

Jialeng "Albert" Guo

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Research interests

AI for energy and climate, approached through the lens of energy economics: how AI can support electricity markets, energy pricing and access to energy, and how AI agents can make energy research faster and more reproducible.

Education

- 2021.12 **University College London (UCL)**, M.Sc. in Energy Systems and Data Analytics
- Modules: principles of AI, econometrics, advanced energy systems, machine learning and data analysis, energy systems analysis for spatial, transport and built environments
 - **Thesis:** *BoatNet: Automated small boat composition detection using deep learning on satellite imagery* (Distinction, top of the cohort, published); supervised by [Dr. Santiago Suárez de la Fuente](#), Assistant Professor in Energy and Transport at UCL
- 2019.07 **University of Leeds**, B.ENG. (HONOURS) in Electronic Engineering
- Grade: strong Upper Second-Class Honours, equivalent to approximately 3.7/4.0 GPA
 - Modules: control theory, system simulation and data-driven modelling
 - Exchange (2018): The Hong Kong University of Science and Technology (HKUST), Robotics (autonomous driving)
 - **Final Year Project:** *Centralised control algorithms for smart grid operation* (Distinction, top 2% of the cohort); supervised by [Dr. Petros Aristidou](#), Assistant Professor in Sustainable Power Systems at the University of Leeds (previously at ETH Zürich)

Experience

- 2026.04-present **Lorhard**, HKU Techno-Entrepreneurship Academy, Qianhai
- Co-founder and CTO**
- Lorhard is an AI-native firm founded on a simple premise: the next great firm will not sell advice; it will deploy the agents that do the work. Rather than delivering recommendations, we embed agent systems within client organisations and run them in production.
 - I lead the firm's technical architecture and forward-deployed engineering. Since April 2026, our first engagement has been with a manufacturing company with annual sales exceeding US\$10 million, where we have taken over its operations and marketing workflows end to end, including traffic acquisition and paid advertising. Both teams can now trigger agent-run analyses on demand, with results delivered in real time, near real time or within two hours, depending on the analysis.
 - We open-source parts of our internal methodology as agent skills. The first release, [lorकिनsey](#), is a set of structured-thinking tools for product decisions and is now listed in Anthropic's official Claude plugin directory.

2021-present	The I Research, London, UK and Hong Kong SAR Founder - An independent research and technology company through which I develop AI products, contribute to early-stage ventures and conduct independent research. - Since May 2025, I have been building BentoAI, an LLM-powered platform that turns data-intensive documents such as financial reports, technology newsletters and academic papers into interactive, bento grid-style web pages, helping readers draw insight from them quickly. It accepts PDFs (including scanned documents, via OCR), Office files, images and YouTube videos (via transcription). - Beginning in January 2024, I served as an angel investor, co-founder and CTO of Mora AI Lab, a start-up working at the intersection of AI and blockchain finance, with a particular focus on AttentionFi. We raised US\$100,000 and brought on several angel investors and advisors who shared our vision. - Previously, I was among the first data scientists (as a consultant) at Ensemble Analytics, a start-up founded by alumni of the UCL Energy Institute and supported by UCL Innovation & Enterprise. I accelerated the development of its back-end allocation algorithm, which optimised workforce scheduling and forecasting for the maritime industry. - I have also worked as an independent researcher on deep learning methods for tracking and measuring the carbon footprint of maritime transport. This work was presented to University Maritime Advisory Services (UMAS) and the UCL Energy Institute's Shipping and Oceans Research Group in November 2021 and published in May 2023; its datasets and code are openly released.
2019-2020	University of Leeds, Leeds, UK Graduate Research Assistant – Quantitative Systems Analysis - Conducted quantitative analysis comparing centralised and decentralised secondary frequency control (SFC) under different communication delays, examining how controller speed affects system performance, the impact of economic dispatch strategies, and the system's resilience to variable or unpredictable time delays. - <i>Key findings</i>: although centralised automatic generation control (AGC) may hold a slight advantage in transient performance under ideal conditions, the distributed consensus-based scheme provides a more robust, resilient and economically optimal solution for secondary frequency control in modern cyber-physical power systems, especially in future grids where communication delays and cybersecurity threats must be taken into account. (Unpublished)
2018-2019	Undergraduate Researcher – Centralised SFC for Renewable Energy Systems Designed centralised secondary frequency control (SFC) for a Nordic hybrid renewable energy system to maintain stable frequency. The work involved extending a smart grid simulator with a new communication layer; formulating and implementing control strategies; developing physical and mathematical models of the system; building analytical models for performance testing; tuning hyperparameters for dynamic optimisation; refining the models with simulated cyber-attack data; conducting risk analysis; and working closely with a PhD candidate on the research.

