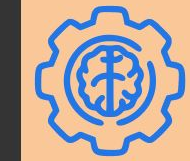
welcome to
ML Study Jam
session #3

Google Developer Student Clubs
Simon Fraser University



Timeline

20 June	27 June	4 July	11 July
Session 1	**Session 2**	**Session 3**	**Session 4**
Intro to Machine Learning	Feature Engineering	ML Application	Practice Project
Data Processing	Intro To Deep Learning	Computer Vision	

Deep Learning Recap

Computer Vision

Natural Language Processing

Deep Learning Recap

Computer Vision

Natural Language Processing

Quick Recap 1

Deep Learning: training neural networks with multiple layers to learn and extract intricate patterns from data.

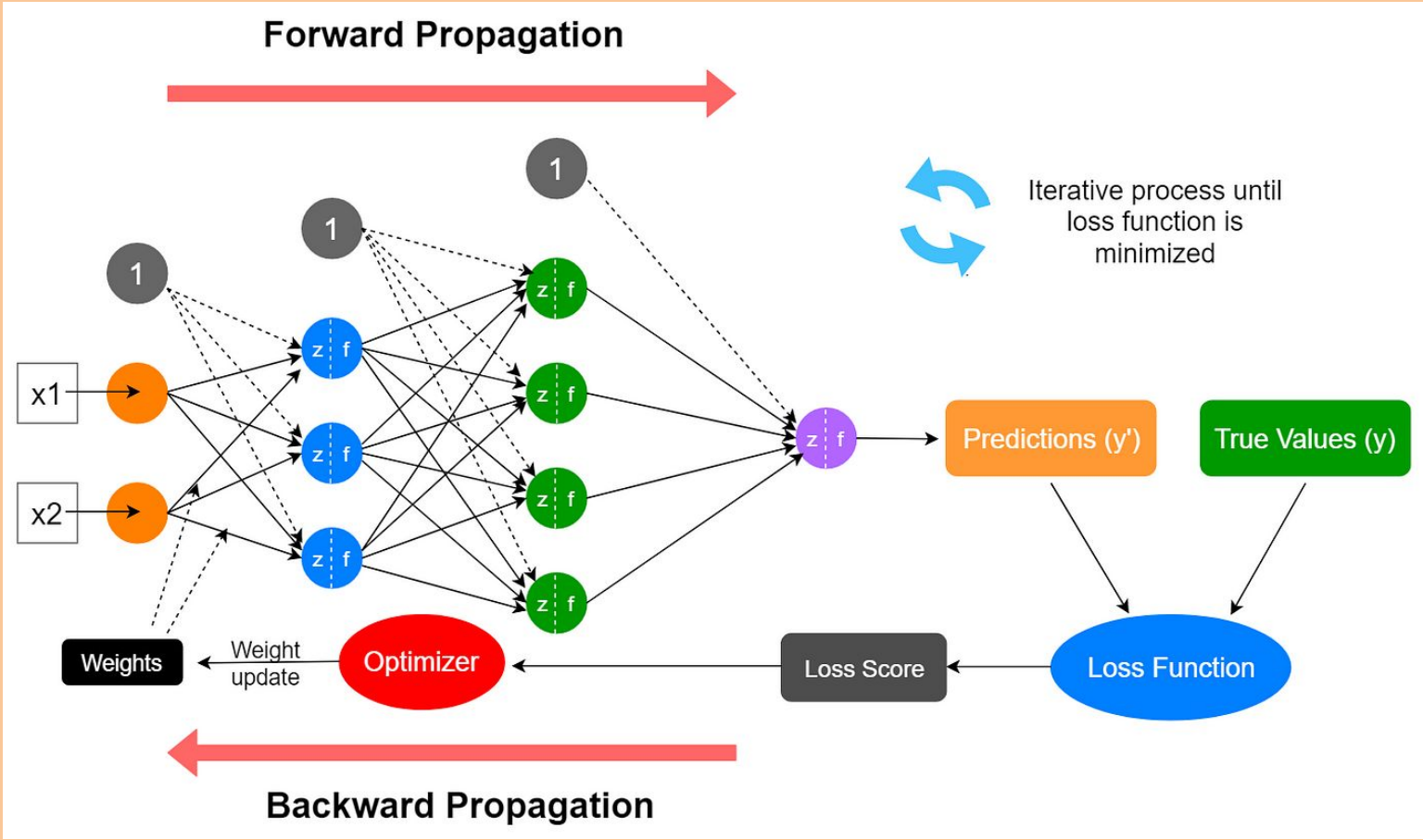
Key Concepts:

