Ulysse Pavloff, PhD

Specialization: Distributed Computing and Game Theory
PhD Thesis: "A Game-Theoretic Approach to the Study of Blockchain's Robustness"

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Education

2021–2024 **PhD in Computer Science,** *CEA and Paris-Saclay University*, France.
- Research area: Distributed Computing and Game Theory, focusing on blockchain robustness and incentive mechanisms.
- Thesis: *"A Game-Theoretic Approach to the Study of Blockchain's Robustness."* Focused on Ethereum's Proof-of-Stake (PoS) protocol to derive general insights into robust protocol design.
- Key contributions: Formalized the Ethereum PoS protocol through pseudo-code based on its specifications and implementation. Identified how inactivity leaks and incentive mechanisms can both strengthen and compromise protocol robustness. Demonstrated that rational validators converge to compliant behavior under equilibrium conditions, providing critical insights into the interplay between incentives and security.
- Teaching: Delivered courses on Ethereum PoS and robust protocol design at prestigious institutions, including École Polytechnique, HEC Paris, and ENSIIE.
- Advisors: Sara Tucci-Piergiovanni, Yackolley Amoussou-Guenou.

2019–2021 **Master's Degree in Computer Science**, *Sorbonne University*, France.
Specialization in Game Theory and Artificial Intelligence.

2016–2019 **Two Bachelor's Degrees in Mathematics and Computer Science,** *Sorbonne University*, France.
Selective Curriculum (Double Intensive Computer Science and Mathematics).

Experience

2022–2023 **Blockchain and ZK Content Author**, *Node Guardians.*
Authored comprehensive, in-depth technical content on zk-SNARKs and blockchain technologies. Simplified complex concepts, such as pseudo-randomness and zero-knowledge proofs, into explanatory post followed by a quiz to evaluate comprehension. [804 reads / 653 quiz completed; reference: Hector Roussille.]

Jan–Jun 2021 **Research Internship,** *Paris Dauphine University*, France.
Developed and applied Monte Carlo Tree Search algorithms and Game Theory to analyze voting systems. This work resulted in a scientific paper titled Sequential Elimination Voting Games, which provides tight bounds on worst-case ratios, measuring the loss of social welfare due to strategic behavior, and presents experimental analyses demonstrating that the average impact of manipulation is significantly lower than in the worst-case scenarios.
Supervised by Prof. Jérôme Lang and Prof. Tristan Cazenave.

Summer 2019 **Data Scientist,** *Wister*, France.
Leveraged deep learning models to optimize ad selection, improving user engagement and automating model updates. Improved CTR by 155%.

Publications

- *Pavloff*, *Ulysse*, Yackolley Amoussou-Guenou, and Sara Tucci-Piergiovanni. "Ethereum Proof-of-Stake and the Probabilistic Bouncing Attack." Accepted. *ACM Distributed Ledger Technologies Journal*.
- *Pavloff*, *Ulysse*, Yackolley Amoussou-Guenou, and Sara Tucci-Piergiovanni. "Incentive Compatibility of Ethereum's PoS Consensus Protocol." *28th International Conference on Principles of Distributed Systems (OPODIS 2024)*, 2024.
- *Pavloff*, *Ulysse*, Yackolley Amoussou-Guenou, and Sara Tucci-Piergiovanni. "Byzantine Attacks Exploiting Penalties in Ethereum PoS." *54th IEEE/IFIP DSN 2024*, *Brisbane*, *Australia*, 2024.
- **[Cited 34 times]** *Pavloff*, *Ulysse*, Yackolley Amoussou-Guenou, and Sara Tucci-Piergiovanni. "Ethereum Proof-of-Stake under Scrutiny." *38th ACM/SIGAPP Symposium on Applied Computing*, 2023.
- Attiya, Hagit, Alessia Del Pozzo, Alessia Milani, *Ulysse Pavloff*, and Alexandre Rapetti. "The Synchronization Power of Auditable Registers." *27th OPODIS 2023*, 2023.
- *Pavloff*, *Ulysse*, Yackolley Amoussou-Guenou, and Sara Tucci-Piergiovanni. "Exploitation des amendes dans Ethereum PoS." *AlgoTel 2024 – Rencontres sur les Aspects Algorithmiques des Télécommunications*, 2024.
- *Pavloff*, *Ulysse*, Tristan Cazenave, and Jérôme Lang. "Sequential Elimination Voting Games." *arXiv preprint*, 2022.