Paper

2023.05

BoatNet: Automated Small Boat Composition Detection using Deep Learning on Satellite Imagery (with Dr. Santiago Suárez de la Fuente and Prof. Tristan Smith), published in ***UCL Open: Environment***

This research addresses the tracking and measurement of the carbon footprint of small boats, a significant yet poorly quantified contributor to global transport emissions. Accurate data for this segment have historically been difficult to obtain: traditional methods relied on high-level technological assumptions or satellite sensors and focused mainly on fishing and recreational boats. The emergence of high-resolution, open-access satellite imagery now makes new methods for quantifying greenhouse gas emissions feasible.

In this study, we developed a methodology called "*BoatNet*", which uses deep learning to detect small boats in three cities in the Gulf of California, Mexico. Despite low-resolution and blurred images, *BoatNet* detects, measures and classifies small boats with an accuracy of 93.9% and a precision of 74.0%. Notably, it can determine a boat's length with up to 99.0% precision.

The work has several implications:

1. It provides insight into the composition and activity of the small-boat fleet in the Gulf of California, supporting estimates of the region's maritime carbon footprint.
2. The system could be used to estimate the number and types of boats in key regions, informing assessments of regional carbon emissions and supporting policies to reduce greenhouse gases and air pollution. With a pre-trained model, the approach can be applied to any maritime region worldwide, offering efficiency gains for practitioners estimating local maritime emissions.
3. *BoatNet* determines boat lengths quickly and accurately, allowing researchers to focus on specific vessels of interest.
4. The approach also has limitations. In its current form, the system treats each boat as a single detection object and does not account for other objects such as docks. Image resolution and quality affect the model's efficiency, especially on large images, and background conditions such as water or land may influence classification accuracy, which warrants further investigation.

Despite these limitations, *BoatNet* demonstrates the potential of deep learning for detecting and classifying small boats accurately. Future work includes benchmarking the results against other algorithms and coupling *BoatNet* with datasets on small-boat behaviour, machinery and emissions to provide a comprehensive analysis of maritime carbon footprints.

Other research

2021

Predicting Sea Ice in the Arctic with Supervised Learning (with Prof. Aidan O'Sullivan, Dr. Patrick De Mars, Jeff Jingfeng Guo, Shawn Runguo Xu, and Lulu Yang), UCL MSc course group project

This project predicts Arctic sea ice extent with a range of supervised learning algorithms: linear regression, penalised linear and polynomial regression, random forests and neural networks. It begins with a review of the role of sea ice in climate research and of previous

approaches to predicting sea ice extent, then sets out the analytical strategy, including the data sources, accuracy metrics such as R-squared and mean squared error (MSE), and K-fold cross-validation, adopted because of the small dataset. The findings are presented in two parts.

Part I covers the foundations: the importance of sea ice, the modelling techniques considered and the algorithms selected, together with the mathematical underpinnings of each, including penalty terms and higher-order terms in the regression models.

Part II presents the results, with visualisations of the correlations and of each supervised learning model's performance; the random forest performed best in the experiments. The project also designed three future scenarios, one following current trends and two representing specific, potentially more severe conditions. The most adverse scenario shows a potential 1% greater loss of Arctic sea ice than the baseline, underscoring the need for policy action on global warming and the greenhouse effect.

In conclusion, the project acknowledged the work that remains in Arctic sea ice prediction and in environmental data more broadly. At the time, efforts were centred on exploring a physics-inspired machine learning model to better understand the relationship between melt rates and temperature.

2019.06-
2020.03

Performance of Secondary Frequency Control under Communication Time-Delays
(with Dr. Sultan Alghamdi, Prof. Johannes Schiffer, and Dr. Petros Aristidou)

This research addresses challenges in the control and operation of energy systems arising from the growing integration of renewable energy resources. The shift from conventional thermal generation to power-electronic-interfaced components reduces total system inertia, making it harder to maintain a stable frequency; an unacceptable drop in frequency can cause blackouts, which calls for new control methods.

Frequency control in energy systems is traditionally organised as a three-layer hierarchy of primary, secondary and tertiary control. This research focuses on secondary frequency control, which restores the steady-state frequency to its nominal value by adjusting active power setpoints.

Next-generation energy systems are cyber-physical, combining power and communication infrastructure, which enables more advanced strategies for steady-state frequency regulation. Secondary frequency control has historically been centralised through automatic generation control (AGC): frequency deviations are sent to a control centre for analysis before new setpoints are dispatched to each generator. Communication delays and uncertainties in such centralised systems can affect stability and are therefore crucial considerations in AGC design.

