Thibaut GERMAIN

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Research Interests

My research interests lie at the crossroads between geometry, shape analysis, and machine learning for time series. More precisely, I am interested in developing shape-based machine learning methods for time series with a particular focus on biomedical applications.

Education

2021 - now **Ph.D., Centre Borelli, Ecole Normale Supérieur Paris-saclay, France**. Thesis focusing on Pattern detection and shape analysis for physiological time series. Supervised by Laurent OUDRE and Charles TRUONG

2020 **Master of Science, Ecole Normale Supérieur Paris-saclay, France**. Master Mathématiques Vision et Apprentissage (MVA), highest honors.

2017 **Master of Science, Université Lyon 1, France**. Master Operational Research and Supply Chain.

2017 **Master's degree, Ecole des Mines de Saint-Etienne, France**. Master in supply chain engineering.

Positions

2024 **Visiting researcher, Duke University, Durham, NC (USA)**. One month visiting.

2020 **Research volunteer, Centre Borelli, France**. Assisted Argyris KALOGERATOS for simulating COVID-19 dynamical propagation within a hospital department. Four months volunteering.

2017 - 2019 **Supply chain engineer, Tempest Tech Corp., Fresno, CA (USA)**. Standardizing and optimizing operational activities. Overseeing research and development activities. Management support: supervising the production team, training, and hiring.

2017 **Supply chain intern, Airbus Helicopters, Marignane, France**. Modeling and optimizing the supply chain of the H160 during its research and development phase. Evaluating the supply chain robustness through a sensitivity analysis.

Teaching

2021 - 2024 **Teaching assistant (TD/TP), Ecole Normale Supérieur Paris-saclay, France**.

- Mathematical statistics and machine learning, (Graduate course).
- Statistics for the French exam "Agrégation de mathématiques", (Graduate course).

2022 **Teaching assistant (TD/TP), Ecole Normale Supérieur Paris-saclay, France**.

- Introduction to measure theory, integration, and probability, (Undergraduate course).

Students

Graduate

- Valerio GUERRINI, M2 MVA, April-September 2024, co-supervised with Charles TRUONG and Laurent OUDRE, on "Benchmark for motif discovery in time series".
- Lucas HAUBERT, M2 MVA, April-September 2024, co-supervised with Chrysoula KOSMA and Laurent OUDRE, on "Toward shape-based losses for deep learning on time series".

Undergraduate

- Romain DELAUNAY and Hugo GAIBLE, L3 ENS Paris Saclay, April-June 2023, co-supervised with Alexandre BOIS and Laurent OUDRE, on "Convolutional dictionnay learning".
- William RAMOS and Oussama ZEKRI, L3 ENS Paris Saclay, April-June 2022, co-supervised with Laurent OUDRE, on "Optimal transport and elastic measures on time series".

Talks

1. "Shape analysis and machine learning for time series", (Duke University, July 2024).
2. "Persistence-based Motifs Discovery in Time Series", (Centre Borelli, June 2024).
3. "Linear-trend normalization for multivariate subsequence similarity search", (ICDE 2024, May 2024).
4. "Interpretable classification of ventilation behaviors based on machine learning", (Integrative Neuroscience and Cognitive Center (INCC), January 2023).
5. "Une méthode de regroupement des comportements respiratoires basée sur des distances DTW entre séries temporelle & Comment les nouveaux outils permettent de redécouvrir des données ?", (Maths & Medecine, December 2022).
6. "Unsupervised study of plethysmography signals through DTW clustering", (EMBC 2022, July 2022).

PUBLICATIONS

Journal papers:

1. Thibaut Germain, Charles Truong, and Laurent Oudre. "Persistence-based motif discovery in time series". In: *IEEE Transactions on Knowledge and Data Engineering* (2024)
2. Thibaut Germain et al. "Unsupervised classification of plethysmography signals with advanced visual representations". In: *Frontiers in Physiology* 14 (2023), p. 1154328

International conference papers:

1. Thibaut Germain et al. "Shape analysis for time series". In: *Advances in neural information processing systems* (2024)
2. Thibaut Germain, Charles Truong, and Laurent Oudre. "Interactive motif discovery in time series with persistent homology". In: *Joint European Conference on Machine Learning and Knowledge Discovery in Databases*. Springer. 2024, pp. 383–387
3. Thibaut Germain, Charles Truong, and Laurent Oudre. "Linear-trend normalization for multivariate subsequence similarity search". In: *2024 IEEE 40th International Conference on Data Engineering Workshops (ICDEW)*. IEEE. 2024, pp. 167–175
4. Thibaut Germain et al. "Unsupervised study of plethysmography signals through DTW clustering". In: *2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*. IEEE. 2022, pp. 3396–3400

National conference papers:

1. Thibaut Germain et al. "Détection non supervisée de motifs sur séries temporelles". In: *2023 29ème Colloque Francophone de Traitement du Signal et des Images (GRETSI)*. 2023
2. Thibaut Germain et al. "Approches non-supervisées et non-linéaires pour l'analyse de signaux de pléthysmographie". In: *2022 28ème Colloque Francophone de Traitement du Signal et des Images (GRETSI)*. 2022

REFERENCES

1. **Laurent OUDRE**
   Full Professor, Machine Learning Department
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   Email: laurent.oudre@ens-paris-saclay.fr
   Phone: +33 1 81 87 53 96
   Relationship: Ph.D. supervisor

2. **Eric KREJCI**
   Research Director, Neurophysiology Department
   Centre Borelli, Ecole Normale Supérieur Paris-Saclay
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