

Hugo Koubbi

PhD student in mathematics and machine learning theory
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POSITIONS AND RESEARCH EXPERIENCE

09/2025–expected 2028 **Université Paris-Dauphine PSL and Sorbonne Université**

PhD student, funded by AI4IDF

Advisors: Antonin Chambolle and Borjan Geshkovski.

09/2024–07/2025 **Yale University, New Haven, USA**

Visiting Assistant Researcher

Subject: learning under invariance. Advisor: Theodor Misiakiewicz.

EDUCATION

09/2021–09/2023 **Université Paris-Saclay and École Normale Supérieure Paris-Saclay**

M.Sc. in Probability Theory and Statistics

Highest honors.

09/2020–09/2021 **École Normale Supérieure Paris-Saclay**

B.Sc. in Mathematics

Highest honors.

09/2018–09/2020 **Lycée du Parc, Lyon, France**

*Classes préparatoires MPSI–MP**

Highest honors.

PUBLICATIONS AND PREPRINTS

Published papers

1. **Learning single-index models via harmonic decomposition.** Nimit Joshi, **Hugo Koubbi**, Theodore Misiakiewicz, and Nathan Srebro. NeurIPS 2025.

Preprints

1. **The impact of LoRA on the emergence of clusters in Transformers.** **Hugo Koubbi**, Louis Hernandez, and Matthieu Bousard. Submitted.
2. **Dynamic metastability in the self-attention model.** Borjan Geshkovski, **Hugo Koubbi**, Yury Polyanskiy, and Philippe Rigollet. Preprint.
3. **Homogenized Transformers.** **Hugo Koubbi**, Borjan Geshkovski, and Philippe Rigollet. Preprint.

TALKS AND POSTERS

2026	Homogenized Transformers. Congreso Bienal RSME, Alicante.
2026	Homogenized Transformers. PhD seminar, Université de Lorraine, Nancy.
2026	Homogenized Transformers. PhD seminar, Université Paris-Dauphine.
2025	Learning single-index models via harmonic decomposition. Poster, EurIPS.
2025	Learning single-index models via harmonic decomposition. Poster, NeurIPS in Paris.
2024	The impact of LoRA on the emergence of clusters in Transformers. Retreat of SPOC and IdePHICS Labs.
2024	Dynamic metastability in the self-attention model. Poster, Physics of AI Algorithms.

TEACHING

Since 2025	Université Paris-Dauphine PSL <i>Teaching assistant</i> Numerical optimization and differential calculus.
Since 09/2021	Admi-Univ, Paris <i>Teacher</i> Mathematics program for undergraduate students.
2022–2024	Lycée Louis-le-Grand, Lycée Michelet, and Lycée Janson-de-Sailly, Paris <i>Oral examiner, classes préparatoires</i>

MENTORING

Adviser for master theses

1. **Maga Grafe, Ayoub Metboul, and Bo-Cheng (Yugoo) Lu.** Scaling limits of Markov chains; ballistic and diffusive limits of stochastic gradient descent. M1 Dauphine (2026).

LANGUAGES

French	Native.
English	Advanced, CAE C1.
Spanish	B1.
Italian	B1.