Brian Staber

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Professional experience

Deep learning scientist **Since January 2025**

Safran.AI (ex Preligens) *Paris, France*

- **Job title**: Deep learning scientist.
- Surveying recent literature in image-based anomaly detection and implementing state-of-the-art methods within the company's production codebase.
- Contributing to the Digital Inspection Program, developing production-ready models for industrial anomaly detection across multiple Safran entities.
- TL;DR: Computer vision, anomaly & OOD detection, software development for production-level ML systems, cloud computing and containerization

Research engineer **March 2020 - January 2025**

Safran's research corporate center *Magny-les-Hameaux, France*

- **Job title**: Trustworthy AI for engineering design in **computational fluid and solid mechanics**.
- **Main research topics**: deep learning and machine learning for mesh-based simulations, uncertainty quantification
- **Publications:** co-authored **4 papers** in international conferences (**NeurIPS** and **AISTATS**), 1 submitted preprint. – Google scholar
- **Patents:** 2 submitted patents.
- Development of machine learning packages in Python: batorch, kernax, pbnn
- Mentored 6 internships about kernel methods, physics-informed machine learning, generative models, graph neural networks, and transformers.
- Co-supervising two PhD students at Ecole Polytechnique (CMAP) and ENSAI Rennes (CREST).
- Lecturer in Python for machine learning at ENSAI Rennes, and **supervising** several master's theses each year as well.
- Lecturer in optimization & surrogate modeling for engineers at Safran University.
- Managed a workpackage in an ANR project.
- Involved in French research communities: RT-UQ and GIS Lartisste.

Postdoctoral researcher **March 2019 - March 2020**

Safran & Mines ParisTech *Paris, France*

- **Research topic:** Modeling local instability phenomena in elasto-plasticity with non-smooth plasticity theory.
- **Advisor:** Samuel Forest.
- **Publication:** 1 paper in the journal IJSS.
- **Implemented** a new elasto-plastic model in the C++ commercial software Zset.
- **Applied** the proposed algorithm to representative problems at Safran.

Research engineer **Oct. 2018 - March 2019**

Egis Industries *Paris, France*

- **Job description**: Applied research in mechanics of materials and nuclear safety analysis.
- **Tasks**: Design of experiments and uncertainty propagation.

Education

PhD in Mechanical Engineering – Uncertainty quantification in biomechanics **Sept. 2015 - Sept. 2018**

Université Gustave Eiffel *Paris, France*

- **Thesis topic:** Stochastic analysis, simulations, and identification of hyperelastic constitutive equations – https://theses.hal.science/tel-01982185
- **TL;DR**: physically admissible random field models in linear and finite elasticity, application to soft biologicial tissues for uncertainty quantification, surrogate models in nonlinear multiscale mechanics.
- **Supervisor**: Johann Guilleminot
- **Publications**: 8 papers and 1 book chapter in international peer-reviewed journals including SIAM-JUQ, CMAME, ZAMM-JAMM, and CRM. – Google scholar
- **Implemented** a parallel finite element solver by relying on Sandia's Trilinos project.
- **PhD awards**: French CSMA PhD award, European ECCOMAS PhD award
- **Last year spent** at Duke University in the CEE departement (UQ lab).
- **Collaboration** with the US Naval Research Laboratory that lead to a paper in CMAME.

Master of Engineering – Mechanics of materials and structures **Sept. 2013 - Sept. 2015**

Université Gustave Eiffel *Paris, France*

Bachelor of science – Physics **Sept. 2010 - Sept. 2013**

Université Gustave Eiffel *Paris, France*

Skills

- **Programming**: 10 years of experience in Python and C++, basic knowledge of R.
- **Development tools**: VSCode, Git, CI/CD, Docker, PyPi, conda, poetry, pants.
- **Machine learning stack**: 6 years experience with PyTorch, JAX, scikit-learn, and related packages.
- **Engineering**: Mechanics of materials and structures, finite element method for solid mechanics.
- **Languages**: French (native), English (fluent), and Dutch (basic).