Centralised schemes, however, raise concerns about scalability, flexibility and single points of failure in future energy systems, and their communication requirements can make them costly and complex. Distributed control structures avoid these problems and are therefore preferable in some settings. This research focuses in particular on consensus-based distributed secondary frequency control, in which generation units communicate peer to peer without a central control point. Like centralised schemes, however, these remain vulnerable to communication delays, which can degrade perfor-

mance and stability.

While many studies use simplified energy system models for design and stability analysis, an open question remains as to how controllers perform under detailed, real-world dynamics and communication channels. To the best of the authors' knowledge, no prior study had compared the performance of secondary frequency controllers in depth with explicit consideration of communication delays; this research addresses that gap.

The main contributions are:

1. An extensive case study evaluating secondary frequency control methods on a realistic, large-scale cyber-physical energy system, which shows empirically that previously established conditions for delay robustness also ensure stability in the presence of additional unmodelled dynamics.
2. A deeper investigation than previous studies into how varying communication delays and unmodelled dynamics affect secondary frequency controllers, particularly under combined physical and cyber disturbances.
3. An extension of prior work that covers both conventional AGC and distributed consensus-based control, uses a realistic communication layer (the BT 21CN fibre core network) to calculate communication delays accurately, and considers both physical and cyber disturbances.
4. All simulations were performed on the GB test system using the RAMSES simulator.

2018.10-
2019.05

Centralised Control Algorithms for Smart Grid Operation

This research addresses the challenge of maintaining nominal frequency in smart grids, focusing on secondary frequency control (SFC) and proportional–integral (PI) control.

The research (1) examines frequency control mechanisms in depth; (2) details the design of a centralised control system for stabilising smart grids; (3) describes analysis tools built in Python and MATLAB; (4) tests the system under varying time delays and analyses the impact of emergency control; and (5) finds that increasing time delay narrows the range of feasible tuning parameters and affects stability.

The author built a communication layer for an existing smart grid simulator and a central controller to stabilise the system, and developed models to analyse system performance under various disturbance scenarios. Building on the central controller and these analytical models, an optimal controller was introduced and shown to be effective in stabilising frequency during disturbances.

The project developed an in-depth understanding of SFC and PI control, their application and testing in the Nordic scenario, and the associated analysis tools. Further work remains, particularly on advanced algorithms such as artificial neural networks (ANN), genetic algorithms and particle swarm optimisation (PSO), and on their potential role in smart grids.

Other projects

2025.01-
present

Alpha Factor Generation and Backtesting with Large Language Models (Prototype)

- Built a prototype system in which LLMs (such as GPT-4.1 and o4-mini) generate, im-

plement and backtest quantitative factors automatically, accelerating the "idea → code → test" iteration loop. The system integrates OpenAI and DeepSeek models to support hypothesis generation and factor interpretability analysis.

- Workflow: (i) prompt → code: the LLM writes code for feature construction and factor calculation; (ii) code → execution: the code runs automatically in a notebook or script, and its outputs are validated and iterated on; (iii) evaluation and visualisation: a lightweight framework analyses and visualises strategy performance.

Invited talk

An Image Recognition Algorithm Approach to Distinguishing and Categorising the Small-Boat Fleet in the Gulf of California

2021.11 Invited talk, UCL Shipping and Oceans Research Group, UCL Energy Institute & University Maritime Advisory Services (UMAS), London, UK

Grants and scholarship

2026 NVIDIA Inception Program
 2025 Cloudflare for Startups Grant, US\$5,000
 2025 Modal for Startups Grant, US\$5,000
 2024 Microsoft and OpenAI for Startups Founders Hub Grant, US\$7,500
 2024 AWS Activate Founders Grant, US\$1,000
 2022 AWS AI and ML Scholarship
 2018 Undergraduate Exchange Scholarship, University of Leeds

Affiliations

2019-2024 Member, Institute of Electrical and Electronics Engineers (IEEE)
 2018-2020 Student Member, The Institution of Engineering and Technology (IET)

Extracurricular

2024 Music creator (**luv '30**)
 2023-2024 Organiser, St John's Park Tennis Group
 2023-2024 Visiting Staff in Entrepreneurship, UCL
 2023-2024 Member, KCL Hiking Club
 2022-2024 Vice President, Somers Town Table Tennis Group
 2022 Open-source Contributor and Machine Learning Engineer, Unify AI
 2022 Voice Actor, University of the Arts London (UAL)
 2020-2021 Founder, The Bartlett Master Hub
 2017-2019 Member, Leeds University Union Table Tennis Society
 2018 Student Intern, Siemens

2017-2018	Member, Leeds University Union HiTECH Innovation Society
2015-2017	Vice President, Psychology Association, The Sino-British College
2015-2016	Volunteer, Shanghai Symphony Orchestra

Languages

Mandarin (native), English (professional)

Last updated: October 17, 2026