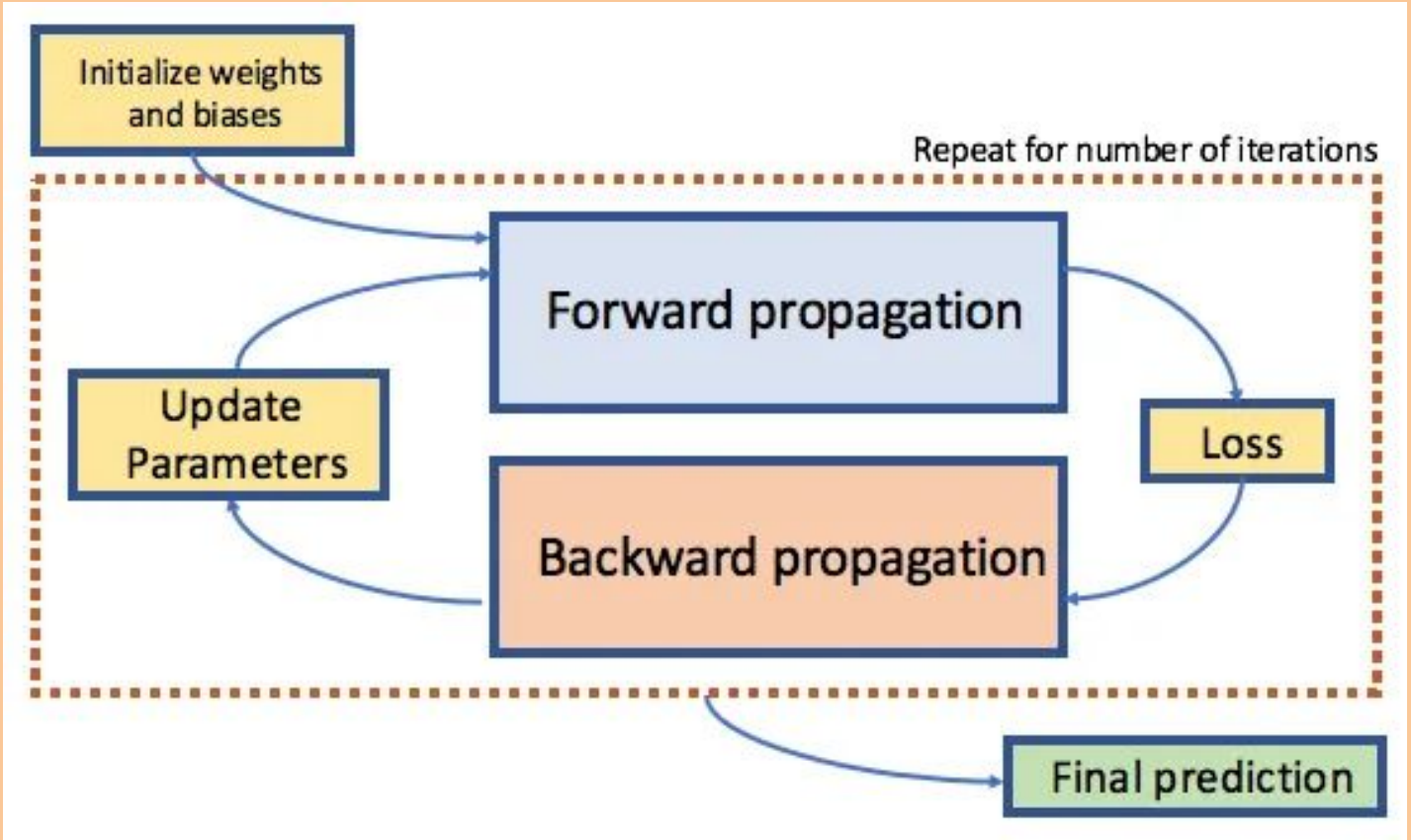
- Neuron: A basic unit in a neural network that processes inputs, applies a mathematical operation, and produces an output using an activation function.
- Neural Network: A computational model composed of interconnected layers of artificial neurons.
- Weights: Numeric parameters that determine the strength of connections between neurons in a neural network.
- Bias: An additional input that allows it to shift the activation function's output, providing flexibility in fitting the data.

