

Matthew Dupraz

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Education

- 2024– **PhD Mathematics**, *Freie Universität*, Berlin
present ○ Work in DFG funded project “ K -theory and normal complexes” under the supervision of Prof. Christian Haase and Dr. Leonid Monin (EPFL)
○ Combinatorial study of the K -theory of toric varieties, e.g. using lattice counts on a polyhedral complex to compute Euler characteristics, and study of combinatorial generalizations of the K -ring of a toric variety
- 2022– **MSc Mathematics**, *EPFL*, Lausanne
2024 ○ *Obtained the EPFL Master Excellence Fellowship*
○ Minor in Computer Science
○ Grade average: 5.80/6
- 2019– **BSc Mathematics**, *EPFL*, Lausanne
2022 ○ Grade average: 5.73/6

Past Projects

- Spring **Tropical linear systems**, *EPFL*, Lausanne, Master thesis
2024 ○ Supervisor: Prof. Francesca Carocci (University of Geneva)
○ Linear systems on metric graphs and of their realizability as the tropicalization of linear systems on algebraic curves.
○ Showed that tropical linear systems have (as abstract polyhedral complexes) dimension locally bounded from below by their rank, extending existing results on the subject.
- Autumn **Tate’s thesis and applications**, *EPFL*, Lausanne, Semester project
2023 ○ Supervisor: Prof. Philippe Michel
○ Fourier analysis on the locally compact group of adèles, adelic Poisson summation formula and proof of the functional equation and meromorphic continuation of the Hecke L-functions
○ Applications to counting primes in number fields
- Spring **Weil conjectures on elliptic curves**, *EPFL*, Lausanne, Bachelor project
2022 ○ Supervisor: Prof. Dimitri Wyss
○ Verification of the Weil conjectures for elliptic curves by studying the trace and determinant of the map induced on the curve’s Tate’s module by the Frobenius endomorphism
○ Showing the correspondence between elliptic curves and complex tori to verify the statement about Betti numbers

Teaching Experience

- 2020– **Student assistant**, *EPFL*, Lausanne
2024 ○ Lead exercise sessions, followed the progress of students and helped them understand challenging concepts
○ Graded weekly exercises and exams
○ SPRING 2024: **Rings and fields, Analysis IV**
○ AUTUMN 2023: **Algebraic Structures, Probability**
○ SPRING 2022: **Advanced analysis II**
○ AUTUMN 2021: **Group theory, Metric and topological spaces**
○ SPRING 2021: **Fluids and electromagnetism, Object-oriented programming**
○ AUTUMN 2020: **Classical mechanics and Information, Computation, Communication**

Programming Projects

- Autumn 2023 **Open Vote Network implementation**, EPFL, Lausanne, (course project)
- Developed a decentralized voting solution written in Golang and based on the Open Vote Network, with PBFT as consensus algorithm
 - Implemented Cramer-Damgard-Schoenmaker's protocol for proofs of partial knowledge
- Spring 2023 **Physically-based renderer**, EPFL, Lausanne, Advanced computer graphics (course project)
- Developed a physically-based renderer in C++ based on Nori with custom BSDFs, environment lighting, ray portals utilizing Multiple Importance Sampling (MIS)
 - Achieved runner-up position in the course's rendering competition, which was judged by an independent panel of computer graphics experts
- Autumn 2022 **Protein solubility classification based on FASTA sequences**, EPFL, Lausanne, Machine Learning (course project)
- Analysed data with scikit-learn and built deep learning models using PyTorch
 - Experimented with various architectures, including CNNs, RNNs and achieved favorable results compared to existing models

Languages

Bilingual	French, Czech	
Fluent	English	CAE Grade A (202/210)
Good	Spanish	IB Spanish SL Grade 6/6
Basic	Mandarin, German	

Extra-curricular

- 2022-2023 **Theatre programmer**, Association Satellite, Lausanne
- Produced Satellite's artistic program, featuring 15 theater performances which took part on EPFL's campus and were viewed by hundreds of people
 - Ensured smooth running of the events and organised teams of about 20 staff members
 - Took active part in other association activities, including music festivals, concerts and game nights
- 2021-2022 **Regular member**, Association Satellite, Lausanne
- Actively participated in the numerous weekly events organized by Association Satellite, principally as a sound/light technician during concerts and theater plays
 - Developed efficiency in teamwork and adaptability to various situations

Competitions

- 2022 and 2023 **BPuzzled**, Bloomberg
- Worked in a team of 4 people to solve puzzles against the clock
 - Participated to the 2022 and 2023 editions of the competition and won the university round at EPFL both times. The final took place at the Bloomberg Headquarters in London and this year we obtained third place among the teams from Europe.
 - Learned how to work quickly and efficiently in a team
- Autumn 2022 **Laushack**, Lausanne
- Collaborated in a group of 4 people to come up with a project idea and develop a working prototype in 24h
 - Wrote a compiler for a custom markup language (like LaTeX, Markdown etc.) which supports strongly typed scripting for dynamic document generation
 - Improved brainstorming and prototyping skills during the event