# Preethi S R

Kochi, India · linkedin.com/in/preethied ·
github.com/preethi-ed

www.preethisratheesh.com

## Research Interests

Structure-aware algorithms for risk under dependence uncertainty · network analysis of financial systems · interpretable machine learning · quantum and heuristic optimisation

## Education

| Degree | Institution | Years | Grade |
|---|---|---|---|
| M.Tech, Artificial Intelligence and Data Science & Engineering | Indian Institute of Technology Patna | Jan 2025–Dec 2026 | 8.98 |
| B.Tech, Applied Electronics and Instrumentation | Rajagiri School of Engineering & Technology, Kochi | 2015–2019 | 8.52 |

## Research

**M.Tech thesis (IIT Patna, 2026):** *Detecting Structural Fragility in Financial Markets Using Dynamic Graph Modeling and Retrieval-Augmented Learning.* Supervisor: Dr. Rajiv Misra.

- Built the Network Coupling Index (NCI) from rolling correlation networks of the NIFTY 50 (2015–2026), combining spectral measures, correlation structure and minimum spanning trees with past-only standardisation.
- On 12 objectively defined drawdown episodes, the NCI reached AUC 0.785 (95% bootstrap CI 0.62–0.88), comparable to India VIX, with placebo p = 0.001.
- Built a retrieval-augmented explanation layer with a locally run LLM (Llama 3.2) that matches index spikes to dated market events under strict temporal constraints, with citation checks.

**Preprints**

1. Preethi S R. *Tsetlin Machines versus Classical Classifiers for Predictive Maintenance: A Controlled Comparative Study on AI4I 2020.* Preprint, 2026. Zenodo doi:10.5281/zenodo.24530678 · Code: github.com/preethi-ed/tm-predictive-maintenance.

    - Nested benchmark against random forest, decision tree, MLP and logistic regression; the Tsetlin Machine reaches about 86% of the random forest's F1 with readable, multiplication-free clause rules.
2. Preethi S R. *Intraday Volatility Regimes via Unsupervised Machine Learning: Evidence from the NIFTY Index.* Preprint, 2026. SSRN doi:10.2139/ssrn.6294638 · Zenodo doi:10.5281/zenodo.18894223.
    - UMAP and HDBSCAN on 5-minute NIFTY data identify three volatility regimes with Markov switching; regime-conditioned forecasts reduced 30-minute realised-volatility error by 5.65%.

**Work in progress**

1. Preethi S R. *Look-Ahead Leakage in Unsupervised Time-Series Regime Detection: A Controlled Ablation Study on High-Frequency Financial Data.* In progress (IEEE).
2. Preethi S R. *Disentangling Genuine Lead–Lag from Measurement Artefacts in High-Frequency Financial Time Series: Evidence from NIFTY Futures and Spot.* In progress (IEEE).
3. Preethi S R. *Worst-case risk aggregation as a QUBO: classical and constraint-preserving QAOA approaches.* In progress.

## Professional Experience

**Co-founder and Director**, Orvel Technologies Pvt. Ltd. (DPIIT-recognised) · May 2026–present

- Co-founded an early-stage technology company; currently in its foundation stage.

**Sr. Developer**, Cognizant Technology Solutions, Bengaluru · Oct 2019–May 2026

- Designed and deployed enterprise data pipelines processing millions of records daily, and SQL-based ETL for automated reporting.
- Built Python and Java automation workflows that cut manual workload by about 60%.
- Designed Power BI dashboards for KPI tracking and business reporting.

Total industry experience: 6+ years.

## Technical Skills

| Area | Skills |
|---|---|
| Programming | Python, Java, C, SQL, Node.js, Flutter, Git, LaTeX |
| ML and data | scikit-learn, pandas, NumPy, NetworkX, Tsetlin Machines (TMU) |
| Optimisation | QUBO formulation, simulated annealing, QAOA simulation |
| LLM and retrieval | Retrieval-augmented generation, Ollama (local LLMs) |
| Tools | Git, LaTeX, Power BI (DAX), SQL Server/SSIS, AWS, Azure, GCP |

## Additional

- Certifications: AWS Certified Developer – Associate · Google Cloud Architect · Oracle Generative AI Professional · Microsoft Power BI Data Analyst · Azure Fundamentals
- Languages: English, Malayalam, Hindi, Telugu, Kannada