Quick Recap 2

More Key Concepts:

- Feedforward Neural Networks: Information flows in one direction, from input to output, without loops or feedback.
- Backpropagation: Training algorithm that adjusts network weights based on the prediction error to minimize the loss function.
- Activation Functions: Functions applied to the output of neurons to introduce non-linearity and capture complex relationships.
- Loss Function: A measure of how well a model's predictions align with the actual values, used to guide the learning process.
- Optimization Function: Algorithm used to adjust the model's parameters to minimize the loss function and improve performance.


Forward Propagation
1
1
1
x1
x2
z f
z f
z f
z f
z f
z f
z f
Iterative process until loss function is minimized
Predictions (y')
True Values (y)
Loss Function
Loss Score
Optimizer
Weight update
Weights
Backward Propagation


Initialize weights and biases
Repeat for number of iterations
Forward propagation
Update Parameters
Loss
Backward propagation
Final prediction

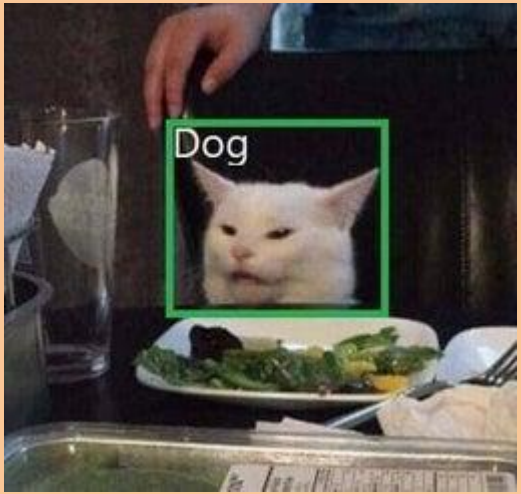
Deep Learning Recap

Computer Vision

Natural Language Processing

Introduction to Computer Vision

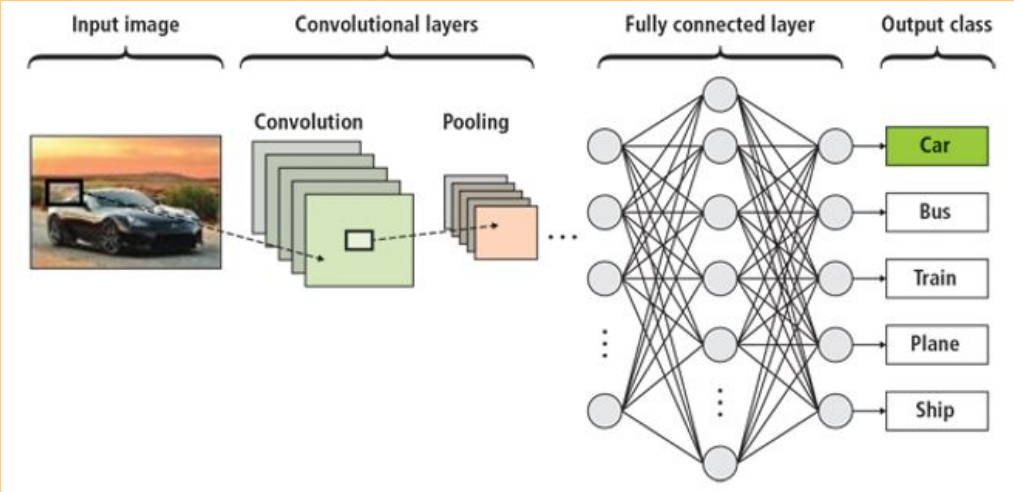
Teaching machines to "see" and understand visual data such as images and videos

