

Abhinav Kumar Verma

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Summary

Moved by the impact of complex systems in the modern world and the unboundedness of general intelligence, I have studied network dynamics, complex sciences, random graph theory, artificial intelligence, and neuroscience and I am actively looking to contribute to the domain. I have extensive experience with systems and simulator design, AI development, and deployment. I am self-motivated and have undertaken projects related to AI/LLM, random graph theory, cellular automata, and evolutionary game theory over multi-agent systems.

Academic Qualification

2014 - 2019	Indian Institute of Technology, Kharagpur, WB, INDIA Dual Degree (B. Tech and M. Tech), Department of Electronics and Electrical Communication Engineering <ul style="list-style-type: none">• M. Tech Specialization in Telecommunication System Engineering• Micro Specialization in Embedded Wireless Systems.• CGPA: 8.96/10 for the complete term and GPA of 9.49/10 for the final two years.
2014	Delhi Public School, Varanasi, UP, INDIA Central Board of Secondary Education - Class 12th <ul style="list-style-type: none">• Core Subjects: Mathematics, Physics, Chemistry, English, and Computer Science• Percentage: 92.4%

Relevant Coursework

Information Theory and Coding Techniques	10/10	Parallel and Distributed Algorithms	10/10
Probability and Stochastic Processes	10/10	Digital Signal Processing	10/10
Linear Algebra and Error Control Techniques	9/10	Algorithms – I	8/10
Adaptive Systems and Signal Processing	9/10	Multi-Objective Optimisation	9/10

Other MOOC/self-assigned courses are:

- Introduction to Complexity
- Networks, Dynamics of and on Networks
- Machine Learning on Graphs
- Introduction to Artificial Intelligence
- Cognitive Psychology
- Fundamentals of Neuroscience
- Nonlinear Dynamics and Differential Equations
- Theory of computation and complexity

Experience

Jul '19 – Jul '23	Qualcomm India Private Limited, Hyderabad, TS, INDIA Senior Engineer – Modem Systems Group <ul style="list-style-type: none">• Developed and enhanced a proprietary high bandwidth inter-chip communication protocol and its simulator for data transfer between modem and radio units.• Led multiple initiatives to conserve the power (usually more than 20%) of modem and radio use-cases through hardware and software changes.• Mitigated development-phase timing constraints by forecasting power consumption of upcoming chipsets using field and lab data, leading to a competitive edge.• Developed automation wrappers to streamline server-based simulations and generate AI-driven reports, reducing manual effort by up to 80%.
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Jul '17 –
Apr '19

G. S. S. School of Telecommunication, Indian Institute of Technology, Kharagpur, WB, INDIA
M. Tech Thesis ([Thesis Link](#)) – Supervisor: Prof Suvra Sekhar Das

- Developed an end-to-end simulator in MATLAB based on IEEE 802.11ac standards for Wi-Fi with all crucial blocks such as scrambler/descrambler, FEC, mapper/demapper, STBC, and IFFT/FFT.
- Built a GUI package over the Wi-Fi simulator that is used as a teaching resource for LDPC decoding and MIMO communications at the graduate level.
- Derived the optimal threshold expression to maximize packet detection probability of the double window energy ratio method.

Skills

Programming Language	Python, MATLAB, C, C++, LabView, Simulink, Verilog, and JavaScript
Technical Expertise	Docker deployment, Web development, Cloud deployment, Software packaging and deployment, PCB CAD, 3D Printing
Language	English (fluent), Hindi (native), German (basic), and Sanskrit (basic)

Relevant Projects

Jun – Aug '24	Development of an automated reasoning system for ARC Prize 2024 (Link) <ul style="list-style-type: none">• Developed a neurosymbolic reasoning system combining the intuition of LLMs (System 2) with heuristic search over custom domain-specific libraries (System 1).• Implemented a causation detection mechanism to automatically identify the transformation rules leading from input to output visual grid.• Enhanced the system's generalization capability by implementing adaptive learning loops over linguistic queries for efficient Python code generation using the DSPy library.• Achieved high accuracy in the prediction of grid size, type of patterns, and count of patterns. Achieved medium-low accuracy in causation detection and replication.
Oct '22 – Mar '23	Multiagent evolutionary games on a random, directed, strongly connected network (Link) <ul style="list-style-type: none">• Developed a network simulator with adaptive agents at each node, exploring their internal dynamics during synchronous gameplay to understand stabilization and emergence criteria from an evolutionary game theory perspective.• Enhanced the networkx library to develop a module for the generation and handling of random, strongly connected directed graphs without isomorphic bias as observed in real life. (Link)• Proved the correctness of the methods in the module for the generation of graphs. (Report Link)
Mar – Jun '21	Detection of Emergence in Cellular Automata for various network topologies (Link) <ul style="list-style-type: none">• Simulated binary cellular automata on topologies like ring, hypercube, clique, etc to detect and study the emergence of complex patterns using all first neighbour binary evolution rules.• It was found that unlike a 1D-ring (where Rules 30 and 110 lead to emergent structures), other rules also lead to emergent behaviour on different network topologies.

Honors and Achievements

- Received a Qualstar and multiple ThankQ (token of appreciation) from team leads in Qualcomm.
- Achieved 1st position in Digianatronix, a circuit design contest organized at IIT Kharagpur.
- Recipient of the prestigious KVPY scholarship offered by the Government of India.
- Received Certificate of Appreciation by HBCSE for outstanding performance in the Indian National Mathematics Olympiad, a qualifying examination for IMO - Indian team.
- General Secretary of Technology at Vidyasagar Hall of Residence, IIT Kharagpur for the academic year 2015-16.

Activities and Interests

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| <ul style="list-style-type: none">• Cryptoanalysis• Trekking | <ul style="list-style-type: none">• Chess• Stock trading and analysis |
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