Anandsingh Chauhan

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Education

Indian Institute of Technology — Gandhinagar, Gujarat
Master of Technology in Electrical Engineering — *July 2018 – Aug 2020*

- CPI : **9.43/10.0**
- Thesis Topic : Peer to Peer Energy Trading Platform: Hardware and Software Integration
- Advisor : Dr. Naran Pindoriya

L. D. College of Engineering — Ahmedabad, Gujarat
Gujarat Technological University , Bachelor of Engineering in Electrical Engineering — *Aug 2014 – June 2018*

- CPI : **9.05/10.0**
- CGPA : **8.92/10.0**

Work Experience

Researcher — Sept 2020 – Present
Data and Decisions Sciences, Tata Consultancy Services – Research — *Mumbai, Maharashtra*

- Conducting research under the guidance of Dr. Mayank Baranwal in the Data and Decision Sciences Research Group
- Focusing on developing artificial intelligence-driven control systems to ensure the resilient and efficient operation of power networks and supply chain operations
- Research Interests: Artificial Intelligence, Generative AI, Power Systems, Reinforcement Learning, Graph Neural Networks, and Supply Chains

Awards and Honours

- **Nasscom AI** Gamechangers Award, 2023-24
- **Certificate of Merit**, Adoption of Artificial Intelligence, Machine Learning and Robotic Solution, India Smart Grid Forum (ISGF), 2024
- **Third prize**, Learning to Run Power Network (L2RPN), TU Delft, The Netherlands 2023
- **Platinum Award**, Best Technology in Electricity Distribution, India Smart Grid Forum (ISGF), 2023
- **Gold Award**, Best Technology in Electricity Transmission, India Smart Grid Forum (ISGF), 2023
- **POSOCO Power Systems Award** for M.Tech thesis, Grid-India(formerly POSOCO) and FITT, 2021

Scholastic Achievements

- Director Fellowship during M.Tech, 2018-2020
- Certificate of Academic Excellence during B.E., 2017
- Prime Minister Scholarship Scheme during B.E., 2014-2018
- 99.13 Percentile in Electrical Engineering, GATE 2019

Research Projects

AI Powered Control and Management of Power Networks | TCS Research

- We develop a RL framework, PowRL, to mitigate the effects of unexpected network events, as well as reliably maintain electricity everywhere on the network at all times. The PowRL leverages a novel heuristic for overload management, along with the RL-guided decision making on optimal topology selection to ensure that the grid is operated safely and reliably (with no overloads). Even with its reduced action space, PowRL tops the leaderboard in the L2RPN NeurIPS 2020 challenge (Robustness track) at an aggregate level, while also being the top performing agent in the L2RPN WCCI 2020 challenge. The extension of this work focuses on the development of learning based algorithmic framework for the generator dispatch and optimal battery scheduling.
- Colloborator(s) : **Dr. Mayank Baranwal**

Cost-Efficient Multi Node, Multi Product Order Fulfillment in E-commerce | TCS Research

- We develop an innovative algorithmic framework to optimize cost-to-serve (CTS) in e-commerce, addressing the challenge of efficiently fulfilling dynamically generated orders from multiple customers across various warehouses and vehicle fleets. This project incorporated a two-level decision-making process: firstly, selecting the optimal fulfillment node for each order (including deferral options), and secondly, routing vehicles efficiently to deliver orders from the same warehouse. Our approach combined graph neural networks, reinforcement learning, for node fulfillment and vehicle routing, while considering real-world constraints such as warehouse inventory capacity, vehicle characteristics, and customer delivery time windows.
- Colloborator(s) : **Dr. Harshad Khadilkar**, **Omkar Shelke**, **Pranavi Pathakota**

Multi-Robot Task Allocation in a Dynamic Warehouse Management | TCS Research

- We addressed the challenge of optimizing productivity in modern warehousing by developing a heuristic-guided Reinforcement Learning(RL) agent. The project aimed to minimize both robot travel distance and task execution delays while considering practical constraints like charging/discharging and collision-free navigation. The developed RL based framework outperformed industry-standard practices such as FIFO and a myopic greedy heuristic. This innovative approach enhances efficiency and operational agility in dynamic warehousing environments.
- Colloborator(s) : **Dr. Mayank Baranwal**, **Aritra Pal**

