Swathy S Aji

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Immediate Joiner

MACHINE LEARNING ENGINEER

As an accomplished machine learning professional having **three years** of experience with a proven track record, I excel in **developing** and **deploying** cutting-edge **ML models** integrated with **REST API**s. My expertise encompasses the entire **data lifecycle**, from meticulous data collection to in-depth **analysis**, and the **fine-tuning** of existing models to maximize performance. With a rich background in both **product-based companies** and **startups**, I bring a dynamic perspective to problem-solving, innovation, and driving results in the ever-evolving field of machine learning.

EXPERIENCE

Freelance Machine Learning Engineer   July 2024 – Present

- Worked on projects involving **prompt engineering** using **Gemini**, focusing on designing and optimizing prompts for various NLP applications.
- Built and deployed **automated LLM pipelines** that integrate with **Google Cloud Storage**, ensuring scalable and efficient data handling for LLM workflows.
- Developed and implemented systems for **prompt performance tracking**, utilizing custom metrics and automation to monitor and improve the quality of model outputs.

Software Engineer (Python/ML)   Oct 2022 – June 2024
Genpro Research, Thiruvananthapuram

- Developed a question-answering module for the MAIA product utilizing Retrieval-Augmented Generation (**RAG**) with **LlamaIndex**. Integrated **OpenAI**'s text-embedding-ada-002 model and **GPT-3.5** to enhance natural language understanding and response accuracy. Employed **Qdrant** and **Milvus vector databases** for efficient semantic search and indexing. Additionally, used OpenAI **tiktoken** for prompt preprocessing to optimize input handling.
- Developed and maintained comprehensive **ML documentation**, including model design, training processes, and testing results. Utilized **MLflow** for tracking experiments and ensuring reproducibility
- Established a **generalized experimentation framework** through code, facilitating efficient scenario testing **for various experiments within the same task**. Enabled streamlined modifications, enhancing the ability to quickly iterate and optimize different experimental setups.
- **Fine-tuned** Large Language Models (**LLMs**), such as **Falcon**, for table summarization. Utilized techniques like **PEFT LoRA** and **4-bit quantization** through **BitsAndBytes** with Hugging Face integration. Developed a custom dataset by combining our proprietary data with selectively preprocessed **ToTTo** dataset entries, adhering to constraints like a maximum of 10 rows and the first row as headers. Employed evaluation metrics such as **ROUGE-1** and **METEOR**, achieving scores of 0.52 and 0.49, respectively, on a test set of 500 entries.
- **Conducted code reviews** for various machine learning tasks, ensuring code quality, adherence to best practices, and alignment with project requirements. Provided

