Manuel S. Mathew, PhD



AI Researcher, Lecturer & Consultant · Applied Machine Learning, LLMs & Agentic AI · Energy and Industrial Systems

12 peer-reviewed publications · 120+ citations · h-index 6 (Google Scholar, 2026-11-22) · course leader for 2 master's courses

manuel@maifor.no · manuelsmathew.com

Profile

I hold a PhD in Artificial Intelligence from the University of Agder (2026). My work is about turning data into better decisions in energy and industrial systems. My doctoral research showed how machine learning can help wind farm operators detect faults, measure ageing and decide on lifetime extension, using operational data from a Norwegian wind farm that has been running for over a decade.

I now run my own research and advisory practice, Mathew AI Forskning og Rådgivning (MAIFoR), which focuses on applied machine learning, large language models (LLMs), RAG and agentic AI. My current work is part of the PHMHydro project, with Å Energi as the client and NORCE, the University of Agder and Scanmatic AS as partners. There I am developing HydroAssist, an AI assistant that helps operators diagnose and maintain hydropower plants, into a research system that is properly evaluated and benchmarked. I am also building a physics-based model that continuously estimates the efficiency of a hydropower turbine. Alongside it I am a part-time Assistant Professor (Universitetslektor) at UiA, where I am course leader for two master's-level courses: pattern recognition and emerging AI technologies.

My background is in electrical power engineering. I did a bachelor's in electrical and electronics engineering in India and energy-systems research in Brunei in collaboration with IBM. In Norway I have worked on renewable energy and AI. As a result I understand both the physical systems and the models that describe them.

Teaching is the part of my work I find most rewarding. I enjoy helping students go from equations to working models on real data. I am looking for positions where I can teach, do applied AI work, or both, whether at a university, a research institute or in industry.

Core competencies

Generative AI	large language models, retrieval-augmented generation (RAG), agentic AI, knowledge graphs, LLM evaluation and benchmarking, and latent diffusion models
Machine learning & deep learning	CNNs, time-series analysis, explainable AI (SHAP), fault detection, diagnostics and prognostics
Energy	wind resource analysis, turbine micro-siting, wake losses, LCOE optimisation, microgrids, EV integration, smart grids, and hydropower condition and efficiency monitoring
Teaching	course design, lecturing, and project-based learning on real datasets at master's level

Ways of working	systems thinking, independent project delivery, and interdisciplinary collaboration between academia and industry and across cultures
Tools	Python, PyTorch, TensorFlow, MATLAB, Git/GitHub, LaTeX, HOMER and Aspen Plus

Experience

May 2026 – present

Researcher & Consultant

Mathew AI Forskning og Rådgivning (MAIFoR), Grimstad

This is an independent research and advisory practice in applied AI and machine learning for industry, including LLMs, RAG and agentic AI systems.

- Works in the **PHMHydro** project (performance and health monitoring of hydropower plants), with **Å Energi** as the client and **NORCE**, the **University of Agder** and **Scanmatic AS** as partners
- **HydroAssist:** developing this LLM-based assistant for diagnosing and maintaining hydropower plants into a research-oriented system, with systematic evaluation and benchmarks. It grounds a language model in a knowledge graph of the plant, built on the RDS standard (ISO 81346). It lets the model run specialised diagnostic agents on SCADA data (vibration, thermal and process statistics) and uses RAG for plant-specific knowledge.
- **Efficiency monitoring:** developing a physics-based model that continuously estimates the efficiency of a Kaplan hydropower unit from plant data. It is anchored to the original commissioning measurements and estimates flow with the Winter-Kennedy method. The pipeline is reproducible and fully tested, and it flags data anomalies.
- Brings domain experience from wind, hydropower and related energy infrastructure

Jan 2025 – present

Assistant Professor (Universitetslektor, part-time)

Department of ICT, University of Agder, Grimstad

- **Course leader, IKT215 Pattern Recognition** (10 ECTS, Spring 2025 and Spring 2026): Bayes decision theory, parametric and non-parametric methods, error estimation and model selection, clustering and regression
- **Course leader, IKT526 Emerging AI Technologies** (7.5 ECTS, Autumn 2025 and Autumn 2026): large language models, RAG, latent diffusion models and sequence models for forecasting
- Designs course content, exercises and projects, gives lectures and leads hands-on work with real datasets

May 2021 – May 2026

PhD Research Fellow

AIMWind, University of Agder, Grimstad

I researched AI for lifetime extension and predictive maintenance of wind farms in AIMWind (Work Package 3). The project was funded by the Research Council of Norway and run by the Centre for AI Research (CAIR), the UiA Mechatronics group and NORCE, in collaboration with TU Delft (Delft Center for Systems and Control), with DNV and Origo Solutions as industry partners.

