven, digitalized Industry.

Jan 2025–Aug 2025 **Biomethane Islands – Feasibility Study**, *Future Energy Networks: Network Innovation Allowance*
base simulation for mass and energy balance, cost estimation, designed small-scale pilot system, and delivered profitability assessment.

Nov 2024–Feb 2025 **D-Xpert: AI-Based Recommender System for Smart Energy Saving**, *Innovate UK Project*
Heat Flow Model Development, HVAC Profiling, AI Occupancy Model, and Model Predictive Control Algorithm development.

Jul 2024–Dec 2024 **Integrating CFD Modeling and Kinetics for Enhanced Anaerobic Digestion**, *The Carbon Recycling Network Business Interaction Voucher*
automated methodology integrating CFD with kinetic models and Bayesian Optimisation for optimizing anaerobic digester mixing systems.

Oct 2024–Oct 2024 **Techno-economic Analysis of Novel Water Treatment System**, *Consultancy with Intelligent Tomorrow Ltd*
base simulation for mass and energy balance, cost estimation, designed pilot system, and delivered profitability assessment.

Technical Skills

Process Engineering	Bioenergy Systems, Process Systems Engineering, Anaerobic Digestion Processes, Physics-based Modelling
Data Science PyTorch, Bayesian Optimization, Dynamic System Identification, Data-Driven Modelling, Model Order Reduction, LLM Integration \ B)	Machine Learning (LSTM, Gaussian Processes, Neural Networks), Deep Learning \ AI Agents, Experiment Tracking (MLflow, W\
Programming	Python (Advanced: PyTorch, scikit-learn, pandas, numpy), MATLAB/Simulink (Advanced), Git/GitHub/GitLab, SQL Databases, Cloud Deployment (Azure, AWS)
Languages	English (Fluent), French (Fluent), Arabic (Native)

Hobbies & Interests

Research:	Reading research articles, ML tools exploration, science books, chess
Gaming:	Playing and watching football, video games across all consoles, triple-A games, Nintendo Switch gaming
Technology:	Tech enthusiast (IT, electronics), DIY projects and electronics, 3D printing, Electronic chips and boards, Operating systems exploration