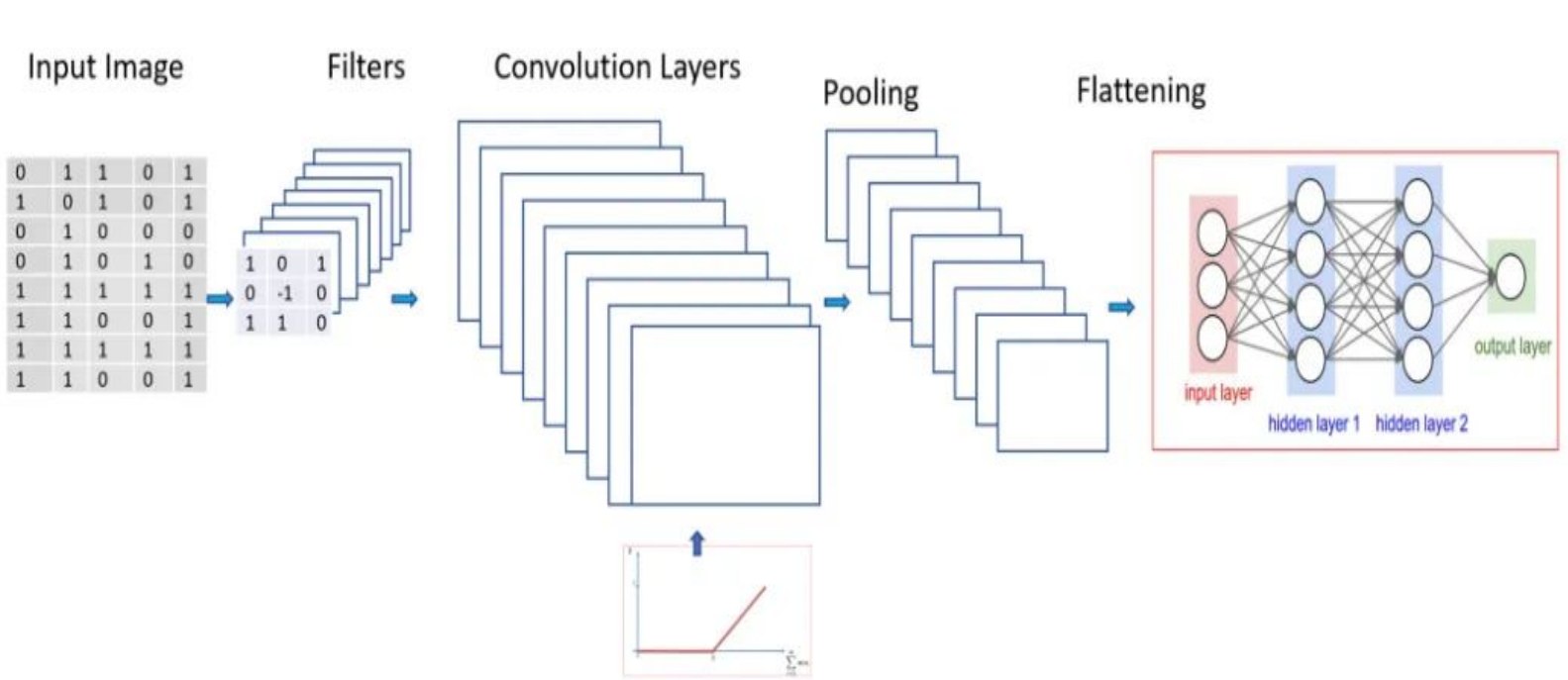


CV Key Concepts

Convolutional Neural Networks (CNNs)

- Convolutional Layers
- Pooling Layers
- Fully Connected Layers
- ReLU




Input Image
Filters
Convolution Layers
Pooling
Flattening
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1 0 1 0 1
0 1 0 0 0
0 1 0 1 0
1 1 1 1 1
1 1 0 0 1
1 1 1 1 1
1 1 0 0 1
1 0 1
0 -1 0
1 1 0
input layer
hidden layer 1
hidden layer 2
output layer

Common CV architectures

1. Image Classification:
    - ResNet: Known for introducing residual connections to tackle the vanishing gradient problem, enabling training of even deeper networks.
2. Object Detection:
    - R-CNN: Combines region proposal techniques with CNNs to detect objects within region proposals, pioneering the field of object detection.
3. Image Segmentation:
    - U-Net: Designed for biomedical image segmentation, utilizes a U-shaped architecture with skip connections for accurate and precise segmentations.

