Lin Du

Machine Learning & Scientific Software Engineer | EPFL Ph.D.
Experimental Systems, Automation & AI for Science

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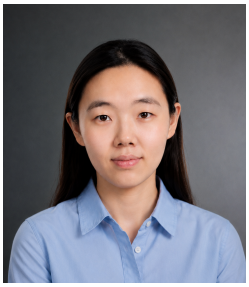

Professional Profile

EPFL Ph.D. in Electrical Engineering working at the interface of **experimental science, machine learning, and scientific software**. Doctoral research developed end-to-end computational workflows for electrochemical sensing, from noisy instrument measurements through signal processing, structured feature extraction, multi-analyte identification and quantification, synthetic-data generation, and uncertainty-aware decision support. Recent work extends this toward **closed-loop scientific automation**: a Python/Java orchestration layer around COMSOL separates high-level proposal generation from deterministic validation, solver execution, metric extraction, and traceable feedback for iterative design refinement. Brings a systems-oriented approach to integrating scientific tools, physical measurements, quantitative models, and reproducible software, with applications across AI for Science, scientific software, and experimental systems.

Core strengths: Python scientific software • experimental measurement pipelines • scientific tool/API integration • deterministic validation • workflow orchestration • quantitative modelling • debugging and reproducibility

Experience

Independent R&D - Scientific Automation & Agentic Systems Switzerland
Python/Java orchestration for COMSOL-based microfluidic design **2026**

- Developed a **closed-loop scientific automation workflow** connecting high-level design proposals to COMSOL Multiphysics through structured parameter interfaces, deterministic feasibility checks, automated solver execution, quantitative result extraction, and iterative feedback.
- Separated **agent reasoning from deterministic execution**: the agent proposed bounded design parameters, while software-controlled validation, geometry/physics construction, solver calls, and metric computation governed what could be executed and how results were evaluated.
- Engineered the workflow for **reproducible and failure-aware execution** with isolated solver runs, structured logs and outputs, explicit validation states, and traceable experiment records to support debugging and quantitative comparison across iterations.
- Applied the system to constrained multi-objective microfluidic design exploration; the selected geometry increased functional reservoir area by **6.9%** while reducing reservoir-surface and outlet response times by **8.3%** and **1.7%**, respectively, versus the baseline.

École Polytechnique Fédérale de Lausanne (EPFL) Neuchâtel, Switzerland
Ph.D. Researcher - Scientific ML for Biosensing and Decision Support **Dec. 2022 – Aug. 2026**

- Designed and implemented an **end-to-end Python pipeline around electrochemical sensor measurements**, transforming raw cyclic-voltammetry data through peak detection, baseline subtraction, Gaussian/GMM feature extraction, identification, drug-specific regression, and final result integration.
- Turned research logic into **reusable, documented Python modules** and a Streamlit interface so experimental and domain collaborators could run complete workflows, inspect intermediate outputs, and reproduce analyses without modifying ML code.
- Built modular PyTorch/scikit-learn models and validation workflows for noisy, interference-prone physical measurements, including multi-branch architectures, task-specific feature selection, custom asymmetric losses, synthetic-data generation, and testing on independently measured data.
- Developed **ETODA**, an automated computational framework integrating pharmacokinetic models, Bayesian posterior estimation, Monte Carlo simulation, candidate-regimen scoring, and risk classification, strengthening experience with robust decision logic under uncertainty.
- Collaborated across machine learning, electrical engineering, electrochemistry, pharmacology, and clinical research; author/co-author of **6 peer-reviewed journal papers and 1 IEEE conference proceeding**.

Beijing Institute of Technology (BIT) Beijing, China
Graduate Researcher - Signal Processing and Machine Learning **Sep. 2019 – Jun. 2022**

- Developed Python/MATLAB signal-processing and ML pipelines for noisy GB-InSAR monitoring data, including dynamic time warping, clustering, automated spatial segmentation, and multistep forecasting.
- Designed and compared LSTM, attention-based, recurrent, and gradient-boosting models; research produced one peer-reviewed journal paper and two granted patents.

Education

École Polytechnique Fédérale de Lausanne (EPFL) — Neuchâtel, Switzerland
Ph.D., Electrical Engineering - Machine Learning and Statistics for Biomedical Data — **Dec. 2022 – Aug. 2026**

- Thesis: *Data-Driven Approaches Applied to Electrochemical Measurements for Therapeutic Drug Monitoring in Precision Medicine*.
- Supervisors: Prof. Sandro Carrara & Prof. Yann Thoma.

