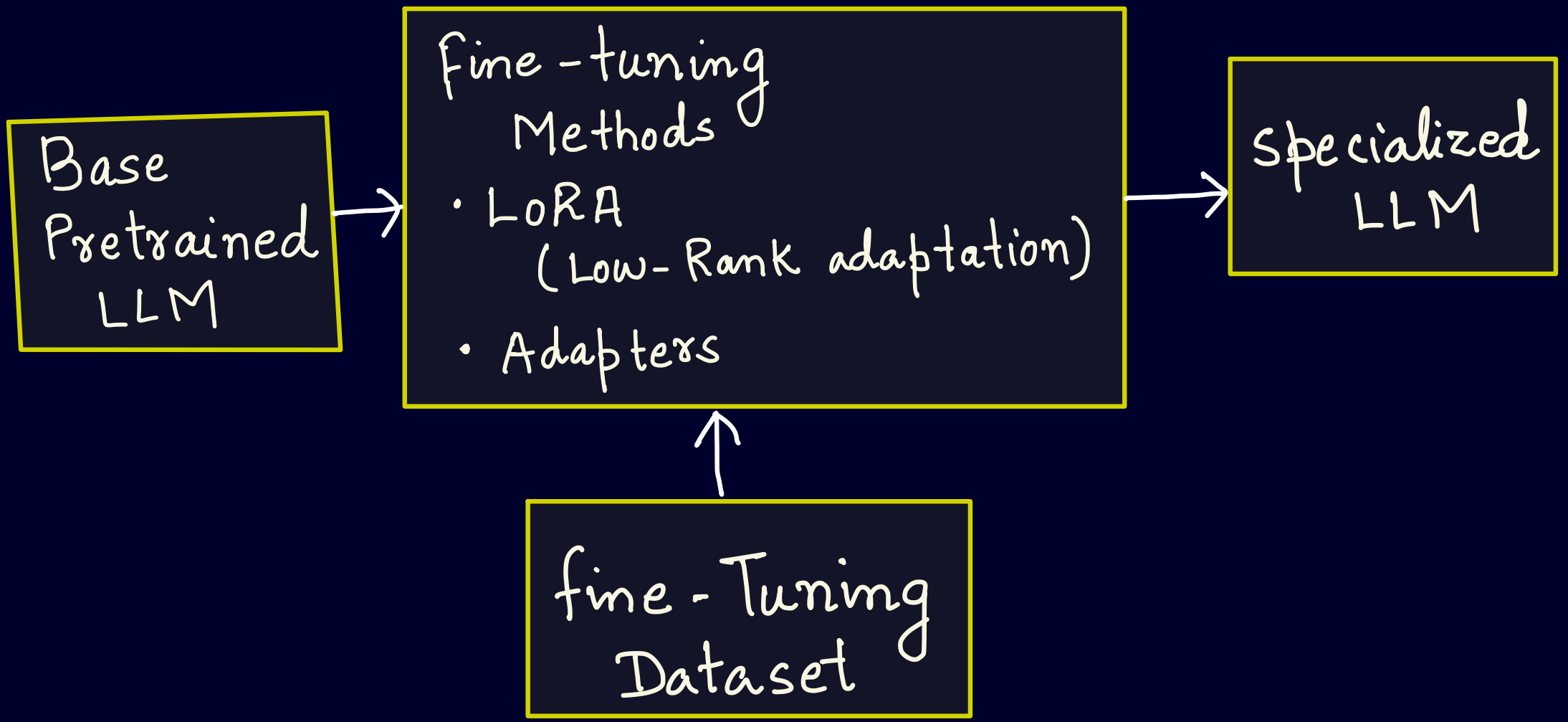
Fine-Tunings of LLM



Base Pretrained LLM

- This is the foundation model trained on massive general-purpose text corpora (eg. GPT, LLaMA, BERT)
- It already has billions of parameters and can performed broad tasks like text generation, summarization and Q & A.
- However, its not specialized for a domain (like medical, legal or financial texts)

Fine-Tuning Dataset

A domain-specific dataset is collected.

Examples:

- legal documents for a law-specific model.
- Medical research papers for healthcare AI.
- Company-specific customer support chat logs.

→ This dataset teaches the base LLM how to speak the "language" of the target domain or tasks.

Specialized LLM

After fine-tuning, the model becomes specialized for the target task or industry.

Legal LLM → better at contract review & case law reasoning

Medical LLM → assists doctors with diagnoses and research.

Customer support LLM → tuned to handle specific company workflows.

Definition :

Fine-tuning = adapting a pre-trained LLM (trained on huge general data) to perform better on specific tasks or domains.

Instead of traning from scratch (very costly), we update weights partially or fully with task-specific data.

Types of Fine-Tuning

Full Fine-Tuning

- Update all model parameters on new dataset
- Very accurate but expensive (billions of parameters).

Parameter-Efficient Fine Tuning (PEFT)

- Updates only a small fraction of parameters (rest stay frozen)

Examples :

- LoRA (Low-Rank Adaptation) → ingects small trainable matrices
- Adapters → small additional layers.
- Prefix / Prompt Tunning → train task specific embeddings, not full weights.

Pipeline

Base Pretrained LLM → add/Freeze layers

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Optimization ← Fine-tuning Dataset

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Task-specific LLM