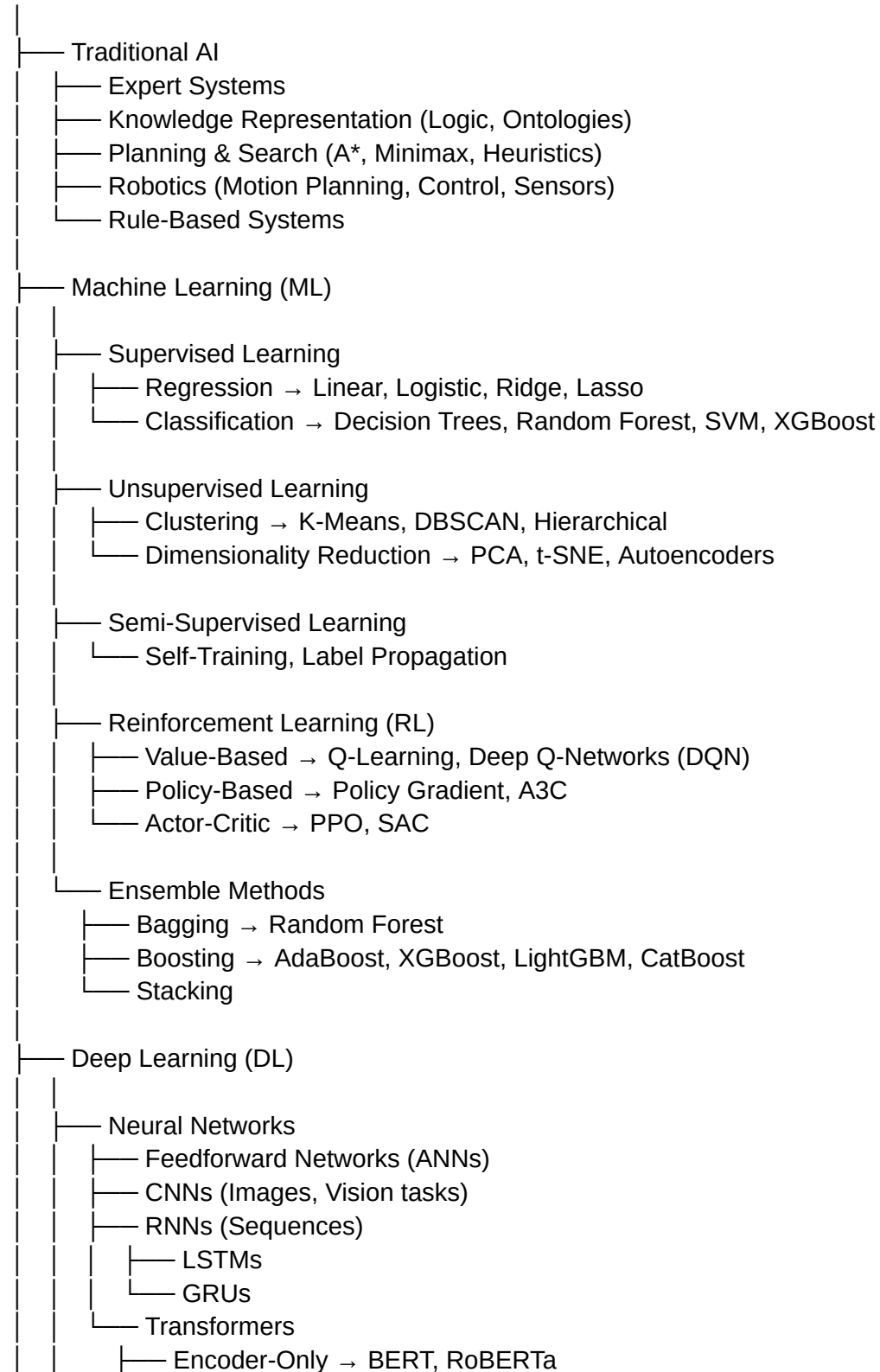
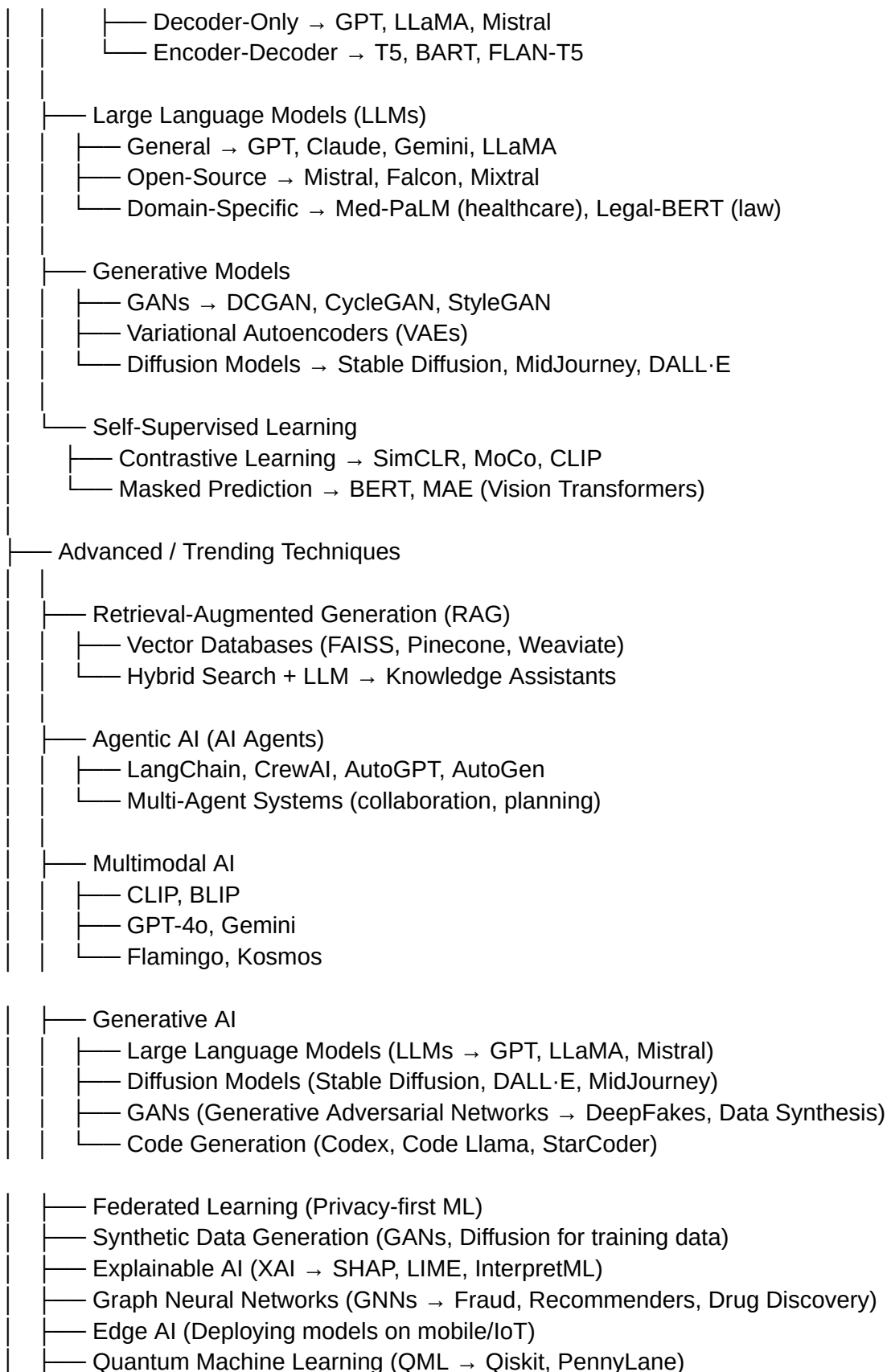
