# Bipin Koirala

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## Education

**Georgia Institute of Technology (On-Campus)** — Atlanta, GA
*Master of Science - Computer Science, Specialization in Machine Learning* — *Expected: May, 2025*

**Relevant Courses:** Machine Learning, Artificial Intelligence, Computer Vision, Convex Optimization, Math Foundation for ML, Gaussian Processes for ML, Natural Language Processing, Statistics, Linear Algebra, High Dimensional Probability, Optimal Transport

**University of Mississippi** — Oxford, MS
*Bachelor of Science - Mechanical Engineering (Honors)* — *May, 2021*

## Skills

**Languages**: Python, SQL (Postgres), HTML/CSS, R, MATLAB, C++
**Frameworks**: PyTorch, OpenCV, Tensorflow, Scipy, Pandas, NumPy, Matplotlib, Scikit-Learn, Seaborn, JAX, Pyro
**Developer Tools**: Git, Docker, Azure, Google Cloud Platform, AWS, Flask
**Miscellaneous**: ROS, LaTex, Gazebo, PTC Cero, Spark

## Experience

**Graduate Research Assistant** — Aug. 2023 – Present
*Georgia Institute of Technology* — *Atlanta, GA*

- Developed algorithm for modeling/forecasting time series for streaming data. This work notably incorporates Gaussian Processes to effectively account for uncertainty in prediction.
- Pioneered the use of retroactive posterior updates in Gaussian Processes to enable continuous learning in dynamic systems, effectively reducing model retraining time.
- Streamlined code quality and collaboration within the research team by executing code review processes to maintain high standards in model development and documentation.

**Engineering Co-op** — Jan 2020 – Dec 2020
*Thyssenkrupp Elevator Corporation* — *Middleton, TN*

- Developed Python scripts to automate the processing of large datasets and led a capacity and time study project, employing statistical tools and software to analyze machine productivity, resulting in actionable insights for enhancing production efficiency
- Authored Standard Operating Procedures (SOPs) for production processes and prepared detailed documentation and reports, facilitating effective communication of technical information across departments

## Projects

**Forecasting** | *PyTorch, YOLO, OpenCV, ffmpeg, Open-Meteo API*

- Developed a probabilistic forecasting model for time-series data, integrating object detection and tracking techniques using YOLO for real-time prediction of asset trajectories
- Designed and implemented a live video capture system to extract video frames from live feeds, including automatic time-stamping and weather data integration using Open-Meteo API
- Built a data processing pipeline for contour extraction and tracking of detected objects, generating comprehensive datasets for model training

**Recommendation System** | *Python, NumPy, SciPy, Scikit-Learn*

- Implemented a collaborative filtering recommendation system to suggest books based on user preferences by leveraging analytics to find similar users using cosine similarity
- Enhanced recommendation accuracy by incorporating a scoring mechanism that adjusts for both popularity and user-specific ratings within the recommendation algorithm

**Ask Your PDF: AI-Powered Document Query System** | *Flask, OpenAI GPT, LangChain*

- Developed a RAG based web application enabling users to upload PDF documents and ask contextual questions, with AI-powered answers generated using OpenAI's GPT API.
- Integrated *LangChain* for document splitting, vector storage, and similarity-based retrieval to efficiently query large documents.
- Utilized MathJax for rendering mathematical equations in AI responses, ensuring accurate display of complex mathematical content.
- Implemented a secure deployment process on Render, using environment variables for API key management and Flask for backend services.

**Autonomous Navigation** | *ROS, PyTorch*

- Developed and trained a deep neural network for street sign classification, achieving high accuracy using a labeled dataset of real-world traffic signs
- Integrated the trained model into a Turtlebot-3 platform to enable real-time autonomous navigation through a maze, leveraging both LIDAR and vision-based sensors for obstacle detection and path planning

## Research

- B. Koirala and P. Seshadri. "*Streaming Gaussian Process with Retroactive Posterior Improvement*"(In-Progress)
- S. Ali, P. Chourasia, H. Mansoor, B. Koirala, and M. Patternson. "*MIK: Modified Isolation Kernel for Biological Sequence Visualization, Classification, and Clustering* (In-Proceedings: Machine Learning for Health) arXiv:2410.15688
- S. Ali, P. Chourasia, B. Koirala, and M. Patterson. "*Nearest Neighbor CCP-Based Molecular Sequence Analysis*" arXiv:2409.04922
- R. Raspet, C. J. Hickey, and B. Koirala. "*Corrected Tilt Calculation for Atmospheric Pressure-Induced Seismic Noise*" Applied Sciences 12.3(2022): 1247