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Deep Learning - intro

Terms

- *Neural Network*
  A computational model inspired by the human brain consists of interconnected nodes, known as neurons
- *Layer*
  - *Input → receives initial data*
  - *Hidden → process the input and give it to the output*
  - *Output → final layer that produces the output*
- *Neuron*
  Basic units for neural networks that process the input and produce an output
- *Weights*
  Parameters in neural networks that adjust during the training.
- *Activation Functions*
  Introducing the non-linearity into the network enables us to learn the complex patterns.
- *Loss function*
  Measures the difference between the predicted value of a model and the actual value.
- *Backpropagation*
  The network learns from its mistakes by adjusting the weights of connections based on the difference between its predicted output and the actual output.
- *Batch size*
  Instead of showing the entire dataset to the model at once, we break it into smaller groups (batches).
- *Epoch*
  It's like going through the entire set of examples once
- *Overfitting*
  Overfitting happens when a machine learning model learns the training data too well, including its noise and outliers
- *Underfitting*
  It's like trying to fit a straight line into a very complex curve.
- *Optimization*
  Optimization in machine learning involves finding the best set of parameters for a model that minimizes or maximizes a certain metric (like minimizing error)

Process

- ➢ *Setup layers and neurons*
- ➢ *Randomly activate weights*
- ➢ *Set a loss function and optimization algorithm*
- ➢ *Get data and split*
- ➢ *Start training*
- ➢ *Loss calculation*
- ➢ *Backpropagation*
- ➢ *Predicting*

Types

- ➢ *Feedforward Neural Network (FNN)*
- ➢ *Multi-Layer Perceptron (MLP)*
- ➢ *Convolutional Neural Network (CNN)*
- ➢ *Recurrent Neural Network (RNN)*
- ➢ *Long Short Term Memory (LSTM)*
- ➢ *Gradient Recurrent Unit (GRU)*
- ➢ *Auto Encoders*
- ➢ *Self-organizing map (SOM)*
- ➢ *Generative Adversarial Network (GAN)*
- ➢ *Transformer Based Networks*

Types of propagation

- ➢ *Forward*
- ➢ *Backward*

Application of Deep Learning

- ➢ *Image and speech recognition*
- ➢ *Self-driving cars*
- ➢ *NLP tasks*
- ➢ *Game playing*

Advantages of Deep Learning

- ➢ *Effective future learning*
- ➢ *Excellent performance in future learning*
- ➢ *Adaptability*
- ➢ *Performance in complex data*

Limitations of Deep Learning

- ➢ *Black box nature →can't interpret*
- ➢ *Data-intensive → needs a lot of data*
- ➢ *Computational intensive*

Loss Functions

- *MSE → for regression*
- *Binary cross-entropy → for binary classify*
- *Categorical cross-entropy → for multiclass classify*

Optimizations

- *Batch gradient descent*
- *SGD*
- *Momentum*
- *RMSProp*
- *Adam*

Activation functions

- *Linear*
- *step*
- *Sigmoid*
- *Tanh*
- *Relu*
- *LeakyRelu*
- *PRelu*
- *Elu*

Regularization

- *Dropout*
- *Early stopping*
- *Batch normalization*
- *Data Augmentation*