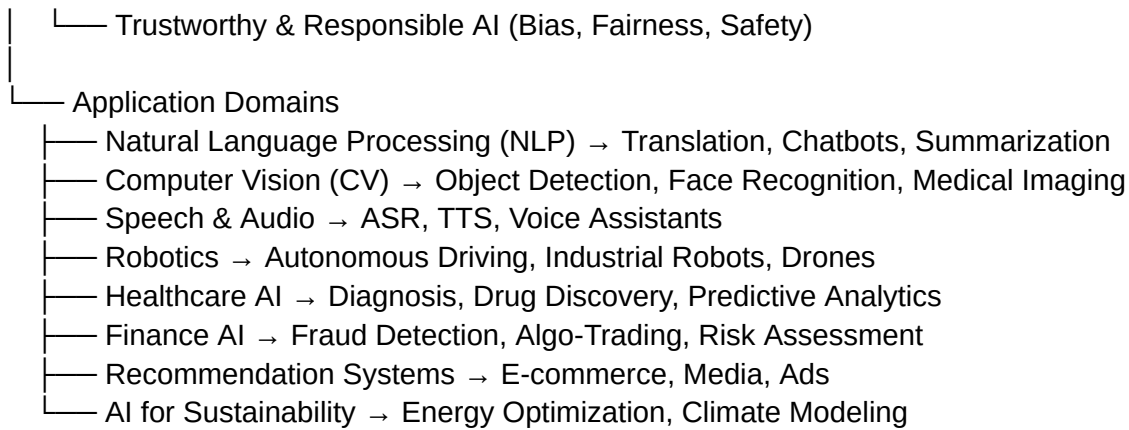


