

# Girish G Hegde

Bengaluru, Karnataka, India

girishghegde7@gmail.com — +91-99026-5436

girishgh7.github.io — linkedin.com/in/girishgh — github.com/Girishgh7

## Research Statement

Aspiring researcher in machine learning and data science with a strong theoretical and implementation-oriented foundation. My academic interests lie in deep learning architectures, generative modeling, and computational approaches to structured reasoning. I am particularly interested in principled models that integrate representation learning, attention mechanisms, and algorithmic structure for scientific and societal applications.

## Education

**Indian Institute of Science Education and Research (IISER), Thiruvananthapuram**  
2022–Present

*Integrated BS–MS in Data Science*

Relevant Coursework: Machine Learning, Deep Learning, Artificial Intelligence, Scientific Computing, Algorithms, Operating Systems

CGPA: 7.5 / 10.0

**Seshadripuram Composite PU College, Bengaluru**

2018–2020

Science Stream (Physics, Chemistry, Mathematics, Biology)

Aggregate: 86%

**BP Indian Public School, Bengaluru**

2008–2018

Aggregate: 81%

## Research Experience

**Frequency Aware Deep Learning for Facial Deepfake Detection**

2024–Present

*Supervisor: Dr. Alwin Poulose, IISER Thiruvananthapuram*

Investigated frequency-domain representations for robust deepfake detection, focusing on GAN- and diffusion-generated facial images. Explored Fourier- and Discrete Cosine Transform-based feature extraction integrated with convolutional neural networks and Vision Transformers. Analyzed cross-domain generalization and sensitivity to spectral artifacts introduced by generative models.

## Other Research Projects

**Generative Image Modeling using Variational Autoencoders and PixelCNNs**

Conducted research on probabilistic generative models for image synthesis, with emphasis on latent space expressivity, reconstruction fidelity, and architectural efficiency. Explored attention-enhanced decoding strategies for improved sample quality under compact representations.

**Neural Network Architectures and Sequence Models from First Principles**

Implemented feedforward networks, recurrent neural networks, and LSTM architectures entirely from scratch, including explicit derivations of backpropagation and gradient-based optimization.

Studied convergence behavior, temporal dependency modeling, and optimization failure modes in controlled experimental settings.

#### **Transformer Models in JAX with Transfer Learning**

Designed and implemented Transformer architectures using JAX, incorporating multi-head self-attention, positional encodings, and efficient training pipelines. Performed transfer learning on domain-specific literary corpora to analyze representational drift and stylistic generalization.

#### **Neural Machine Translation with Custom Transformers**

Developed sequence-to-sequence Transformer models for English–French and English–Kannada translation. Investigated tokenization strategies, positional representations, and training stability in multilingual learning regimes.

#### **Symbolic–Neural Legal Reasoning Framework (Lexi Lawyers)**

Constructed a hybrid reasoning system encoding Indian Penal Code statutes into structured symbolic representations using YAML and semantic graphs. Implemented a forward-chaining inference engine with an interactive interface for structured legal query analysis.

#### **Temporal Modeling of Financial Time Series using LSTM and GRU Networks**

Developed recurrent architectures for modeling sequential financial data streams. Conducted exploratory backtesting to analyze temporal dependencies, predictive uncertainty, and regime sensitivity in market signals.

#### **Neural Reasoning and Entity Interaction with Attention Mechanisms**

Built an experimental reasoning agent combining pretrained embeddings, syntactic parsing, and MLP-based attention to infer relational structure from natural language. Visualized entity interactions using graph-based representations to study interpretability and emergent reasoning behavior.

#### **Parallel Crowd Simulation and Swarm Dynamics**

Implemented a C-based parallel simulator to model crowd and swarm movement in constrained environments, with Python-based visualization of density heatmaps, emergent flow patterns, and anomaly detection.

#### **Media Bias Detection using Classical and Deep NLP Models**

Designed text classification pipelines employing TF–IDF, CNNs, and BERT-based encoders to detect ideological bias in news media. Applied interpretability techniques to identify salient linguistic features influencing model predictions.

## **Technical Proficiency**

**Programming Languages:** Python, R, Julia, C, C++

**Machine Learning Frameworks:** PyTorch, TensorFlow, Keras

**Scientific Tools:** Git, Jupyter, LaTeX, VS Code

**Core Expertise:** Deep Learning, Generative Modeling, Attention Mechanisms, Reinforcement Learning, Scientific Computing, Data Visualization

## **Academic Service and Leadership**

- Student Coordinator, Placement Cell — IISER Thiruvananthapuram (2023–2026)
- Member, Events and Content Team — CSIT Club, IISER Thiruvananthapuram (2022–Present)
- Health and Hygiene Representative — Student Mess Council (2022–2023)

## **Research and Laboratory Skills**

Scientific and technical writing, experimental design and evaluation of machine learning models, visualization of high-dimensional data, basic cell culture techniques, collaborative research

## **Languages**

English (Fluent), Kannada (Fluent), Hindi (Intermediate)

## **Extracurricular Interests**

Table tennis, trekking, cycling, endurance running, outdoor exploration