DS5619 Machine Learning System Operations (Aug–Dec 2025)

LLMOps

Continuous Fine-Tuning of an Open-Source LLM

Team

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GitHub Repository

🔗 Link to Repository

Plan

We aim to design a reproducible pipeline for **continuous fine-tuning of open-source LLMs** by leveraging the tools and techniques we will learn through the MLOps course.

Key steps in the plan:

1. **Finalize use case –** domain-specific Q&A, summarization, or chatbot.
2. **Select base model** from Hugging Face Hub.
3. **Collect and preprocess datasets** (e.g., SQuAD, Alpaca, open QA).
4. **Fine-tune with PEFT/LoRA** for lightweight training.
5. **Track experiments**
6. **Deploy models** via Gradio apps or Hugging Face Spaces.
7. **Enable rollback** if newer models underperform.

Progress

- Completed project proposal outlining problem statement, and objectives.
- Decided use case of chatbot with domain-specific fine tuning.
- Explored potential base models and datasets.
- Set up initial environment and did some fine-tuning.

Tech-stack

- **Model**: StableLM-base-alpha-3b
- **Dataset**: TBD (Using generated data for PoC)
- **Fine-tuning**: using PEFT/LoRA
- **Deployment**: Gradio
- **Versioning**: Git/GitHub for code and dataset snapshots

Deliverables

- Fine-tuned model adapters (**LoRA weights**)
- A hosted chatbot app
- Evaluation report showing improvement
- Documentation of pipeline steps and reproducibility guide

Challenges & Risks

- Limited free GPU availability (Colab/Kaggle).
- Dataset quality and representativeness.
- Ensuring reproducibility across environments.

Expected Outcomes

- **Improved performance** (+5–10% accuracy/quality) on chosen domain-specific tasks.
- **Working chatbot demo** deployed on Gradio.
- **End-to-end reproducible pipeline** covering data, training, evaluation, deployment, and rollback.