# Artificial Intelligence (AI)

## Artificial Intelligence (AI)







## Artificial Intelligence (AI) Knowledge Tree

This part covers the **conceptual foundation**:

- **Traditional AI** → Rule-based systems, expert systems, logic (useful in early AI).
- **Machine Learning (ML)** → Supervised, unsupervised, reinforcement, semi-supervised, ensembles.
- **Deep Learning (DL)** → CNNs, RNNs, Transformers, LLMs, generative models.
- **Trending Topics** → RAG, agentic AI, multimodal, federated, explainability, GNNs, edge AI, quantum ML.
- **Applications** → NLP, CV, speech, robotics, healthcare, finance, recommendation, sustainability.

## AI/ML Tools

### AI/ML Tools

|

| — Core Python ML/DL Frameworks

| | — TensorFlow / Keras → Deep Learning

| | — PyTorch / Fastai → DL research & applications

| | — Scikit-learn → Classical ML

| | — Statsmodels → Statistical models

| | — XGBoost / LightGBM / CatBoost → Gradient boosting

| | — Hugging Face Transformers → NLP, LLMs

| | — JAX → High-performance ML research

| | — RAPIDS (cuML, cuDF) → GPU ML pipelines

|

| — Data Handling & Preprocessing

| | — Pandas / NumPy → Data analysis & math

| | — Dask → Parallel data processing

