

# Alex LAMBERT

## Machine Learning Researcher

jobs.alambert@proton.me | <https://allambert.github.io> | Born 04/13/1994 | French |

### RESEARCH EXPERIENCE

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KU LEUVEN (Belgium): Postdoctoral researcher in the STADIUS group, ESAT. | AUG 2021 - PRESENT  
TÉLÉCOM PARIS (France): PhD thesis in the S2A group, LTCl. | OCT 2017 - JUL 2021

### EDUCATION

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ÉCOLE POLYTECHNIQUE (France): M.S. Applied Mathematics for Data Science. | SEP 2016 - SEP 2017  
TÉLÉCOM PARIS (France): Engineering degree. Major in probabilistic modeling and data science. | SEP 2014 - SEP 2017

### RESEARCH PROJECTS

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**Faster asymmetric learning in feature spaces** (Paper [1], ICML 2024, team of 6) | NOV 2023 - PRESENT

- Improved scalability of learning in feature spaces through a new asymmetric Nyström method linked to kernel SVD.
- I improved the framework and proved the desired theoretical properties of the learning problem.
- Python prototype tested on 5 real-world benchmarks, outperforming competitors on downstream tasks.

**Better and faster kernel PCA** (Paper [2], ICML 2023, team of 4) | DEC 2021 - DEC 2023

- Scaling the extraction of nonlinear components from data to millions of datapoints while being robust to outliers.
- I co-led the project, with a focus on the development of new optimization algorithms based on dualization.
- I developed a Python package that improves the computation time by a factor of 3 on 5 tested real-world datasets.

**Robust functional output regression** (Paper [3], ICML 2022, team of 4) | SEP 2020 - SEP 2022

- New sparse and robust techniques for functional output regression in the presence of outliers, based on convoluted losses.
- I led the project, from the theoretical investigations of new loss functions families to the first prototype of the code.
- Robustness to outliers demonstrated in Python on synthetic and real-world data with several contamination scenarios.

**Continuous control of emotion transfer** (Paper [4], Ctrl Gen workshop 2021, team of 4) | SEP 2020 - DEC 2021

- Emotion transfer for facial landmarks that interpolates continuously between emotions unseen during learning.
- I co-led the project, supervising both the theory and the development of the code prototype.
- Python code competitive with GAN-based state-of-the-art models on two task-specific datasets.

**Robust losses for complex outputs** (Paper [5], ICML 2020, team of 5) | MAR 2019 - SEP 2020

- New loss functions that replace the square loss when data is contaminated, with dedicated optimization algorithms.
- I contributed to the theoretical derivations, to the design of optimization schemes, and supervised some experiments.
- Python implementation shows improvements over the baseline on 3 separate tasks with real-world datasets.

**Joint learning of many tasks** (Papers [6, 7] AMTL workshop 2019 & AISTATS 2019, team of 4) | OCT 2017 - AUG 2019

- Learning jointly infinitely many tasks encoded by a continuous hyperparameter, for example quantile regression.
- I co-led the project. I supervised the theory behind the model, which led to crucial design choices.
- Python prototype scales to thousands of quantile levels, also efficient on outliers detection and cost-sensitive classification.

### SOFTWARE

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- Proficient with Python (numpy, pandas, scikit-learn, pytorch),  $\LaTeX$ , Git, Unix.
- I maintain the `torch_intl` package that solves various integral loss minimization problems with kernels.
- I maintain the `foreg` package that solves robust functional output regression based on convoluted losses.

### COMMUNITY

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- Reviewer for top machine learning conferences and journals including NeurIPS, ICML, AISTATS, TMLR.
- Teaching assistant for more than 10 bachelor and master-level courses around machine learning.
- Mentoring students: supervision of master thesis, internship, scientific advisor on master projects.
- Organizing committee of the international workshop DEEPK on kernels and deep learning.

### LANGUAGES

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- French (native), English (bilingual proficiency), Dutch (elementary proficiency).

### SELECTED TALKS

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- MIND/SODA seminar (Paris), November 2023. *Robustness and sparsity through Moreau envelopes in kernel-based settings.*
- E-Duality meeting (Leuven), May 2022. *On the operator-valued interpretation of Restricted Kernel Machines.*
- Simpas Group Meeting (Paris), Feb 2020. *Learning function-valued functions in RKHSs: application to integral losses.*

## BIBLIOGRAPHY

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- [1] Q. Tao, F. Tonin, **A. Lambert**, Y. Chen, P. Patrinos, J.A.K. Suykens. *Learning in Feature Spaces via Coupled Covariances: Asymmetric Kernel SVD and Nyström method*. In Proceedings of ICML 2024 (paper available soon).
- [2] F. Tonin\*, **A. Lambert\***, P. Patrinos, J.A.K. Suykens. *Extending Kernel PCA through Dualization: Sparsity, Robustness, and Fast Algorithms*. In Proceedings of ICML 2023.
- [3] **A. Lambert**, D. Bouche, Z. Szabó, F. d'Alché-Buc. *Functional Output Regression with Infimal Convolution: Exploring the Huber and  $\epsilon$ -insensitive Losses*. In Proceedings of ICML 2022.
- [4] **A. Lambert\***, S. Parekh\*, Z. Szabó, F. d'Alché-Buc. *Emotion Transfer Using Vector-Valued Infinite Task Learning*. 2021, Preprint.
- [5] P. Laforgue, **A. Lambert**, L. Brogat-Motte, F. d'Alché-Buc. *Duality in RKHSs with Infinite Dimensional Outputs: Application to Robust Losses*. In Proceedings of ICML 2020.
- [6] **A. Lambert\***, R. Brault\*, Z. Szabó, F. d'Alché-Buc. *A Functional Extension of Multi-Output Learning*. In the AMTL workshop of ICML 2019.
- [7] R. Brault\*, **A. Lambert\***, Z. Szabó, F. d'Alché-Buc. *Infinite Task Learning in RKHSs*. In Proceedings of AISTATS 2019.