Publications

[1] Brian Staber and Johann Guilleminot. Approximate solutions of lagrange multipliers for information-theoretic random field models. *SIAM/ASA Journal on Uncertainty Quantification*, 3(1):599–621, 2015.

[2] Brian Staber and Johann Guilleminot. Stochastic modeling of a class of stored energy functions for incompressible hyperelastic materials with uncertainties. *Comptes Rendus Mécanique*, 343(9):503–514, 2015.

[3] Brian Staber and Johann Guilleminot. Stochastic modeling of the ogden class of stored energy functions for hyperelastic materials: the compressible case. *ZAMM-Journal of Applied Mathematics and Mechanics/Zeitschrift für Angewandte Mathematik und Mechanik*, 97(3):273–295, 2017.

[4] B Staber and J Guilleminot. Stochastic hyperelastic constitutive laws and identification procedure for soft biological tissues with intrinsic variability. *Journal of the mechanical behavior of biomedical materials*, 65:743–752, 2017.

[5] B Staber and J Guilleminot. Functional approximation and projection of stored energy functions in computational homogenization of hyperelastic materials: A probabilistic perspective. *Computer Methods in Applied Mechanics and Engineering*, 313:1–27, 2017.

[6] Brian Staber and Johann Guilleminot. Stochastic modeling and generation of random fields of elasticity tensors: a unified information-theoretic approach. *Comptes Rendus Mécanique*, 345(6):399–416, 2017.

[7] Brian Staber and Johann Guilleminot. A random field model for anisotropic strain energy functions and its application for uncertainty quantification in vascular mechanics. *Computer Methods in Applied Mechanics and Engineering*, 333:94–113, 2018.

[8] Brian Staber, Johann Guilleminot, Christian Soize, John Michopoulos, and A Iliopoulos. Stochastic modeling and identification of a hyperelastic constitutive model for laminated composites. *Computer Methods in Applied Mechanics and Engineering*, 347:425–444, 2019.

[9] Brian Staber, Samuel Forest, M Al Kotob, Matthieu Mazière, and T Rose. Loss of ellipticity analysis in non-smooth plasticity. *International Journal of Solids and Structures*, 222:111010, 2021.

[10] Clément Bénard, Brian Staber, and Sébastien Da Veiga. Kernel stein discrepancy thinning: a theoretical perspective of pathologies and a practical fix with regularization. *Advances in Neural Information Processing Systems*, 36, 2024.

[11] Fabien Casenave, Brian Staber, and Xavier Roynard. MMGP: a mesh morphing gaussian process-based machine learning method for regression of physical problems under nonparametrized geometrical variability. *Advances in Neural Information Processing Systems*, 36, 2024.

[12] Brian Staber and Sébastien Da Veiga. Benchmarking bayesian neural networks and evaluation metrics for regression tasks. *arXiv preprint arXiv:2206.06779*, 2022.

[13] Raphaël Carpintero Perez, Sébastien Da Veiga, Josselin Garnier, and Brian Staber. Gaussian process regression with sliced wasserstein weisfeiler-lehman graph kernels. *International Conference on Artificial Intelligence and Statistics*, 2024.

[14] Raphaël Carpintero Perez, Sébastien Da Veiga, Josselin Garnier, and Brian Staber. Learning signals defined on graphs with optimal transport and gaussian process regression. *International Conference on Artificial Intelligence and Statistics*, 2025.

[15] Louis Allain, Sébastien Da Veiga, and Brian Staber. Scalable and adaptive prediction bands with kernel sum-of-squares. *arXiv preprint arXiv:2505.21039*, 2025.

[16] Fabien Casenave, Xavier Roynard, Brian Staber, William Piat, Michele Alessandro Bucci, Nissrine Akkari, Abbas Kabalan, Xuan Minh Vuong Nguyen, Luca Saverio, Raphaël Carpintero Perez, et al. Physics-learning ai datamodel (plaid) datasets: a collection of physics simulations for machine learning. *arXiv preprint arXiv:2505.02974*, 2025.