

ELIE HAMMOU

University of Cambridge, UK

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Research interests

I am currently working with Prof. Maria Ubiali's group on developing robust methods to fit Parton Distribution Functions, describing the structure of the proton, and new physics signals from colliders data. I am particularly interested in exploring possible extensions of the Standard Model, particularly using Effective Field Theories. As a phenomenologist, my focus is to investigate in which measure such extensions could be visible in present and future experiments and observations.

Education

PhD student in particle physics

2022 – Today

University of Cambridge, DAMTP

Cambridge, UK

- Supervised by Prof. Maria Ubiali.
- Working on the description of potential physics beyond the Standard Model with Effective Fields Theories.
- Special focus on fitting Parton Distribution Functions from collider data.

MASt Physics (Part III)

2020 – 2021

University of Cambridge

Cambridge, UK

- Graduated with merit, 73/100.

Diplôme d'ingénieur (Master in Mathematics and Physics)

2017 – 2020

Ecole polytechnique

Palaiseau, France

- Graduated with 3.86 GPA.

Licence de Philosophie (Bachelor degree in Philosophy)

2018 – 2019

University Paris-Nanterre

Nanterre, France

- Studies pursued remotely in parallel of Ecole polytechnique.
- Graduated with mention Bien, 14.6/20.

Classe préparatoire (Bachelor degree in Mathematics and Physics)

2015 – 2017

Lycée Saint-Louis

Paris, France

- Graduated with 4.0 GPA.

Relevant Coursework

- Standard Model (SM)
- Beyond the Standard Model (BSM)
- Group Theory (SFP)
- Quantum Field Theory (QFT)
- Advanced QFT
- Supersymmetry
- Cosmology
- General Relativity
- Statistical Physics
- Effective Field Theories
- QCD
- Machine Learning Methods

Publications

1. E. Hammou, Z. Kassabov, M. Madigan, M. L. Mangano, L. Mantani, J. Moore, M. M. Alvarado, and M. Ubiali. Hide and seek: how PDFs can conceal New Physics. 7 2023 [arXiv:2307.10370]
2. T.-H. Dang, M. Konczykowski, V. I. Safarov, E. Hammou, L. R. Vega, N. Ollier, R. Grasset, A. Alessi, H.-J. Drouhin, H. Jaffrès, et al. Effect of high-energy electron irradiation on the electronic properties of beta-gallium oxide. In *Oxide-based Materials and Devices XIII*, volume 12002, pages 46–53. SPIE, 2022 [spiedigitallibrary.org]

Talks

Conference, Rencontres de Blois 2023

Interplay between PDFs and new physics

May 2023

Blois, France

PhD Schools

Advanced Artificial Intelligence for precision High Energy Physics

Jul 2023

Lake Como School of Advanced Studies

Como, Italy

- Followed Machine Learning, QCD, Bayesian methods and data analysis and quantum machine learning courses.

GGI Lectures on the Theory of Fundamental Interactions 2023

Jan 2023

Galileo Galilei Institute

Florence, Italy

- Followed Effective Field Theories, Gravitational Particle Production, Statistical Methods for Data Analysis in Particle Physics, Tabletop Experiments, Precision Electroweak Physics and Neutrino Physics courses.

Research Experience

Research Assistant and PhD student

Jan 2022 – Sep 2022

University of Cambridge, DAMTP, PBSP

Cambridge, UK

- Member of the research team led by Prof Maria Ubiali for an eight-month position (ongoing).
- Working on the ERC funded project Physics Beyond the Standard Proton (PBSP).
- Using Effective Field Theory (EFT) methods, numerical simulations and LHC data to look for deviations from SM predictions induced by new physics in the proton.

Part III Essay in Physics

2021 – 2022

University of Cambridge, DAMTP

Cambridge, UK

- Guided by Prof Maria Ubiali.
- Undertook a literature review on EFT strategies to probe for BSM physics using a phenomenological approach showing new physics could induce measurable shifts in observables.
- Grade of 75/100.

Research internship

2019 – 2021

Ecole polytechnique, LSI & ETSEF

Palaiseau, France

- Supervised by Prof Henri-Jean Drouhin for a one-year project.
- Investigated the impact of irradiation on semi-conductors through luminescence experiments and numerical simulation.
- Paper detailing results presented at Photonics West 2022 (San Francisco).
- Awarded the Research Centre prize for best Masters project.

Research project

2019 – 2021

Ecole polytechnique

Palaiseau, France

- Supervised by Prof Frédéric Daigne.
- Simulated in Python the dynamics of periodic novae (nuclear surface explosions) in a binary star system.
- Grade A.

Research project

2018 – 2019

Ecole polytechnique

Palaiseau, France

- Supervised by Dr. Eric Charkaluk.
- Simulated an optimised asteroid drill design to maximise radiation of internally generated heat and prevent machine overheating, with a team of undergraduate researchers.
- Produced prototypes via 3D printing for demonstration.
- Grade of 18/20.

Teaching experience

Graduate teaching, Standard Model course

2022 – Today

University of Cambridge, DAMTP

Cambridge, UK

- Course lectured by Prof. Fernando Quevedo and Prof. David Tong in Lent terms.
- Example class teacher for groups of 15-20 in Part III (Master students).
- Marked and provided feedback on regular assignments.

Undergraduate teaching, Principles of Quantum Mechanics course

2021 – Today

University of Cambridge, DAMTP

Cambridge, UK

- Course lectured by Dr. David Skinner in Michaelmas terms.
- Hired by Prof. Christopher Tout.
- Lead supervisions (recitation sections) for groups of 2 students in Part II (Third year students).

Undergraduate teaching, Particle and Nuclear Physics course

2021 – 2022

University of Cambridge, Department of Physics

Cambridge, UK

- Course lectured by Prof. Tina Potter in Lent and Easter terms.
- Lead supervisions (recitation sections) for groups of 3 students in Part II (Third year students).

Highschool teaching, Standard Model course

2019 – 2020

Ecole polytechnique

Palaiseau, France

- Provided subject tutoring and mentorship to students preparing for the French university entrance examinations.

Other work experience

Informatics and Logistics Intern

2019

Vranken-Pommery Monopole

Aigues-Mortes, France

- Developed software to optimise management of employees and vinification (winemaking) processes.

Teaching support

2017 – 2018

Apprentis d'Auteuil

Lille, France

- Supported disabled children and those with additional educational needs to rejoin formal education and gain valuable professional skills.

Skills

Languages: French (native), English (fluent), Spanish (B1), Russian (A2)

Programming Languages: C, C++, Java, SQL, Python, Caml, L^AT_EX