■ Deep Learning Dictionary: Beginner to Advanced Edition

Comprehensive concept explanations in simple, relatable language — perfect for new learners.

■ CORE CONCEPTS (Fundamentals)

Neural Network

A system of layers that learn from data. Like a simplified version of the human brain made up of 'neurons' (nodes) that pass information forward.

Neuron

A small unit that receives input, performs a simple calculation, and passes the result forward — like a student solving one part of a group project.

Layer

A group of neurons working together. Layers learn different levels of information — early ones see edges, deeper ones see shapes or faces.

Weights

Numbers that determine how important each input is — like tuning a radio to the right frequency.

Bias

A value added to make learning more flexible — like giving a small push in the right direction.

Activation Function

Adds creativity — helps the model capture complex relationships rather than just straight lines.

Loss Function

A score showing how wrong the model's predictions are. The smaller the loss, the smarter the model becomes.

Optimizer

The algorithm that adjusts weights to reduce the loss — like a coach correcting your mistakes each round.

Epoch

One full pass through all training data — like rereading your notes once.

Batch

A small set of data processed together — like studying in groups instead of alone.

■■ MODEL & ARCHITECTURE CONCEPTS

Feedforward Network

A simple neural network where data moves straight from input to output — no loops or memory.

Autoencoder

Learns to compress and then rebuild data — like summarizing and then rewriting a story.

Convolutional Neural Network (CNN)

Specialized for image data. Learns edges, colors, and textures — like your brain recognizing patterns.

Recurrent Neural Network (RNN)

Good for sequential data like text or time series — it remembers previous information.

Transformer
Processes data in parallel and focuses attention on important parts — powering models like ChatGPT and BERT.

Generative Adversarial Network (GAN)
Two models in competition: one creates (artist), one judges (critic). They improve each other.

Transfer Learning
Reusing a pre-trained model for a new task — like using your math skills to learn physics faster.

Fine-tuning
Making small adjustments to a pre-trained model for a specific goal — like editing an existing essay.

Embedding
Turning words or data into number vectors that capture meaning — like mapping locations on a coordinate grid.

Attention Mechanism
Lets models focus on important inputs — like paying attention to key words in a question.

■■ TRAINING & OPTIMIZATION CONCEPTS

Gradient Descent
Helps the model learn by taking steps downhill toward lower loss — like hiking down to the valley of best performance.

Backpropagation
Sends errors backward to adjust weights — like fixing your answers after checking your results.

Learning Rate
Controls how big each learning step is. Too big = overshoot; too small = slow learning.

Momentum
Uses past gradients to speed up learning — like pushing a swing with extra force.

Learning Rate Scheduler
Gradually changes learning speed — start fast, end smooth for fine-tuning.

Early Stopping
Stops training when the model stops improving — like pausing study when you've learned enough.

Gradient Vanishing/Exploding
When learning becomes unstable because numbers get too small or too large — like a mic feedback loop.

Batch Normalization
Keeps values balanced across layers for stable learning — like making sure all students start with equal prep.

Regularization
Prevents overfitting — helps models generalize by simplifying learning.

Dropout
Turns off random neurons during training — like rotating team members so everyone learns.

■ EVALUATION & PERFORMANCE CONCEPTS

Accuracy
Percentage of correct predictions — like your score in a test.

Precision
How many of the items predicted as positive were actually correct — like correctly marking only true answers.

Recall
How many of the actual positives were found — like remembering all important details from a lesson.

F1-Score
Balances precision and recall — like combining speed and accuracy.

Confusion Matrix
A table showing what the model got right or wrong — like your test results per topic.

ROC Curve / AUC
Measures how well the model separates classes — higher AUC = better distinction.

Validation Set
Used to tune model settings during training — checks progress without using the test data.

Training vs Testing
Training teaches the model; testing checks how well it performs on unseen data.

Loss Curve
A graph showing improvement over time — like your grades improving with practice.

Epoch Accuracy
How accurate the model was after one complete pass through the data.

■ ADVANCED & MODERN CONCEPTS

Reinforcement Learning
The model learns by trial and error using rewards — like training a dog with treats.

Policy
The model's rulebook for choosing actions — like a playbook in football.

Reward
Feedback given after an action — positive or negative depending on outcome.

Self-Supervised Learning
Learning from unlabeled data by predicting part of the input — like solving puzzles without hints.

Zero-Shot Learning
Handling new tasks without seeing examples before — like understanding a new dialect by context.

Prompt Tuning
Teaching large models to follow specific instructions — used in ChatGPT-like systems.

Parameter
A variable the model learns — like weights and biases.

Hyperparameter
A setting we choose manually — like the learning rate or number of layers.

Explainable AI (XAI)
Helps us understand why models make certain predictions — like asking a student to show their work.

Bias in AI
When the model reflects unfair patterns from data — like learning only from one group’s perspective.