Zelda E. Mariet

Foundation models: theory of uncertainty and applications to biology

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Professional experience

Co-Founder — VP of Research Bioptimus

Multi-scale biological foundation models — *Single-cell, histopathology, spatial omics.* *2023–*

- **Research lead** for the development of foundation models trained on multi-modal medical data; built the research team from scratch to 15+ ML and biochemistry research scientists and engineers.
- **Foundation models for computational pathology.** Released largest open-source foundation model with SOTA performance across histopathology benchmarks (¿60k downloads per month as of July 2025).
- **Public-facing scientific outreach.** Technical spokesperson to support fundraising and commercial opportunities (incl. TEDxParis talk).

Senior Research Scientist Google DeepMind

Reliable deep learning & AI for Science teams — *Modeling uncertainty in ML.* *2019–2023*

- **Reliability via pretrained large models.** Developed models with state-of-the-art performance across a variety of vision, language, and decision-making tasks involving uncertainty.
- **Which diversity improves ensembles?** Resolution of a longstanding open question[1] in ensembles theory.
- **ML-guided nanobody design targeting COVID-19.**

Education

PhD (computer science), advised by Suvrit Sra MIT

Theory and applications of negatively dependent measures for ML. ***Minor****: physical cosmology.* *2014–2019*

Master of Science MIT

Thesis: modeling diversity with determinantal point processes. *2014–2016*

Master of Science & Bachelor of Science Ecole polytechnique (France)

Specialization in Mathematics and Computer Science. *2011–2014*

Selected Publications & patents

24 publications (11 first-author) — **2 patents** (pending) — **h-index**: 15 — **i-index**: 20

- Gemini 2.5: Pushing the Frontier with Advanced Reasoning, Multimodality, Long Context, and Next Generation Agentic Capabilities. *Gemini Team, Google* 2025
- H-Optimus-0. *C. Saillard et al.* 2024
- Ensembling mixture-of-experts neural networks. *Patent #US20230107409A1* 2023
- Population-based black-box optimization. *Patent #US20230083892A1* 2023
- Ensembles of classifiers: a bias-variance perspective. *Gupta, Smith, Adlam, Mariet* TMLR 2022
- Sparse MoEs meet efficient ensembles. *Allingham et al.* TMLR 2022

[1] "Understanding ensemble diversity remains a holy grail problem" (*Ensemble Methods: Foundations and Algorithms*, Zhi-Hua Zhou, 2012)

- Distilling ensembles improves uncertainty estimates. *Mariet, Jenatton, Wenzel, Tran* AABI 2021
- Population-based black-box optimization for biological sequence design. *Angermueller, Belanger, Gane, Mariet, Dohan, Murphy, Colwell, Sculley* ICML 2020
- Foundations of sequence-to-sequence modeling for time series. *Mariet, Kuznetsov* AISTATS 2019
- Learning DPPs by sampling inferred negatives. *Mariet, Gartrell, Sra* AISTATS 2019
- Exponentiated strongly Rayleigh distributions. *Mariet, Sra, Jegelka* NeurIPS 2018
- Maximizing induced cardinality under a DPP. *Gillenwater et al.* NeurIPS 2018
- Elementary symmetric polynomials for optimal experimental design. *Mariet, Sra* NeurIPS 2017
- Kronecker determinantal point processes. *Mariet, Sra* NIPS 2016
- Diversity networks: neural network compression using DPPs. *Mariet, Sra* ICLR 2016
- Fixed-point algorithms for learning determinantal point processes. *Mariet, Sra* ICML 2015

Invited talks

- From modeling the tissue to modeling all of biology. *Broad Institute ML4DD Symposium* 2025
- Ensembling over classifiers: a bias-variance perspective. *Bayes duality workshop, Riken* 2024
- Multi-scale fondation models for the language of life. *TEDxParis* 2025
- ML-guided nanobody design targeting COVID-19. *Gaussian Process Seminar Series* 2023
- A duality perspective on the bias-variance decomposition. *The 2nd Bayes-Duality Workshop* 2024

Hosted workshops

- Duality Principles for Modern Machine Learning (DP4ML 2023) ICML 2023
- Negative Dependence and Submodularity for Machine Learning (NegDepML 2020) ICML 2020
- Negative Dependence in Machine Learning (NegDepML 2019) ICML 2019

Teaching Experience

- **Harvard instructor:** Topics in Machine Learning (CS282r) 2022
- **CSRMP mentor** to 7 undergrad & grad students from underrepresented communities 2022
- **MIT Teaching Assistant:** Machine Learning graduate course (6.867) 2016
- **Math instructor** at GEPPM, a French non-profit for underprivileged students 2011–2012

Awards & Community service

- 100 Women in Tech in Europe, SIFTED 2025
- 100 Womaen Tech Founders to Watch, Founders Forum Group 2024
- Google PhD Fellowship in machine learning 2018
- Accepted to the Corps des Mines after graduating from Ecole polytechnique 2014
- Silver medal, SWERC international algorithmics contest 2013

Area Chair: AISTATS, IJCAI **Reviewer**: NeurIPS, ICML, ICLR, TMLR, JMLR

Spoken Languages

English/French: bilingual **Japanese**: JLPT N3 **German**: strong skills