| | — PySpark (MLlib) → Distributed ML

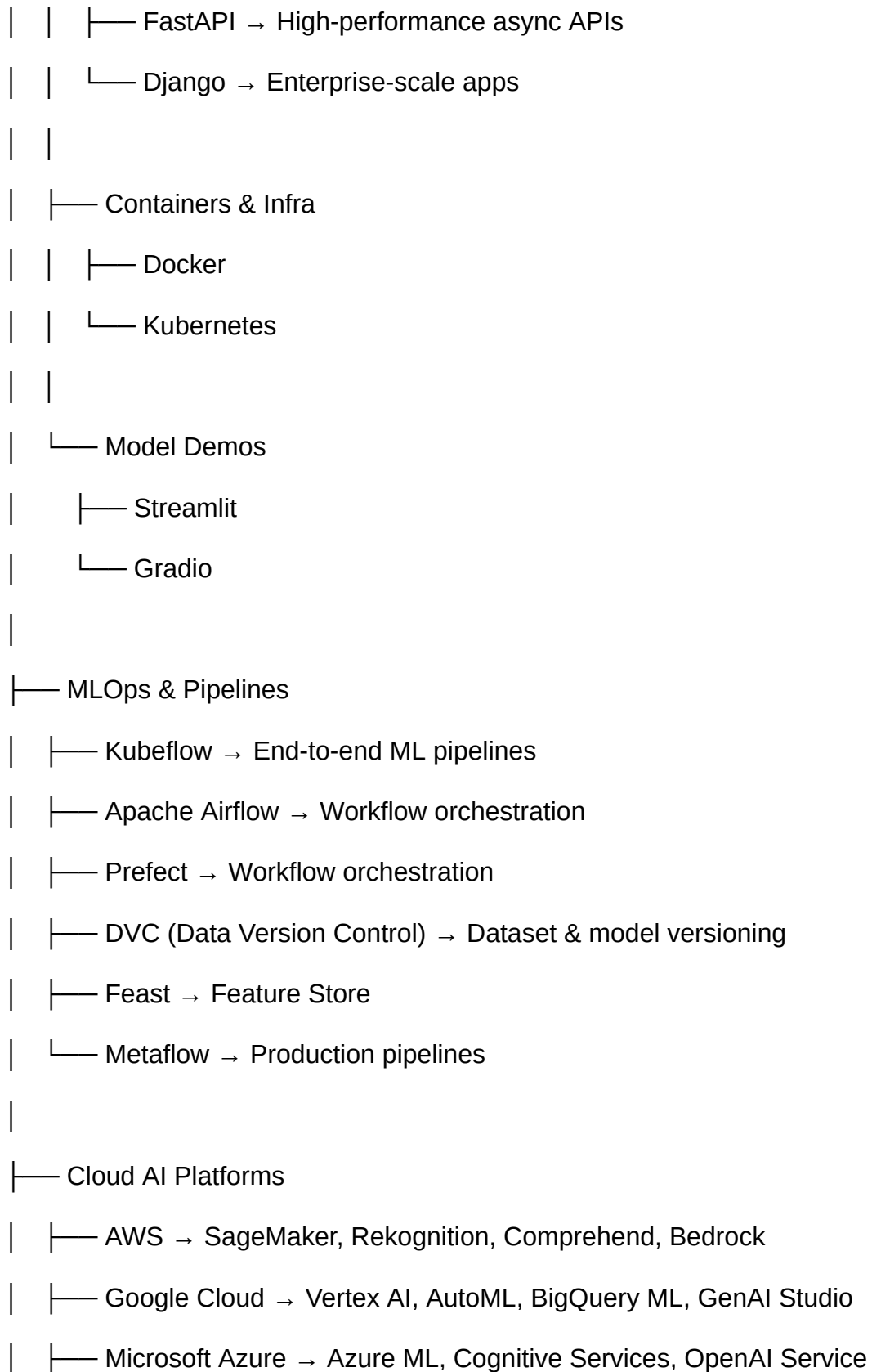
| | — Vaex → Big dataframes

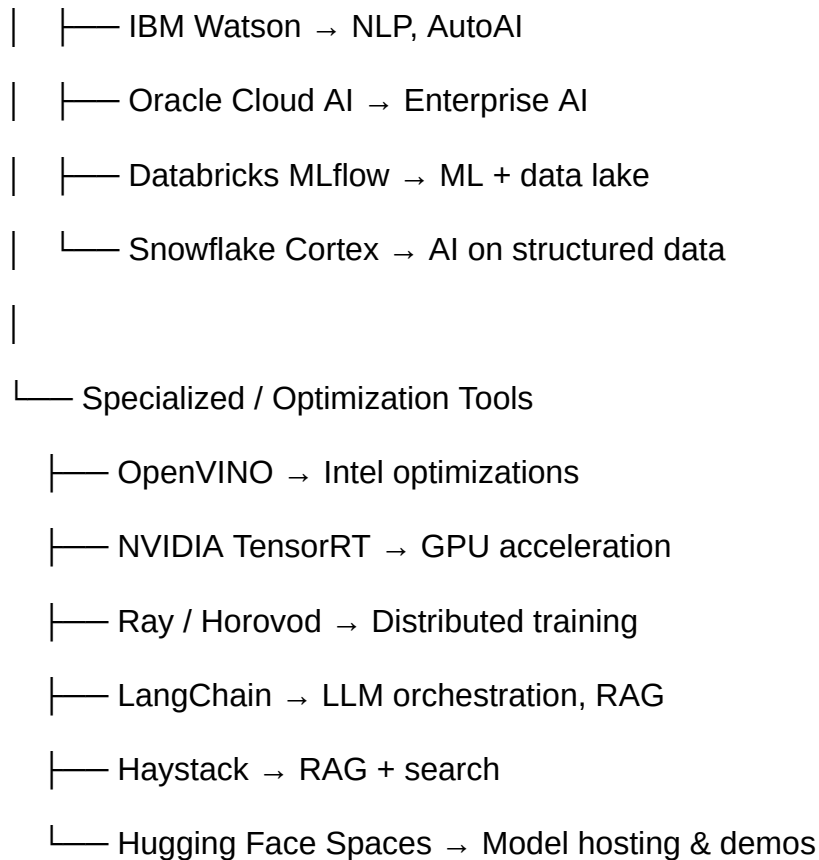
| | — Featuretools → Automated feature engineering

|

| — Visualization & Explainability

- | | — Matplotlib / Seaborn → Static plots
- | | — Plotly / Bokeh → Interactive dashboards
- | | — SHAP → Global & local explanations
- | | — LIME → Local interpretability
- | | — Yellowbrick → ML model visualization
- |
- |
- | — Experimentation & Tracking
- | | — MLflow → Tracking + model registry
- | | — Weights & Biases (W&B) → Live monitoring
- | | — Neptune.ai / Comet ML → Experiment tracking
- | | — ClearML → Orchestration + monitoring
- |
- | — Deployment & Serving
- | | — Model Serving
- | | | — TensorFlow Serving
- | | | — TorchServe
- | | | — ONNX Runtime
- | | | — BentoML
- | |
- | |
- | | — Web Frameworks (Python)
- | | | — Flask → Lightweight APIs for ML





## 2 AI/ML Tools Tree

This part is about the “**how to build**” side:

- **Frameworks** → TensorFlow, PyTorch, Scikit-learn, Hugging Face, etc.
- **Data Handling** → Pandas, Dask, PySpark, Featuretools.
- **Visualization & Explainability** → Matplotlib, SHAP, LIME.
