

SUMMARY

I am an early-career mathematician with original research experience in graph theory and combinatorics. I have taught mathematics across secondary and university levels. Currently continuing research on open problems in uniquely Hamiltonian graphs with the goal of publication. Seeking position as a PhD candidate where this research can be developed further. Additionally open to Mathematics Researcher or a Teaching Assistant role.

EDUCATION

Faculty of Mathematics and Physics, Charles University

Prague, Czechia

Bachelor of Science in Computer Science

2022 – 2024

- Research area: Graph Theory and Combinatorics
- Conducted primary thesis research on Sheehan's Conjecture and uniquely Hamiltonian graphs; ongoing research in collaboration with supervisor toward publication

Department of Computer Science, Forman Christian College

Lahore, Pakistan

Bachelor of Science (Honors) in Computer Science

2013 – 2018

- Research area: Game Theory and Artificial Intelligence

RESEARCH

Research: Uniquely Hamiltonian Graphs

Combinatorial Graph Theory & Discrete Mathematics

In this project I explored Sheehan's Conjecture on the non-existence of uniquely Hamiltonian regular graphs. In an attempt to produce an infinite family of uniquely Hamiltonian 4-regular graphs from cubic hypohamiltonian graphs, following a construction due to Fleischner, I showed that in general this construction does not hold for all cubic hypohamiltonian graphs except for the Petersen graph. I demonstrated the limitations of Fleischner's construction by constructing examples via the 1st Blanuša snark and the 2nd Blanuša snark. To continue the development of theory of uniquely Hamiltonian graphs, I formulated a few open problems which arose in this research. *It is in the prep for a preprint publication.*

Supervisor: Dr. Andrew Goodall — Computer Science Institute, Faculty of Mathematics and Physics, Charles University, Prague

Research: Graph Theory Literature & Problems

Combinatorial Graph Theory & Discrete Geometry

Conducted foundational literature reviews and exploratory investigations on uniquely Hamiltonian graphs and the Hadwiger–Debrunner (p, q) -problem. Surveyed the probabilistic method, analysed Hamiltonian cycle property for bipartite graphs and regular graphs. This established a theoretical groundwork for subsequent research on Sheehan's conjecture.

Supervisor: Dr. Mudassir Shabbir — Information Technology University, Lahore

Thesis: Traffic Regulation Using Game Theory

Algorithmic Modeling, Computer Vision & Reinforcement Learning

I developed an automated, dynamic traffic signal control system designed to mitigate severe urban congestion using computer vision, Game Theory, and Reinforcement Learning. The system employs a background subtraction algorithm with Gaussian distributions to extract real-time vehicle density and velocity from video feeds. By modelling intersecting roads as competing players within a Markov framework, it applies Nash Equilibrium and Minimax strategies to calculate and optimize effective green light durations based on live traffic conditions.

Supervisor: Dr. Nazim Ashraf — Department of Computer Science, Forman Christian College (A Chartered University), Lahore

EXPERIENCE	Substitute Teacher International School of Prague 2025 - Served as mathematics and science substitute teacher for middle school students, covering full lessons independently. - Occasionally responsible for theatre classes.
	Guest Lecturer Czech MENSA Summer Camp, Czechia 2024 Designed and delivered lectures introducing graph theory and mathematical problem-solving to approximately 40 gifted students aged 6–18.
	Private Tutor Mathematics 2018 – present Over 6 years of continuous private tutoring in mathematics, working with 10+ students primarily at secondary school and undergraduate computer science level.
	Teaching Assistant FAST-NUCES, Lahore 2018 – 2019 Supported approximately 30 students per semester in an undergraduate Artificial Intelligence course; held office hours, graded assignments, and delivered the mathematical components of lectures.
	Research Assistant ITU, Lahore 2018 – 2019 Surveyed research literature on uniquely Hamiltonian graphs and the Hadwiger–Debrunner (p, q)-problem in preparation for original research.
	Volunteer Teacher MAKEISTAN (ITU), Lahore 2017 – 2019 Delivered mathematics and STEM presentations and assisted with organising educational activities for community outreach programmes.
SKILLS	Mathematics: Graph Theory, Combinatorics, Analysis, Probability Teaching: Secondary & Undergraduate Mathematics Programming: Python, $\text{\LaTeX}$, Java Languages: English (fluent), Urdu (native)
ACADEMIC AND OTHER ACTIVITIES	EuroComb 2021 — Participant, International Conference on Graph Theory and Combinatorics, Barcelona Volunteer Teaching: Mathematics, Computer Science, and STEM outreach (2017–2019) Creative Writing: I am part of various creative writing and critique groups where I explore poetry, fiction and non-fiction texts.
CONTACTS	Email: sachalabdullah10@gmail.com LinkedIn: www.linkedin.com/in/sachal10 Portfolio / Website: https://theoryculture.github.io/sachal.github.io/ Philosophy Blog: https://medium.com/aude-sapere