Michael Battye

Digital twins, uncertainty quantification, and production ML for regulated systems.

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Experience

University of York (Fusion CDT)
Doctoral Researcher, Plasma Science & Fusion Energy, Oct 2023 – present (expected 2027)
York, UK. Thesis: digital twin model development for the divertor in fusion power plants.

- Published a first-author review of digital twins in fusion (*IEEE Access*, 2025), treating the divertor, breeder blanket, and magnets as modules of one framework.
- Published a first-author paper on Bayesian experimental design for divertor thermocouple layouts, *Fusion Engineering and Design*, 234, article 116147 (2027), doi: 10.1016/j.fusengdes.2026.116147, and gave the IAEA oral on that design problem.
- Selected for a 20-minute contributed oral at the UKAEA VOLDA workshop (27–29 October 2026; day not yet scheduled): diagnostic design, sparse-sensor reconstruction, and health assessment for divertor components.
- Coupled HEAT heat-flux simulation with Gaussian-process regression and Bayesian experimental design, using HPC datasets of 10^4–10^5 samples for MAST-U and NSTX-U.
- On secondment at digiLab (Mar–May 2025, Exeter/Oxford), turned those HEAT outputs into a diagnostic-design workflow from sensor layout through uncertainty quantification.
- Built the data plane around the twin — streaming, storage, communication protocols, and dashboards — so simulation, diagnostics, and models stay coupled.

Oxford Data Plan
Data Scientist, Finance (fixed-term contract), Sep 2024 – Feb 2025
Oxford, UK.

- Put KPI signals for newly listed tickers into daily production at under 12 hours' lag, holding forecast error inside internal and client tolerances.
- Built the Python (statsmodels) and MySQL pipelines that turn earnings reports and Visible Alpha into those client KPIs.

Assystem
Data Scientist, Data / Digital Engineering, Sep 2022 – Jan 2024
Blackburn, UK.

- Led multi-client analytics and data-platform work that cut manual reporting; internal estimate of about £110k a year in administrative cost avoided.
- Delivered an AI-in-fusion feasibility study (data integration and predictive modelling) that informed a £2M+ tender.
- Designed a cross-department data upskilling pathway and mentored engineering graduates into data roles; retained two at-risk graduates.

Mirada Medical
Data Analyst, Medical Imaging / Auto-contouring, Oct 2020 – Aug 2022
Oxford, UK.

- Shipped deep-learning auto-contouring for neuro-oncology organs-at-risk: more than 90% of contours clinically usable, and planning time cut from hours to minutes.
- Co-author, *Physica Medica* (2023): MR model brainstem vDSC 0.92 / sDSC 0.84, and dose within ±1 Gy for 92% of 26 organs-at-risk, with King's College London and Harvard.

DGP Intelsius
Technical Support Scientist, Thermal Packaging / IoT, Apr 2019 – Sep 2020
York, UK.

- Led physical and simulation validation of thermal packaging that helped secure a £1M contract.
- Led an IoT location and temperature-monitoring platform; projected about 30% fewer thermal-excursion incidents through earlier detection.

Earlier. ACM Global Labs, Data Technician (Sep 2018 – Apr 2019); Greenshoots SCS, Support Worker (Sep 2016 – Sep 2018).

Education

University of York
PhD, Plasma Science & Fusion Energy (expected 2027), Oct 2023 – present
York, UK. Fusion CDT. Industry secondment at digiLab. Thesis as above.

University of York
BSc (Hons) Physics, 2:1, Graduated Jul 2017
York, UK.

University of Oxford
Artificial Intelligence: Cloud and Edge Implementations, 2023
Edge deployment, machine-learning development, and model optimisation.

Publications & Contributions

Battye, M.I. et al. (2027). Thermocouple layout optimisation towards divertor digital twins using Bayesian experimental design. *Fusion Engineering and Design*, 234, article 116147. doi: 10.1016/j.fusengdes.2026.116147.

Battye, M.I. and Perinpanayagam, S. (2025). Digital Twins in Fusion Energy Research: Current State and Future Directions. *IEEE Access*, 13, 75787–75821. doi: 10.1109/ACCESS.2025.3561920.

Vaassen, F. et al., including Battye, M. (2023). Geometric and dosimetric analysis of CT- and MR-based automatic contouring for the EPTN contouring atlas in neuro-oncology. *Physica Medica*, 114, 103156. doi: 10.1016/j.ejmp.2023.103156.

- **Oral.** Diagnostic design, sparse-sensor reconstruction and health assessment for divertor components in a digital twin environment. Third Visualizing Offline and Live Data with AI (VOLDA) Workshop, UKAEA, The Cosener's House, Abingdon, 27–29 October 2026. indico.ukaea.uk/event/708/contributions/2313.
- **Oral.** Bayesian Experimental Design for Divertor Heat Loads in Fusion Power Plants. IAEA 5th Technical Meeting on Divertor Concepts. conferences.iaea.org/event/394/contributions/37602.
- **Posters.** A Divertor Diagnostic Designer for a Digital Twin Environment. IAEA 15th Technical Meeting on Control Systems, Data Acquisition, Data Management and Remote Participation; 5th International Conference on Data-Driven Plasma Science (ICDDPS-5, UC Berkeley); 50th IoP Plasma Physics Conference; MoD-PMI 2023.
- **Peer reviewer.** Royal Society Open Science, 2026.

Skills

Programming. Python (NumPy, SciPy, pandas, scikit-learn, statsmodels, TensorFlow, PyTorch, JAX), SQL, Bash, Git, Docker, Kubernetes, HPC workflows.

Machine learning. Gaussian processes, Bayesian experimental design and active learning, Bayesian optimisation, supervised learning, CNNs, time-series models, uncertainty quantification.

Data and delivery. Production pipelines and ETL, simulation-to-sensor workflows, containerised deployment, dashboards, dataset curation at 10^4–10^5 samples.

Domain. Magnetic-confinement fusion (HEAT; MAST-U and NSTX-U divertors), digital twins for high-heat-flux components, medical image auto-contouring, industrial thermal engineering.