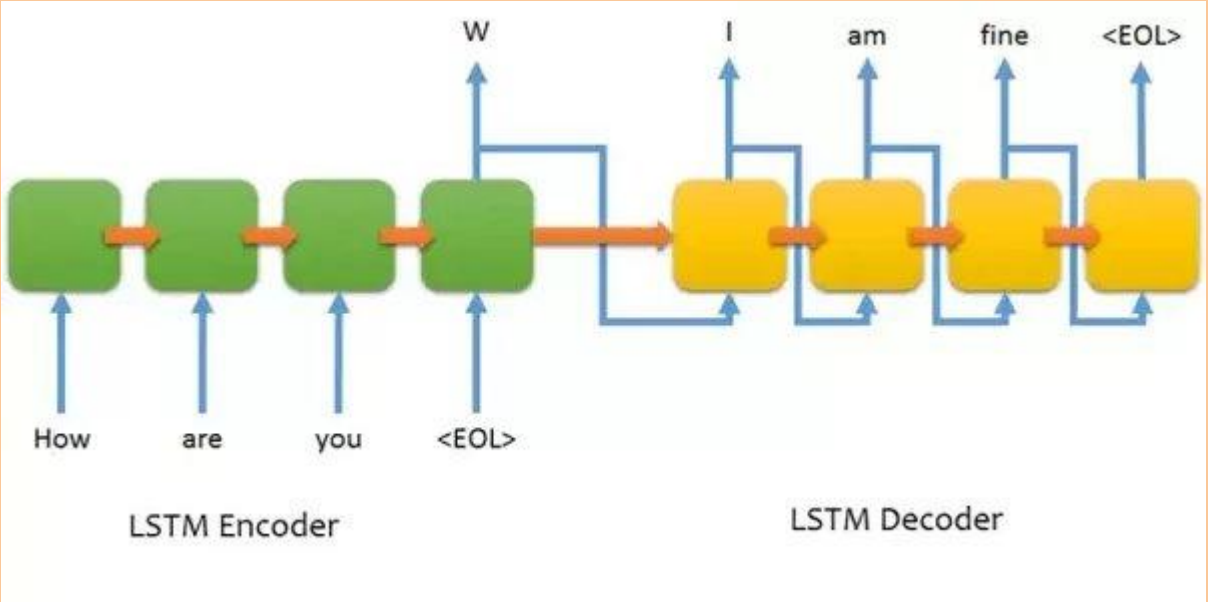
Deep Learning Recap

Computer Vision

Natural Language Processing

Intro to Natural Language Processing

Enabling machines to understand, interpret, and generate human language.