- Analysed long-term operational data from an onshore wind farm in Norway
- Developed automated fault diagnostics and methods for measuring ageing at turbine and farm level (see *PhD*)
- Presented the work at international conferences in Turin, Split, Copenhagen, Prague and Dublin
- Took part in the INRESCOS industrial research school (Industrial Research School in Complex Systems)

PhD

2026

Aging-Aware Multi-Scale Analytics for Wind Farm Asset Management and Performance Monitoring

Defended 8 May 2026, University of Agder

https://hdl.handle.net/11250/5506328

Many of Europe's wind farms are nearing the end of their design life. Their operators must choose between lifetime extension, repowering and decommissioning. The thesis proposes an ageing-aware analytics framework that treats the technical and social sides of asset management together. It has four parts:

Fault detection	fully automated diagnostics of the induction motors in offshore wind turbine pitch systems. It combines a CNN with the Extended Park Vector transform and needs minimal new sensors.
Turbine-level ageing	a deep-learning model trained on SCADA data and interpreted with SHAP. It showed that a 2 MW turbine's efficiency fell by 0.64% per year on average over ten years.
Farm-level ageing	capacity-factor estimation with a soft-ordering 1-D CNN to track performance loss across a whole wind farm, which enables farm-level degradation analysis.
Public acceptance	a systems-thinking analysis of how public opinion on wind power forms in Norway.
Supervisors	Prof. Christian W. Omlin (UiA) and Dr. Surya Teja Kandukuri (NORCE).

Published as Doctoral dissertations at UiA no. 597 (ISBN 978-82-8427-315-0).

Education

2021–2026

PhD in Information and Communication Technology, specialisation in Artificial Intelligence

University of Agder

2019–2021

MSc in Renewable Energy (sivilingeniør)

University of Agder

Thesis: *Smart Energy Management System for Renewable Energy Prioritized Electrical Distribution Network with Increased Penetration of Electric Vehicles*

2015–2017

Master of Engineering, Systems Engineering

Universiti Brunei Darussalam

Affiliated with the UBD | IBM Centre.

Thesis: *Optimal Design of an Isolated Microgrid and Development of a Load Forecasting System for its Management*

2008–2012

Bachelor of Technology, Electrical and Electronics Engineering

Mahatma Gandhi University, Kerala, India

Thesis: *Optimized Micro Grid for Renewable Energy Based Distributed Generation*

Publications

DOCTORAL THESIS

2026

M. S. Mathew. Aging-Aware Multi-Scale Analytics for Wind Farm Asset Management and Performance Monitoring. *University of Agder*, Doctoral dissertations at UiA no. 597, ISBN 978-82-8427-315-0.

JOURNAL ARTICLES

2023

M. S. Mathew, M. L. Kolhe, S. T. Kandukuri, C. W. Omlin. Data driven approach for the management of wind and solar energy integrated electrical distribution network with high penetration of electric vehicles. *Journal of Cleaner Production*, 421, 138467.

2020

R. Veena, S. M. Manuel, S. Mathew, M. I. Petra. Wake Induced Power Losses in Wind Farms. *International Journal of Engineering and Advanced Technology*, 9(3).

2020

R. Veena, S. M. Manuel, S. Mathew, I. Petra. Parametric models for predicting the performance of wind turbines. *Materials Today: Proceedings*, 24, 1795-1803.

2016 S. Mathew, C. M. Lim, M. I. Petra, G. S. Philip, M. Noorfathin, S. M. Manuel, V. Raj. Matching the Characteristics of Low Wind Speed Turbines with Candidate Wind Regimes. *Energy Procedia*, 95, 286-293.

CONFERENCE PAPERS

2024 M. S. Mathew, S. T. Kandukuri, C. W. Omlin. Fully Automated Diagnostics of Induction Motor Drives in Offshore Wind Turbine Pitch Systems using Extended Park Vector Transform and Convolutional Neural Network. *PHM Society European Conference*, 8(1).

2024 M. S. Mathew, S. T. Kandukuri, C. W. Omlin. Soft Ordering 1-D CNN to Estimate the Capacity Factor of Windfarms for Identifying the Age-Related Performance Degradation. *PHM Society European Conference*, 8(1).