Beijing Institute of Technology (BIT) — Beijing, China
M.Sc., Information and Communication Engineering — **Sep. 2019 – Jun. 2022**

- Thesis / focus: *Intelligent Information Processing Methods for GB-InSAR*. — GPA: 90.62/100

Beijing Institute of Technology (BIT) — Beijing, China
B.Sc., Electronic Information Engineering; B.Econ., Economics (Dual Degree) — **Sep. 2015 – Jun. 2019**

- Main topics: Image Processing, Signal Processing. — GPA: 89.27/100

Technical Skills

Programming & Software: **Python** (NumPy, SciPy, Pandas, Matplotlib), MATLAB, C, SQL; Java through COMSOL API integration; Git; familiarity with FastAPI, Pydantic, and Docker/Docker Compose; reusable module design, technical documentation, and API-oriented interfaces.

Scientific Automation: COMSOL Multiphysics; LLM APIs; structured/constrained outputs and tool calls; schema- and constraint-based validation; agent-to-tool orchestration; process isolation; result parsing; experiment ledgers; logs and traceable execution; human-reviewable automation patterns.

Scientific & Experimental Data: Electrochemical sensor data, cyclic voltammetry, signal processing, feature extraction, simulation/measurement integration, synthetic-data generation, microfluidic transport modelling, and quantitative validation.

Machine Learning: PyTorch, scikit-learn; classification, regression, multi-branch neural networks, Gaussian mixture models, custom loss functions, time-series modelling, gradient boosting, Bayesian estimation, Monte Carlo simulation, and uncertainty-aware evaluation.

Engineering Foundation: Ph.D. in Electrical Engineering and B.Sc. in Electronic Information Engineering; experience working with biosensing, scientific instrumentation context, physical measurement data, and multiphysics models.

Languages: English (professional fluency); Mandarin Chinese (native).

Publications & Patents

Journal Papers

- **L. Du**, M. Briki, T. Buclin, M. Guidi, S. Carrara, Y. Thoma. "ETODA: Automatic Three-dimensional Error Tolerance Grid Generation for Dosage Adaptation in Precision Medicine." *Computer Methods and Programs in Biomedicine*, 2026.
- **L. Du**, T. Matsumoto, F. Rodino, C. Premachandra, Y. Thoma, S. Carrara. "Optimized IdentQuantNet: A machine learning-based approach for identification and quantification of multiple drugs with interaction on electrochemical sensors in personalized medicine." *Microchemical Journal*, 2025.
- **L. Du**, Y. Thoma, F. Rodino, S. Carrara. "Automatic simulation of electrochemical sensors by machine learning for drugs quantification." *Electrochimica Acta*, 2024.
- **L. Du**, F. Rodino, Y. Thoma, S. Carrara. "Identification and Quantification of Multiple Drugs by Machine Learning on Electrochemical Sensors for Therapeutic Drug Monitoring." *IEEE Sensors Letters*, 2024.
- T. Matsumoto, **L. Du**, F. Rodino, Y. Thoma, C. Premachandra, S. Carrara. "Optimized Quantification of Multiple Drug Concentrations by WeightedMSE With Machine Learning on Electrochemical Sensor." *IEEE Sensors Letters*, 2024.
- W. Tian, **L. Du**, Y. Deng, X. Dong. "Partition of GB-InSAR deformation map based on dynamic time warping and k-means." *Journal of Systems Engineering and Electronics*, 2022.

Conference Proceedings

- T. Matsumoto, **L. Du**, Y. Thoma, S. Carrara. "Simultaneous Quantification of Multiple Drugs by Machine Learning on Electrochemical Sensors." *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2024.

Granted Patents

- W. Tian, **L. Du**, C. Hu, Y. Deng, X. Dong. "Slope deformation area division method based on dynamic time warping and k-means clustering." CN113177575B, granted, 2022.
- W. Tian, **L. Du**, C. Hu, Y. Deng, T. Xiao. "Step-type landslide displacement prediction method based on gradient boosting machine and quadratic programming." CN112668606B, granted, 2022.

Teaching, Awards and Service

Teaching (EPFL) Teaching Assistant, Applied Machine Learning; Teaching Assistant, Deep Learning for Autonomous Vehicles.
Awards Beijing Outstanding Graduate (2022, top 5%); National Scholarship of China (2021, top 2%).
Peer Review *Measurement*; *IEEE Sensors Journal*; *BioNanoScience*.