

# Kilian Lieret

kl5675@princeton.edu <sup>✉</sup> | +1 (609) 436 0792 | <https://lieret.net> <sup>✉</sup>  
40 Linden Ln, Princeton, NJ-08540, U.S.A.

## RESEARCH AND EDUCATION

### Princeton University, IRIS-HEP <sup>✉\*</sup>

Associate Research Scholar  
Postdoctoral Research Associate

Princeton, U.S.A

since July 2023  
July 2022 – July 2023

**Adviser:** Peter Elmer

#### Projects:

- Application of machine learning to high-throughput problems in High Energy Physics, especially the reconstruction of particle trajectories; current focus on learned-clustering techniques using graph neural networks or transformers; software is developed open-source at [github.com/gnn\\_tracking](https://github.com/gnn_tracking) <sup>✉†</sup>
- Coordination of software training and education initiatives in High Energy Physics

### Ludwig Maximilian University <sup>✉</sup>

Ph.D. in Experimental Particle Physics

Munich, Germany

Oct 2018 – May 2022

**Adviser:** Thomas Kuhr

#### Projects:

- Calibration of the *Full Event Interpretation* algorithm, a complex, multi-stage machine learning algorithm that reconstructs cascades of particle decays at the Belle and Belle II experiments
- Cluster analyses of kinematic distributions of particle decays to determine experimental sensitivities and to estimate dependencies of experimental results on theoretical models
- Maintenance of the software testing and validation framework for the Belle II experiment

**Thesis:** Calibration of Machine Learning based Hadronic Tagging in Preparation for a  $|V_{cb}|$  Measurement and Clustering of Kinematic Distributions

**Final grade:** Summa cum laude

### Ludwig Maximilian University <sup>✉</sup> and Technical University of Munich <sup>✉</sup>

Elite-M.Sc. course on Theoretical and Mathematical Physics <sup>✉</sup>

Munich, Germany

Oct 2014 – Sep 2018

**Thesis:** Construction of Angular Observables Sensitive to New Physics in  $\bar{B} \rightarrow D^* \tau^- \bar{\nu}_\tau$  Decays and Measurements of Differential Cross Sections of  $\bar{B} \rightarrow D^* \ell^- \bar{\nu}_\ell$  Decays with Hadronic Tagging at Belle

**Final grade:** 1.31 <sup>‡</sup>

---

\* Institute for Research and Innovation in Software for High Energy Physics

† All research projects are described in more detail at [lieret.net/research](https://lieret.net/research) <sup>✉</sup>

‡ German academic grades range from 1.0 (best) to 4.0

**Ludwig Maximilian University** [↗](#)

B.Sc. in Physics

**Thesis:** Truth-Level Based Estimation of the Sensitivity to Phenomenological Minimal Supersymmetric Standard Models in Events With One Hard Lepton

**Final grade:** 1.29

**Munich, Germany**

Oct 2011 – Sep 2015

**Ludwig Maximilian University** [↗](#)

B.Sc. in Mathematics (minor: Theoretical Physics)

**Thesis:** Elliptic Functions

**Final grade:** 1.04 (best of my semester)

**Munich, Germany**

Oct 2011 – Aug 2014

## RESEARCH STAYS AND INTERNSHIPS

**University of Tokyo** [↗](#)

Visiting research scientist

**Project:** Search for New Physics in  $B \rightarrow D^{(*)} \tau \bar{\nu}_\tau$  decays

**Tokyo, Japan**

Dec 2017 – Feb 2018

**Tokyo Institute of Technology** [↗](#)

Research-oriented summer school

**Project:** Complex Organic Molecules in Protoplanetary Disks

**Tokyo, Japan**

Jul 2017 – Sep 2017

**Nagoya University** [↗](#)

Nagoya University Program for Academic Exchange [↗](#)

**Nagoya, Japan**

Sep 2015 – Sep 2016

**LHCb** [↗](#), **CERN** [↗](#)

Research-oriented summer school

**Project:** Data Acquisition Performance Analysis

**Geneva, Switzerland**

Jul 2015 – Sep 2015

## LEADERSHIP

**High Energy Physics Software Foundation** [↗](#)

2020, 2022, 2023

Convener of the Software Training and Careers Working Group [↗](#) organizing cross-experiment software training events and reaching more than 1,500 participants during my terms

**Belle II Collaboration** [↗](#)

2020 – 2023

Convener of the Software Documentation and Training Group; coordinated complete overhaul of training materials and training paradigm (see [3])

## SCHOLARSHIPS

<b>University of Tokyo</b> <sup>↗</sup> Short-term scholarship	Dec 2017 – Feb 2018
<b>German National Academic Foundation</b> <sup>↗</sup> Financial and academic support throughout B.Sc./M.Sc. studies	Apr 2013 – Jun 2018
<b>Max Weber-Program of the state of Bavaria</b> <sup>↗</sup> Financial and academic support throughout B.Sc./M.Sc. studies	Dec 2013 – Oct 2017
<b>Tokyo Institute of Technology</b> <sup>↗</sup> Short-term scholarship	Jul 2017 – Sep 2017
<b>German Academic Exchange Service (DAAD)</b> <sup>↗</sup> One-year scholarship for studies in Japan	Sep 2015 – Aug 2016