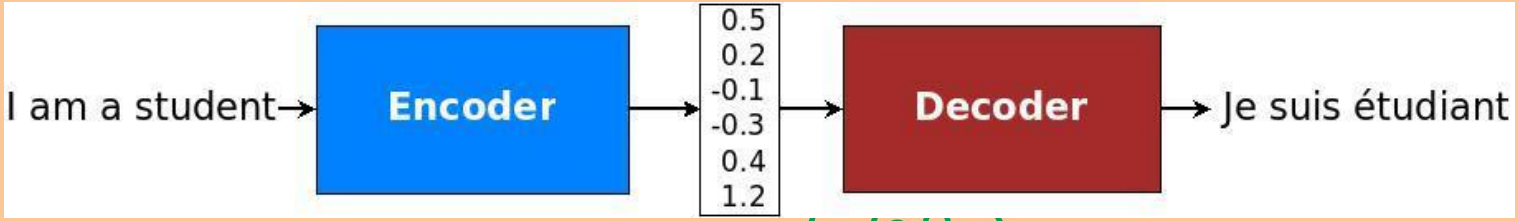


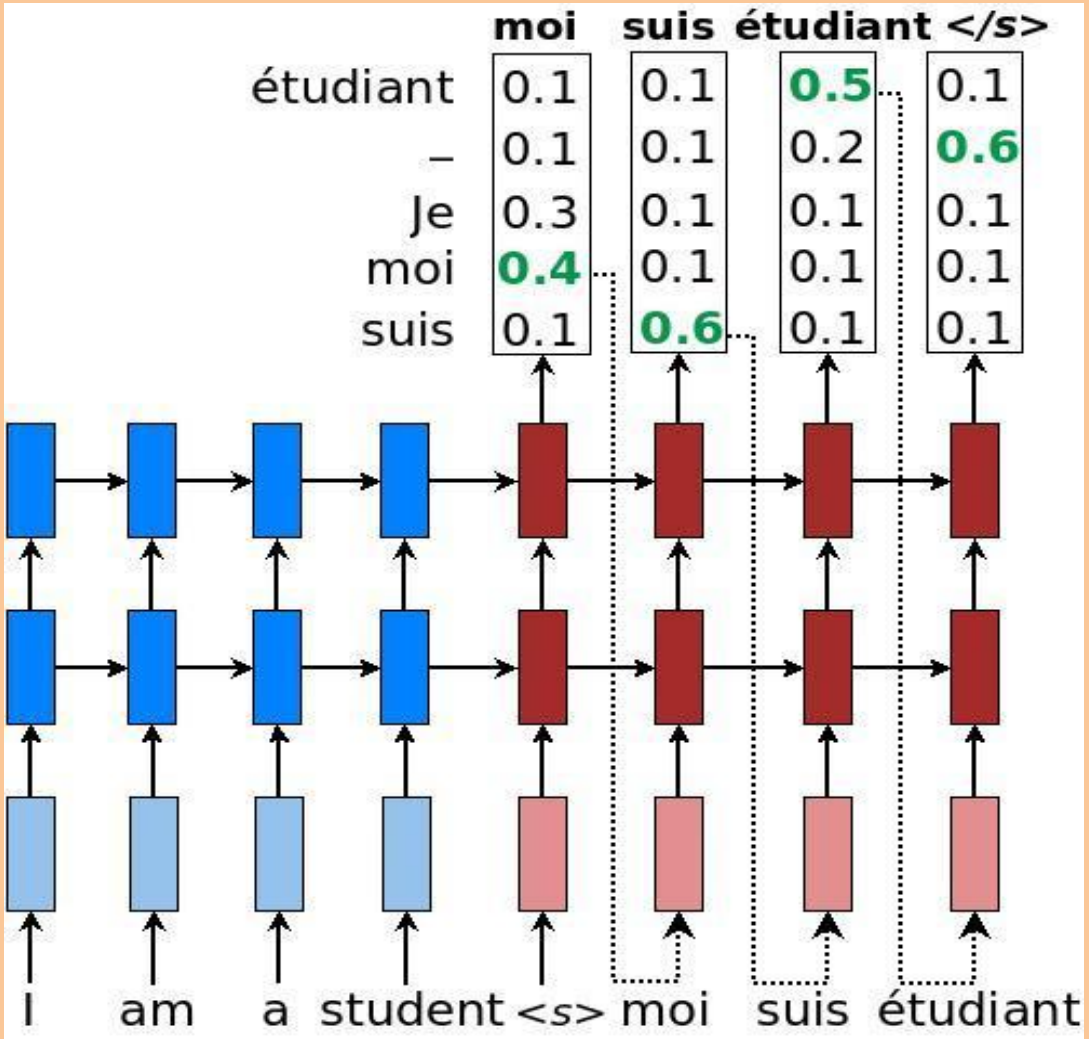
Key Concepts

- Tokenization: Breaking text into smaller units, such as words or subwords.
- Word Embeddings: Vector representations of words that capture semantic relationships.
- Context Information: surrounding a word or phrase that influences its meaning.
- Encoder: Converts input text into fixed-dimensional representation
- Decoder: Converts encoded representation to an output sequence

NLP Architectures

- Recurrent Neural Networks (RNNs): Effective for sequential and contextual tasks.
- Long Short-Term Memory (LSTM): A type of RNN that can handle long-term dependencies.
- Gated Recurrent Units (GRUs): Another type of RNN that simplifies the architecture.

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Exercise Time

https://colab.research.google.com/drive/1VgMM_U3ks7aZbF1Bx0XI8P5udT1kO77k?usp=sharing

Kaggle Resources

- https://www.kaggle.com/learn/intro-to-deep-learning
- https://www.kaggle.com/learn/computer-vision
- https://www.kaggle.com/learn/intro-to-game-ai-and-reinforcement-learning

Thank you!

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