

Syllabus of finetuning

Tuesday, May 6, 2025

1:02 PM

☐ Video 01: Introduction to Fine-Tuning in AI

- What is Model Training? (ML, DL, CV, NLP, GenAI)
- Transfer Learning (Live demo with CNN)
- What is Pretraining, Finetuning & Why it matters
- Pros & Cons of Finetuning
- Overview of Top LLM Finetuning Frameworks: HF TRL, Unsloth, Llama Factory, Axolotl
- Important Research Papers
- Tips Before You Fine-Tuning

☐ Video 02: Finetuning vs RAG vs AI Agents — What to Use When?

- Definitions: Finetuning, Transfer Learning, RAG, Agents
- Comparison Table
- Use Cases & When to Use What
- Industry Examples

☐ Video 03: Finetuning in Deep Learning

- CNN Example End-to-End (Image Classification)
- How feature extraction + finetuning works

☐ Video 04: Why Finetuning is not possible in RNN/LSTM?

- Limitations of older architectures (RNN, LSTM)
- Compare with Transformer-based models

☐ Video 05: Hugging Face vs Lang Chain | Full HF Tutorial

- HF Installation & Environment Setup
- Using HF APIs vs Offline Downloads

☐ Video 06: Finetuning Classical Language Models

- BERT Fine-Tuning (Text Classification / QA)
- T5 Fine-Tuning (Text2Text Tasks)

☐ Video 07: Knowledge Distillation in LLMs

- What is Knowledge Distillation?
- Example: BERT → Distil BERT
- Combine with Fine-Tuning for better efficiency

☐ Video 08: LLM Quantization Explained

- What is Quantization?
- Weight Quantization Techniques
- GGUF, GGML, GPTQ, AWQ, INT4/INT8 demos
- Why quantization matters

☐ **Video 09: Finetuning Large Language Models (Llama, Mistral, Gemma, Phi-3)**

- One-command fine-tuning demo
- PEFT Techniques: **LoRA, QLoRA, DoRA, ReFTy**
- Structured output fine-tuning (**QLoRA**)
- Chat-based fine-tuning (**OpenAssistant-like**)
- Full finetuning vs parameter-efficient finetuning
- Dataset Prep: Wiki dataset, **FinWeb**
- Tools: **Axolotl, Apple MLX, Unsloth**
- Post-Finetune Deployment (**Ollama integration**)

☐ **Video 10: API-Based Model Finetuning (GPT-4o, Gemini etc)**

- OpenAI Finetuning Walkthrough
- Distillation as Alt for API models
- Gemini Finetune Insights
- GPT-4o use case finetuning

☐ **Video 11: Best Frameworks for LLM Fine-Tuning**

- Hands-on: **LlamaFactory, Unsloth**
- Minimal Code, Max Performance
- Compare speed, memory, and flexibility

☐ **Video 12: Finetuning Vision-Language Models**

- What are VLMs? (**ViT, Florence2, Qwen2, LLaGemma**)
- Finetuning VLMs with **LlamaFactory**
- Upload Adapters & Models to Hugging Face Hub

☐ **Video 13: Reinforcement Learning with Human Feedback (RLHF)**

- PPO vs DPO vs Direct Preference Optimization
- Real examples and when to use what
- How RLHF fits into finetuning pipeline

☐ **Video 14: Embedding Finetuning Deep Dive**

- Embedding vs Fine-Tuning: Conceptual & Practical
- SFT vs USFT (Supervised Fine-Tuning variants)
- Embedding for Retrieval & Semantic Search
- When to fine-tune embeddings vs models