# OSCAR DAVIS

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https://github.com/olsdavis

## EDUCATION

**PhD in Computer Science**, University of Oxford — Oct 2023 – Jul 2026
· Funded by Project CETI and Intel. Supervised by Prof M. Bronstein, Dr İ. Ceylan, and Dr A.J. Bose.

**MSc in Advanced Computer Science**, University of Oxford — Oct 2022 – Aug 2023
· Supervised by Prof M. Bronstein and Dr İ. Ceylan. Obtained with distinction.

**Visting Student**, Imperial College, London — September 2021 – July 2022
· Supervised by Prof A. Gervais. Funded by Swiss scholarship. Finished with distinction.

**BSc in Computer Science**, EPFL — Sep 2019 – Jul 2022

## RESEARCH EXPERIENCE

**Research Intern at Microsoft Research, Cambridge**, supervised by Dr J. Gladrow & Dr K. Kalinin — Nov 2023 – Feb 2024
· Engineering work on Diffusion Models, Latent Diffusion Models, VAEs, simple video models, Neural ODEs.
· Theoretical analyses of Diffusion Models via SDEs, PDEs. *(Patent coming soon!)*

**MSc Dissertation**, Information Theory for GNNs, with Dr. I. Ceylan and Prof. M. Bronstein — Feb 2023 – Aug 2023
· Developed a formal information-theoretic framework to fully characterise informational bottlenecks in Graph Neural Networks, including over-smoothing and over-squashing. The analysis involved advanced concepts in information theory, and linear algebra. Received the Tony Hoare Prize for the best dissertation of the course.

**BSc Research Project**, DeFi analysis, with Prof A. Gervais — Jan 2022 – Aug 2022
· Analysed DeFi markets on the Ethereum and BNB Chain blockchains, quantified offered financial security.
· Created a program in Go using a custom GPU version of Bellman-Ford in CUDA to detect real-time arbitrage opportunities, and to quantify historically how much more assets could have been extracted, scanning $864\times$ more markets than previous SOTA within $1.5 \pm 1.2$ seconds, outperforming past arbitrage by on average 0.06 ETH and up to 4.4 ETH.

**Student Research Project**, Scala 3.0 Compiler Extension, with Prof M. Odersky — June 2021 – September 2021
· Participated to the implementation of a then-new thread-safe implementation of lazily-evaluted variables ("lazy vals"), in the Scala 3.0 compiler, "dotty".

## TEACHING EXPERIENCE

**TA for Graph Representation Learning**, University of Oxford, under Dr. İ Ceylan — October – December 2023, and 2024
· Teaching PyTorch and PyTorch Geometric (for Graph Neural Networks, and Knowledge Graph Learning).

**TA for Object-Oriented Programming (Java)**, EPFL, under Dr M. Schinz — February – June 2020
· Second most prolific helper on the student forum.
· Leader of marking group for final projects, marked twice.

## PUBLICATIONS

**Fisher Flow Matching for Generative Modeling over Discrete Data** — May 2024
**Davis, O.**, Kessler, S., Petrache, M., Ceylan, I., Bronstein, M., Bose, AJ. NeurIPS 2024.
Preprint: arxiv.org/abs/2405.14664.

## ACADEMIC ACHIEVEMENTS

**Tony Hoare Prize for the best MSc Dissertation**, University of Oxford — September 2023
· Prize awarded for my dissertation entitled "Information-Theoretic Perspectives on Graph Neural Networks."

**Swiss Study Foundation Scholarship** — September 2021
Granted based on academic performance (almost 100% GPA on my last term's exams).

**G-Research Grant for PhD Students and Postdocs** (£1k) February 2024

**French National Mathematics Olympiads** 2017
- Obtained a distinction in the Bordeaux academy.

**French Scientific Baccalaureate with Advanced Mathematics** 2019
- Obtained high honours, and 100% in Mathematics, with the Advanced Mathematics option.

## SKILLS

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| **Proficient in** | Python (PyTorch, PyG, NumPy, Matplotlib), Java, Scala (Spark, Akka), Go, C |
| **Languages** | Fluent in French, English and Russian, conversational in German |
| **Music** | Piano (ABRSM 8), guitar (self-taught, beginner), composition, arrangement, sound-engineering |