Teaching

Spring 2023 — **Guest Lecturer**, *École Polytechnique*, with Prof. Julien Prat.
Delivered specialized lectures on Ethereum consensus mechanisms and their role in blockchain scalability and security.

2022–2023 — **Teaching Assistant**, *HEC*, with Prof. Bruno Biais.
Delivered lectures and guided discussions on Ethereum consensus mechanisms, emphasizing their application in decentralized finance.

2022–2023 — **Teaching Assistant**, *ENSIIE*.
Conducted hands-on courses on Solidity programming and smart contracts, preparing students for practical blockchain development.

2021–2022 — **Teaching Assistant**, *Paris-Saclay University*.
Designed and taught an introductory course on coding fundamentals, covering Git, Agile methodologies, and best practices for development organization.

Projects

- **HCI Research Experiment 2020.** Designed and implemented a web application to analyze cognitive biases in Human-Computer Interaction, supervised by Gilles Bailly. This work contributed to the scientific paper *Computational Model of the Transition from Novice to Expert Interaction Techniques*, which investigates why users often fail to adopt expert interaction techniques, highlighting the preference for immediate rewards over long-term efficiency.
- **Data Challenge SFDS 2018.** Achieved 1st place in predicting electricity consumption with mathematical models (ARMA) and neural networks, attaining an error rate below 6%. Supervised by Taieb Touati.
- **Behavioral Evolution Simulation.** Simulated behavioral specialization in embodied evolutionary robotics, based on a scientific paper. Supervised by Prof. Nicolas Bredeche.

- **WhatsUrvivor.** Designed and developed a three-month social engagement game for 39 participants, featuring weekly challenges such as riddles and interactive games. Built with React and Node.js, the project fostered collaboration and engagement through creative, dynamic gameplay.
- **Serious Game.** Created an educational game in C# using Unity, designed to teach coding principles to young students. The game was used as a teaching tool by two entire classes, demonstrating its practical educational impact.
- **Adaptive Game.** Designed a mobile game in C# with dynamic difficulty that adjusts to user skill levels, enhancing player engagement.
- **Lemmings Remake.** Remade and enhanced the classic game in Java, improving mechanics and introducing new functionalities.
- **Booking Website.** Designed and developed a booking platform that significantly increased rental visibility, resulting in a 30% boost in direct bookings and reducing reliance on platforms which charge high fees. This improved both user experience and profitability for property owners.

Technical Skills

C, C++, C#, CSS, Git, HTML, Java, JavaScript, LaTeX, Matlab, Python, Solidity, SQL.

Conference and Seminar Talks

Jan. 2025	Byzantine Attacks Exploiting Penalties in Ethereum PoS, Scientific DILS day, Palaiseau, France.
Nov. 2024	A Game-Theoretic Analysis of Blockchain Robustness, PhD Defense, Palaiseau, France.
Aug. 2024	Byzantine Attacks Exploiting Penalties in Ethereum PoS, DSN, Brisbane, Australia.
Jun. 2024	Invited to Attend, Summer School on real-world crypto and privacy 2024, Vodice, Croatia.
May 2024	Exploitation des amendes dans Ethereum PoS, Algotel, St-Briac, France.
Feb. 2024	Ethereum Proof-of-Stake and the Probabilistic Bouncing Attack, Apéro Défi, Paris, France.
Mar. 2023	Ethereum Proof-of-Stake under Scrutiny, SAC, Talinn, Estonia.
Jun. 2023	Introduction to zk-SNARKs, Invited Speaker, Blockchain Bytes, Palaiseau, France
Feb. 2023	Ethereum Proof-of-Stake Under Scrutiny, Invited Speaker, Blockchain@X, Paris, France
Mar. 2022	Ethereum Consensus Protocol, Invited Speaker, Blockchain Bytes, Palaiseau, France

Languages

French	Native Speaker
English	Fluent
German	Student Level

Interests

Cinema. Avid attendee with a yearly subscription.
Chess. Rated 1900 Elo on Lichess.
DIY Furniture Design. Created furniture from reclaimed materials, ranging from tables and plant stands to storage solutions.