Intelligent Manufacturing Replenishment for Multi-Lead Time Products | TCS Research

- We developed a Reinforcement Learning(RL) based framework for optimizing the replenishment process of multiple products with varying lead times. The system efficiently forecasts upcoming demand while considering factors such as shelf life, lead times, and other critical variables. This project showcased the ability to apply advanced AI techniques to enhance manufacturing and supply chain operations.
- Colloborator(s) : **Dr. Harshad Khadilkar**, **Ansuma Basumatary**

Development of a Prosumer Driven Integrated SMART grid | IIT GN

- Contributed to the establishment of a cutting-edge hardware and software platform for Peer-to-Peer (P2P) energy trading at IIT Gandhinagar. The project centered around creating a real-world testbed involving two prosumers (Peer A and Peer B) and a consumer (Peer C). Peer A utilized solar PV and battery energy storage, while Peer B featured electric vehicle (EV) charging capabilities with Vehicle-to-Grid (V2G) functionality. Additionally, the testbed seamlessly interfaced with a Blockchain-based digital platform to demonstrate Peer-to-Peer energy trading in a practical environment. This work aligns with the evolving energy sector's transformation, facilitating the integration of renewables, operational efficiency improvement, and transactive energy dynamics.
- Colloborator(s) : **Dr. Naran Pindoriya**

Papers and Patents

- Pal, A., **Chauhan, A.**, Baranwal, M., and Ojha, A., Heuristic-guided Reinforcement Learning for Multi-robot Task Allocation in Dynamic Warehouse Environments. *Proceedings of the European Conference on Artificial Intelligence (ECAI), 2024.* [**Acceptance Rate - 23%**].
- **Chauhan, A.**, Baranwal, M. and Basumatary, A., 2023. PowRL: A Reinforcement LearningFramework for Robust Management of Power Networks. *Proceedings of the AAAI Conference on Artificial Intelligence, 2023.* [**Acceptance Rate - 19.2%**] doi:10.1609/aaai.v37i12.26724
- Shelke, O. * , Pathakota, P. *, **Chauhan, A.** * , Meisheri, H., Khadilkar, H., and Ravindran, B. A Learning Approach for Discovering Cost-Efficient Integrated Sourcing and Routing Strategies in E-Commerce. *Accepted at CODS-COMAD 2024* doi/10.1145/3632410.3632426 .
- Shelke, O., Pathakota, P., **Chauhan, A.**, Meisheri, H., Khadilkar, H., and Ravindran, B. Multi-Agent Learning of Efficient Fulfilment and Routing Strategies in E-Commerce.*NeurIPS Generalization in Planning workshop 2023* openreview link.
- R. B. Kuhada, **Chauhan, A.,**, and N. M. Pindoriya, Real-time simulation of V2G operation for EV battery, *21st National Power Systems Conference (NPSC), 2020* doi: 10.1109/NPSC49263.2020.9331873
- **Chauhan, A.**, Baranwal, M., 2023. Reinforcement Learning and heuristic based real time power grid management ,U.S. Patent US 2024/0186789 A1
- **Chauhan, A.**, Baranwal, M., 2022. Reinforcement Learning and heuristic based real time power grid management, India Patent 202221069773 *Published dated Jun 7, 2024*
- Pindoriya, N., **Chauhan, A.**, Kuhada R., Jha M., 2022. Universal IoT based smart energy management device, India Patent 202221028935 *published dated Nov 24, 2023*

Under Review Papers

- **Chauhan, A.**, Suthar, S., Kuhada, R., Cherukuri, S., and Pindoriya, N., Peer-to-Peer Energy Trading Framework: An Experimental Evaluation (*Submitted at ISGF-Asia 2024*)

Technical Skills

- **Computer Programming**: Python, PyTorch, Tensorflow, MATLAB, HTML
- **Other Professional Software Skills**: Simulink, PSSE, LaTeX
- **Hardware Skills**: Lab-Volt, OPAL-RT, Raspberry Pi