Finetuning Dictionary

Your A-to-Z Guide to Mastering LLM Finetuning

Bhavishya Pandit

A - Augmentation

Expanding model abilities with external data or techniques.

- Ensures better outputs by adding domain knowledge.
- Enhances reliability in fine-tuned LLMs.
- Common in adaptive learning systems.

Credit:sych.io

B - Batch Size

Source

The number of samples processed before updating model weights.

- Affects learning stability and speed.
- Balancing small and large batch sizes is key.
- Important for tuning computational efficiency.

C - Curriculum Learning

Training models step-by-step with increasing complexity.

- Speeds up convergence.
- Helps the model generalize better to tasks.
- Inspired by human learning systems.

Source

D - Domain-Specific Tuning

Source

Adapting LLMs to excel in specialized fields.

- Essential for medical, legal, or finance sectors.
- Improves performance in niche applications.
- Requires high-quality labeled datasets.

*self promotion ahead

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E - Embeddings

Converting text into numerical vectors for analysis.

- Key for semantic search & dense retrieval.
- Used extensively in fine-tuning pipelines.
- Powers tasks like recommendations and clustering.

Credit:Community.aws

F - Few-Shot Learning

Source

Fine-tuning with minimal labeled data.

- Enables rapid adaptation to new tasks.
- Helps in low-data scenarios.
- Balances pre-training and specialized knowledge.

G - Gradient Descent

Optimization method to minimize error in training.

- Drives the learning process by adjusting weights.
- Central to every fine-tuning process.
- Requires proper tuning of learning rates.

Source

H - Hyperparameters

Source

Settings like batch size, learning rate, and epochs.

- Fine-tuning requires precise hyperparameter optimization.
- Impacts model accuracy and speed.
- Experimentation helps achieve optimal results.

I - Iterative Training

Refining models through repeated training cycles.

- Enhances performance step by step.
- Key for achieving state-of-the-art results.
- Reduces overfitting by monitoring progress.

Source

J - Joint Learning

Trains retrieval and generation components simultaneously.

Credit:arxiv.org

- Ensures better synergy between retrieved data and generated outputs.
- Reduces the need for separate fine-tuning.
- Often leads to improved overall system performance.

K - Knowledge Distillation

Transferring knowledge from large models to smaller ones.

- Makes models more efficient for deployment.
- Retains essential capabilities with fewer resources.
- Common in low-resource environments.

Source

L - Learning Rate

Source

The speed at which the model learns.

- Critical to balance between slow and fast learning.
- Improper tuning can lead to overfitting or underperformance.
- Often adjusted dynamically during training.

M - Model Weights

Parameters learned during training.

- Define how the model processes input.
- Fine-tuning adjusts weights for specific tasks.
- Pretrained weights act as a foundation.

$$\overbrace{W_{\mathtt{ft}}}^{\text{Finetuned Weights}} = \underbrace{W_{\mathtt{pt}}}_{\text{Pretrained Weights}} + \overbrace{\Delta W}^{\text{Weight Update}}$$

Source

N - Noise Handling

Source

Addressing noisy or low-quality data in fine-tuning.

- Improves the model's ability to generalize.
- Requires robust preprocessing pipelines.
- Common in messy, real-world datasets.

O - Optimization

The process of improving model performance.

- Involves methods like Adam or SGD.
- Essential for faster convergence in fine-tuning.
- Balances trade-offs between accuracy and efficiency.

Source

P - Pretraining

Source

Training on large datasets before fine-tuning.

- Provides general knowledge to the model.
- Reduces data requirements for fine-tuning.
- Speeds up task-specific adaptation.

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Q - Quality Evaluation

Measuring performance with metrics like BLEU, ROUGE, or accuracy.

- Validates the effectiveness of fine-tuning.
- Guides iterative improvements.
- Helps identify issues like overfitting.

Source

R - Regularization

Source

Techniques to prevent overfitting.

- Includes dropout, weight decay, or early stopping.
- Improves generalization on unseen data.
- Key for robust fine-tuned models.

S - Supervised Fine-Tuning

Using labeled data to teach specific tasks.

- Boosts performance in well-defined use cases.
- Requires high-quality annotations.
- Common in domain-specific applications.

Source

T - Tokenization

Splitting text into smaller units (tokens).

- Prepares data for model consumption.
- Handles variations like punctuation and casing.
- Fundamental for both training and inference.

Credit:Youtube.com

U - Underfitting

A model failing to capture data patterns.

- Often due to insufficient training.
- Addressed by increasing complexity or data size.
- Opposite of overfitting.

Source

V - Validation Set

Source

Dataset used to monitor training performance.

- Helps prevent overfitting during fine-tuning.
- Guides decisions on hyperparameter tuning.
- Ensures the model generalizes well.

W - Warm-Start

Initializes retrieval systems with pre-trained embeddings or models.

- Speeds up convergence and improves early-stage performance.
- Reduces training time for new tasks.
- Common in transfer learning scenarios.

Credit:determined.ai

X - Explainability

Credit:Medium.com

Understanding model predictions.

- Essential for building trust in AI systems.
- Identifies biases or issues in fine-tuned outputs.
- Key for high-stakes applications like healthcare.

Y - Yield Optimization

Maximizing output relevance and efficiency.

- Improves response quality for fine-tuned models.
- Involves iterative adjustments and monitoring.
- Enhances user satisfaction in real-world use.

Credit:fractal.ai

Z - Zero-shot learning

Source

Performing tasks without task-specific fine-tuning.

- Leverages general knowledge from pretraining.
- Useful for quick adaptation to new domains.
- A hallmark of advanced LLMs.

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