## SELECTED AWARDS

<b>Most Creative Team at the Deep Learning Hackathon #d3hack2019</b> <sup>↗</sup> For developing a novel graph neural network approach for a project on Monte Carlo generation	Sep 2019
<b>Best Presentation Award</b> For my summer project at Tokyo Institute of Technology <sup>↗</sup>	Sep 2017
<b>Main Prize: Best Overall Project</b> As team leader of “Information Please” at the CERN <sup>↗</sup> webfest (“hackathon”)	Aug 2015

## SELECTED PUBLICATIONS

### Published:

- [1] Jason Aebischer, Thomas Kuhr, and Kilian Lieret. Clustering of  $\bar{B} \rightarrow D^{(*)} \tau^- \bar{\nu}_\tau$  kinematic distributions with ClusterKinG. *JHEP*, 04:007, 2020. [arXiv:1909.11088](https://arxiv.org/abs/1909.11088) <sup>↗</sup>, [doi:10.1007/JHEP04\(2020\)007](https://doi.org/10.1007/JHEP04(2020)007) <sup>↗</sup>.
- [2] James Kahn, Emilio Dorigatti, Kilian Lieret, Andreas Lindner, and Thomas Kuhr. Selective background Monte Carlo simulation at Belle II. *EPJ Web Conf.*, 245:02028, 2020. [doi:10.1051/epjconf/202024502028](https://doi.org/10.1051/epjconf/202024502028) <sup>↗</sup>.
- [3] Kilian Lieret et al. A new software training model at Belle II. *Journal of Physics: Conference Series*, 2438(1):012052, feb 2023. URL: <https://dx.doi.org/10.1088/1742-6596/2438/1/012052>, [doi:10.1088/1742-6596/2438/1/012052](https://doi.org/10.1088/1742-6596/2438/1/012052) <sup>↗</sup>.
- [4] Sudhir Malik, Samuel Meehan, Kilian Lieret, et al. Software Training in HEP. 2021. CSBS. [arXiv:2103.00659](https://arxiv.org/abs/2103.00659) <sup>↗</sup>.

## Submitted:

- Kilian Lieret, Gage deZoort. An Object Condensation Pipeline for Charged Particle Tracking at the High Luminosity LHC. Submitted to EPJ Web Conf. URL: <https://arxiv.org/abs/2309.16754>.

## In preparation:

- Kilian Lieret, Gage deZoort. An Object Condensation Pipeline for Charged Particle Tracking.
- Kilian Lieret, Thomas Kuhr, Florian Bernlochner, Felix Metzner. Calibration of the Full Event Reconstruction hadronic tagging algorithm using  $B \rightarrow X\ell\nu$  decays at Belle.
- Markus Prim, Kilian Lieret, Thomas Kuhr, Florian Bernlochner, Felix Metzner. Determination of the CKM matrix element  $|V_{cb}|$  and search for new physics using semileptonic  $B \rightarrow D^*\ell\nu$  decays with hadronic tagging at Belle.

## RECENT & UPCOMING TALKS

- High Pileup Particle Tracking with Object Condensation. Connecting the Dots. Toulouse, France, October 2023.
- Tracking with Graph Neural Networks, PyHEP, October 2023.
- An Object Condensation Pipeline for Charged Particle Tracking. 26th International Conference on Computing in High Energy & Nuclear Physics. Norfolk, VA, U.S.A., May 2023.
- Building a Global HEP Software Training Community. 26th International Conference on Computing in High Energy & Nuclear Physics. Norfolk, VA, U.S.A., May 2023.

## OPEN SOURCE PROJECTS

I have authored more than 20 open-source projects, most of them listed at [lieret.net/opensource](https://lieret.net/opensource) and available on [github.com/klieret](https://github.com/klieret). Notably:

- `gnn_tracking`, a library for particle trajectory reconstruction using graph neural networks
- `wandb-osh`, a package to facilitate synchronizing ML runs to the Weights & Biases dashboard from SLURM nodes without internet access
- `AnkiPandas` interfaces Anki (a popular spaced repetition program) with `pandas`
- `ClusterKinG` [1] clusters kinematic distributions in particular for HEP purposes

## LANGUAGES

**German:** native

**English:** near-native (C2\*), TOEFL iBT: 115<sup>†</sup> (Nov 2014)

**Japanese:** upper-intermediate/pre-advanced (B2/C1), JLPT N2<sup>‡</sup> (Jul 2016)

**French:** upper-intermediate (B2)

---

\* Common European Framework of Reference for Languages, a scale ranging from A1 (beginner) to C2 (near native)

<sup>†</sup> Test of English as a Foreign Language. The iBT score ranges from 0 to 120.

<sup>‡</sup> Japanese-Language Proficiency Test. Scale of five levels: N5 (beginner) to N1