2024 M. S. Mathew, M. Mansouri, S. T. Kandukuri, C. W. Omlin. A Systems Perspective on the Public Perception of Wind Power in Norway. *INCOSE International Symposium*, 34(1), 1429-1446.

2022 M. S. Mathew, S. T. Kandukuri, C. W. Omlin. Estimation of Wind Turbine Performance Degradation with Deep Neural Networks. *PHM Society European Conference*, 7(1), 351-359.

2022 M. S. Mathew, M. L. Kolhe. Performance Modelling of Renewable Energy Systems Using kNN Algorithm for Smart Grid Applications. *7th International Conference on Smart and Sustainable Technologies (SpliTech)*.

2019 S. M. Manuel, S. R. Rinu, J. Jom, J. Ebin, M. N. Anuraj. Reducing the Grid Dependency of Large Buildings through Renewable Integrated Microgrids. *National Conference on Recent Advances in Electrical & Electronics Engineering*.

2016 S. M. Manuel, M. I. Petra, L. C. De Silva, J. Hazra. Econo-environmental Sensitivities of an Isolated Microgrid towards the Renewable Energy Penetration Rates. *Brunei International Conference on Engineering and Technology (BICET)*.

2016 R. Veena, S. M. Manuel, S. Mathew, M. I. Petra, C. M. Lim. A Simple Method to Predict the Power Output from Large Offshore Wind Farms Using Artificial Neural Networks. *Asian Wave and Tidal Energy Conference (AWTEC)*.

POSTERS

2023 Predicting the capacity factor of wind farms using deep neural networks for estimating age related performance degradation. *WindEurope Annual Event*, Copenhagen, 25-27 April 2023.

2023 Predicting the capacity factor of wind farms using deep neural networks for estimating age related performance degradation. *Science Meets Industry*, Fevik, 20–21 February 2023.

2021 Analytics for Wind Farm Asset Management. *Science Meets Industry*, Kristiansand, 29–30 November 2021.

MASTER'S THESES

2021 M. S. Mathew. Smart Energy Management System for Renewable Energy Prioritized Electrical Distribution Network with Increased Penetration of Electric Vehicles. *University of Agder*.

2017 M. S. Mathew. Optimal Design of an Isolated Microgrid and Development of a Load Forecasting System for its Management. *Universiti Brunei Darussalam*, MEng thesis, Systems Engineering.

BACHELOR'S THESIS

2012 M. S. Mathew. Optimized Micro Grid for Renewable Energy Based Distributed Generation. *Mahatma Gandhi University*, BTech thesis, Electrical and Electronics Engineering.

Conferences & talks

2026 **PhD defence, University of Agder, Grimstad**

Trial lecture: *Deep Penetration of Renewable Energy Systems in Power Grids: Challenges and Main Technologies*

2024 **PHM Society European Conference (PHME), Prague**

Two papers: pitch-system fault diagnostics and farm capacity-factor estimation

2024 **INCOSE International Symposium, Dublin**

Paper: public perception of wind power in Norway

2023 **WindEurope Annual Event, Copenhagen**

Poster: capacity factor and age-related degradation of wind farms

2023 **Science Meets Industry, Fevik**

Poster: capacity factor and age-related degradation of wind farms

2022	**PHM Society European Conference (PHME), Turin** Paper: wind turbine performance degradation with deep neural networks
2022	**SpliTech, Split** Paper: performance modelling of renewable energy systems with kNN
2021	**Science Meets Industry, Kristiansand** Poster: analytics for wind farm asset management
2016	**Brunei International Conference on Engineering and Technology (BICET)** **Invited talk:** microgrids and renewable penetration

Academic service & volunteering

- **Peer reviewer** for international journals and conferences, including the *International Journal of Electrical Power & Energy Systems* and *Renewable Energy*
- **Board member, St. Franciskus Xaverius Catholic parish, Arendal**, 2025–2027

Languages

English	Fluent (IELTS 8.0)
Norwegian	B2/B1 (HKDir): B2 reading and listening, B1 speaking and writing
Malayalam	Native
Hindi	Fluent

Courses, summer schools & certificates

- Introduction to Git and GitHub, Coursera, 2023
- Eastern European Machine Learning Summer School (EEML), Košice, Slovakia, July 2023
- Structuring Machine Learning Projects, Coursera, 2021
- Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization, Coursera, 2021
- Neural Networks and Deep Learning, Coursera, 2021
- The Data Scientist's Toolbox, Coursera
- Driving licence, class B (Norwegian)

Interests

Music (I'm learning guitar and listen across genres), hiking and photography, reading, working out and web development as a hobby.

References

Available on request.