

Samuel Wiese

Curriculum Vitae

Wolfson College
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Education

- started 10/2020 **Computer Science (PhD)**, *University of Oxford*, UK.
○ Complex Systems: Agent-based modelling of business cycles, memory & imitation effects
○ Advisors: Doyne Farmer, Ani Calinescu
- 10/2015 – 08/2020 **Mathematics (Diploma)**, *University of Leipzig*, Germany.
Focus on optimization and game theory, top 3%
- 08/2017 – 04/2018 **Mathematics (Semesters abroad)**, *University of Toronto*, Canada.
Focus on dynamical systems and algebraic geometry, top 3%
- 10/2015 – 08/2017 **German Law (Intermediate Examination)**, *University of Leipzig*, Germany.
Focus on constitutional law, top 20%

Experience

- 10/2019 - 01/2020 **Derivatives Trading Intern**, *Allianz Global Investors*, Germany.
○ Development of a machine learning model for the automatic execution of exchange-traded derivatives in Python
○ Development of a Transaction Cost Analysis (TCA) engine for real-time performance evaluation of traders in derivatives trading
○ Sentiment analysis to evaluate market-sensitive Twitter tweets
- 07/2019 – 10/2019 **Research Intern**, *University of Oxford, Department of Mathematics*, UK.
○ Topic: "Best reply structure of multiplayer games"
○ Studied convergence frequency of randomly created games for best reply dynamics and six chosen learning dynamics
○ Advisor: Doyne Farmer
- 08/2018 – 09/2018 **Research Intern**, *Saint Petersburg State University, Chebyshev Laboratory*, Russia.
○ Topic: "Various Shadowing Properties of Dynamical Systems"
○ Studied conditions for direct and inverse shadowing using Lyapunov functions
○ Advisor: Sergei Yu. Pilyugin
- 05/2018 – 08/2018 **Research Intern**, *Cornell University, Department of Mathematics*, US.
○ Summer Program for Undergraduate Research
○ Studied Laplace eigenvalues and eigenfunctions of fractals using FEM
○ Advisor: Robert S. Strichartz
- 04/2016 – 08/2017 **Junior Consultant**, *Campus Inform e.V., student consultancy*, Germany.
○ Led the performance center for strategy (7 consultants), held workshops and case studies
○ External projects: 3, for local social clubs and a start-up, developed financing concepts
○ Internal projects: 2, process-optimization in the consultancy using BPMN

Skills

- Languages German (native), English (fluent), Latin (Latinum)
IT Python (proficient); C#, Sage, Mathematica (intermediate); SQL (novice)

Research

- accepted **Spectrum of the Laplacian on Regular Polyhedra**, with Evan Greif, Daniel Kaplan, Robert S. Strichartz, *Communications on Pure and Applied Analysis* 20(1): 193-214, 2021.
We study eigenvalues and eigenfunctions of the Laplacian on the surfaces of four of the regular polyhedrons: tetrahedron, octahedron, icosahedron and cube (DOI).
- accepted **A Convex Surface with Fractal Curvature**, with Iancu Dima, Rachel Popp, Robert S. Strichartz, *Fractals* 28(4), 2020.
We construct an example of a convex surface whose curvature is a fractal measure related to the Sierpinski Gasket. The construction produces the surface S as a limit of convex polyhedra P_n . The curvature of each P_n is a discrete measure supported on its vertices, and these discrete measures will converge to the fractal measure on S (DOI).
- accepted **Spectrum of the Laplacian on Snowflake Domains and filled-in Julia sets**, with Robert S. Strichartz, *Experimental Mathematics* (forthcoming).
We compute the spectrum of the Laplacian on snowflake domains and chosen filled-in Julia sets, their box-counting dimension and area and investigate the eigenvalue counting function (DOI).
- submitted **The Frequency of Convergent Games under Best-Response Dynamics**, with Torsten Heinrich.
Generating payoff matrices of normal-form games at random, we calculate the frequency of games with a unique pure strategy Nash equilibrium in the ensemble of n -player, m -strategy games. We then consider a wider class of games that converge under a best-response dynamic, in which each player chooses their optimal pure strategy successively (arXiv).
- submitted **Best-response dynamics, playing sequences, and convergence to equilibrium in random games**, with Torsten Heinrich, Yoojin Jang, Luca Mungo, Marco Pangallo, Alex Scott, Bassel Tarbush.
We show that the playing sequence—the order in which players update their actions—is a crucial determinant of whether the best-response dynamic converges to a Nash equilibrium. Specifically, we analyze the probability that the best-response dynamic converges to a pure Nash equilibrium in random n -player m -action games under three distinct playing sequences: clockwork sequences (players take turns according to a fixed cyclic order), random sequences, and simultaneous updating by all players. We analytically characterize the convergence properties of the clockwork sequence best-response dynamic (arXiv).
- in preparation **Spectrum of the Laplacian on the Projective Hexagasket**, with Jeffrey Marino, Robert S. Strichartz.
One way to create new fractals from old fractals is to identify points. We use spectral decimation to investigate the spectrum of the Laplacian on the projective hexagasket, which is obtained from the hexagasket by identifying antipodal points on the outer boundary and on each of a countable set of inner boundaries.

Selected Honors

- 05/2020 Full Scholarship by the Dept. of Computer Science, University of Oxford
- 06/2019 Erasmus Scholarship by the German Academic Exchange Service (DAAD)
- 08/2018 goEast Scholarship by the Germany Academic Exchange Service (DAAD)
- 07/2018 PROMOS Scholarship by the Germany Academic Exchange Service (DAAD)
- 05/2018 Provost's International Research Internship Program Fellowship at Cornell
- 02/2017 University of Toronto Full Tuition Fellowship
- 12/2016 Full-year Scholarship by the German Academic Exchange Service (DAAD)
- 10/2016 Scholarship by the Foundation of German Business (SDW)