- constructive feedback and recommendations to enhance code efficiency and maintainability.
- Utilized **design patterns** such as **Strategy and Factory Method** for developing ML components and integrating them into products. These patterns facilitated flexible, modular, and maintainable code structures, enhancing the scalability and robustness of machine learning solutions.
- Developed an article re-ranking pipeline using the **online machine learning** library **RiverML**'s classifier model. Experimented with various feature engineering techniques such as **TF-IDF, word vectors, sentence vectors**, and **document vectors**, including methods for generating document vectors by combining word vectors through summation. Implemented dimensionality reduction techniques like **PCA** and **t-SNE** to handle the limitations of RiverML models, which cannot take tensors as input. Evaluated the re-ranking model using multiple methods, including **plotting online learning curves** and creating **custom evaluation metrics** to ensure robust performance.
- Developed applications using **Streamlit** and **FastAPI** for demos
- Enhanced the Named Entity Recognition (NER) pipeline by upgrading from spaCy 2 to **spaCy 3** models and integrating domain-specific **NER** models from **Hugging Face**. Implemented a solution to address memory leakage issues in spaCy and introduced domain-specific **postprocessing** with **logical filters** to improve the accuracy of extracted entities.
- Developed **test cases for various ML features**, including **unit tests, integration tests, and stress tests**. Ensured comprehensive validation and robustness of ML components through systematic testing approaches.
- Updated **GitLab CI/CD pipeline** to incorporate comprehensive testing of various machine learning features. Enhanced the automation workflow to ensure robust integration and validation of ML components within the product
- Performed experiments with **Hugging Face** ,John Snow Lab **nlu** and **spaCy** models across different tasks, which include paraphrasing and **NER**.
- Performed various experiments in **Jupyter Lab**, logged my progress with **MLflow**, and visually displayed the results using various libraries such as **Matplotlib**.
- Conducted **analysis**, **data cleaning**, **feature engineering** and employed actual clinical research data to tackle challenging issues within the clinical research domain.
- Explored, made adjustments to, and utilized **datasets** that are **publicly available** for training and finetuning of models.
- Applied machine learning techniques to effectively utilize modern **parallel computing** environments.
- **Automated data cleaning** tasks to cut down on the time required.
- Developed **microservices** using **FastAPI** for ML applications and integrated **Celery workers** for asynchronous task processing. Utilized **Docker** to containerize the services.
- Experimented with parallel processing frameworks including **Ray** and **PySpark**. Explored their capabilities for scaling machine learning workflows and optimizing data processing tasks, enhancing efficiency and performance.
- Experienced with ML models such as **XGBoost** and Support Vector Classifier (**SVC**). Conducted extensive **hyperparameter tuning** using **Optuna** to optimize model performance and achieve superior results.
- Run machine learning **tests** and **experiments**
- **Evaluated** models and **fine-tune** them for business objectives
- **Retrained** the models when there is a **model drift**
- **Extended existing ML components** in product
- Created custom evaluation metrics for specific use cases when required

Machine Learning Engineer   Jul 2021 - Aug 2022

Visualyze.AI, Thiruvananthapuram , India

- **Developed an application for training and retraining** Named Entity Recognition (**NER**) models, encompassing both **text-based** and **document-based** models, as well as **AutoML Tabular** models, and successfully deployed it for production use
- Responsible for server that offered **all AI-based services** to the **RPA studio**
- Experience in **h2o, spaCy , tpot ,NLTK** and **hugging face** models like **LayoutLM**
- Leveraged **Azure AI Document Intelligence** (formerly **Form Recognizer**) to deploy prebuilt models such as **Read, Layout, General Document (Key-Value Pair), Invoice, and Receipt** for efficient document processing. **Fine-tuned custom models**, including the **Custom Neural Model** and **Custom Template Model**, for specific document analysis tasks. Utilized **Azure Blob Storage** for data management and storage to support scalable and secure document processing workflows.
- Experienced with OCR technologies, including **PaddleOCR** and **Tesseract OCR.**
- Performed Machine Learning Model Tests and Experiments
- Experience in working with **Linux OS ,Windows ,virtual machines** and Google colab
- Experience with creating web APIs in **Flask-RESTful**
- Experience with ML libraries like **Pandas, Numpy, Seaborn, Opencv, Scikit-learn** and **Matplotlib**
- Experience in professional software development practices and tools for source control and project management like **Git** and **JIRA**
- Experience in **Sql Alchemy , Sqlite and regular expressions**
- **Developed model** that can **translate sentences** from European languages to English using word vectors
- **Created dataset** (including **data labeling**) and trained **key-value pair extractor model** for invoices.
- Labeled data, **supervised dataset splitting**, and **developed NER** model for shipping-related emails

Python and Machine Learning Intern   Feb 2021 - Jul 2021

Oracuz InfoTech Pvt ltd, Thiruvananthapuram , India

- Used different ML algorithms to solve problems
- Experience in Python, Sqlite and Tkinter
- Experience in image processing using **OpenCV**

Project Intern   Nov 2017 - Feb 2018

*Vikram Sarabhai Space Centre (**VSSC**), Thiruvananthapuram , India*

- **IOT** based vehicle parking manager , makes finding parking slots more efficient ,less time consuming for the employees . Smart parking includes the use of low cost **sensors** ,**realtime data** and **android application** that allow users to monitor available and unavailable parking spots.

EDUCATION

Bachelor of Technology - Information Technology
Government Engineering College, Thiruvananthapuram

SKILLS

Expert in: NLP, Python, ML, Deep learning, Pytorch