- **Experiment Tracking** → MLflow, W&B, ClearML.
- **Deployment & Serving** → Flask, FastAPI, Django, Streamlit, Gradio, Docker, Kubernetes.
- **MLOps & Pipelines** → Kubeflow, Airflow, DVC, Feast.

- **Cloud Platforms** → AWS SageMaker, GCP Vertex AI, Azure ML, IBM Watson, Databricks, Snowflake.
- **Specialized Tools** → OpenVINO, TensorRT, LangChain, Haystack.

### **Steps to cover all topic**

#### **Step 1 – Foundations**

- Python, NumPy, Pandas, Matplotlib/Seaborn.
- Statistics, probability, linear algebra.

#### **Step 2 – ML Basics**

- Scikit-learn (regression, classification, clustering).
- XGBoost, LightGBM.

#### **Step 3 – Deep Learning**

- PyTorch or TensorFlow.
- CNNs (CV), RNN/LSTM (time-series), Transformers (NLP).

#### **Step 4 – Advanced AI**

- Generative AI (GANs, VAEs, Diffusion).
- LLMs + Hugging Face + LangChain.
- RAG + vector databases.

#### **Step 5 – Deployment & MLOps**

- Flask, FastAPI, Docker, Kubernetes.



- MLflow, W&B for tracking.
- Cloud platforms (AWS/GCP/Azure).

### **Step 6 – Specialization**

- Pick a domain: NLP, CV, speech, robotics, healthcare, finance, recommender systems.
- Explore trending: GNNs, federated learning, quantum ML, edge AI.