



AI-Driven Price Forecasting for Crude Oil

Predict future crude oil prices using historical data, enabling better demand planning and petroleum market analysis.

Presented By
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Just A little Question....

You are interested in trading petroleum (crude oil) stocks with the goal of maximizing your profit by buying low and selling high. Given the volatile nature of crude oil prices influenced by geopolitical events, supply-demand changes, and seasonal factors, how can you use time series forecasting and machine learning models to determine the optimal times to buy and sell crude oil stocks?

Learning Curve

- What are Time Series
- Dataset Preprocessing Software Demo
- What are ANNs
- CNNs in the context of Sequential Data
- CNNs vs RNNs in Time Series Forecasting
- How to train a model on a sequence of data
- How to use Keras to build a model, train it and make predictions
- How to plot the results using matplotlib, pandas....
- Predict the petroleum market in the 5 upcoming years

The background features a dark, stylized illustration of an oil field with several pumpjacks. Overlaid on this is a line chart with 15 data points connected by a dark line, showing a general downward trend. Below the line chart is a bar chart with 15 vertical bars of varying heights, also showing a general downward trend. The text "Understanding Time Series and Our Challenge" is centered in a large, white, sans-serif font.

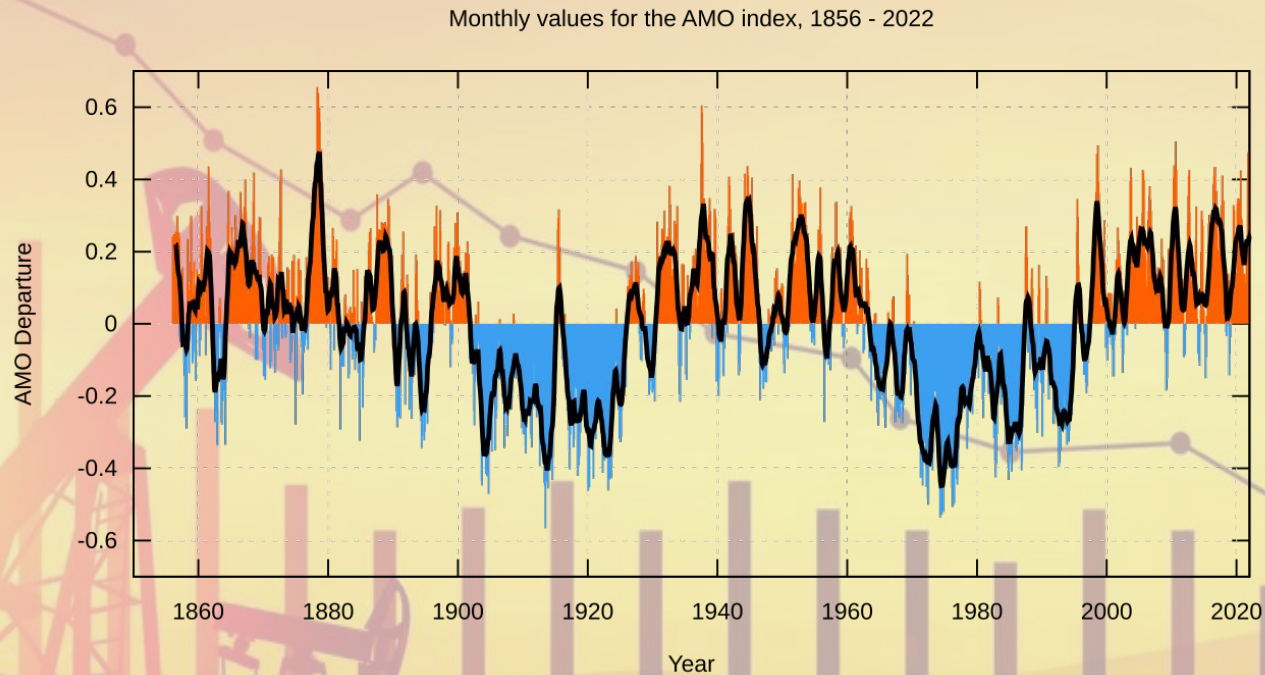
Understanding Time Series and Our Challenge

What Are Time Series?

Time series are sequences of data points collected or recorded at successive points in time, often at uniform intervals.

This type of data is inherently sequential, meaning each value depends on previous ones.





Time Series Example

Examples of Time Series Data

- Stock and commodity prices
- Weather measurements (temperature, rainfall, etc.)
- Website traffic
- Energy consumption
- And Any Sequential Data



Our Focus

In this workshop, we'll use machine learning to forecast future values in a time series. Specifically, we'll predict crude oil prices using historical data, but the same techniques can be applied to many other domains, such as temperature prediction, sales forecasting, or even social media trends.

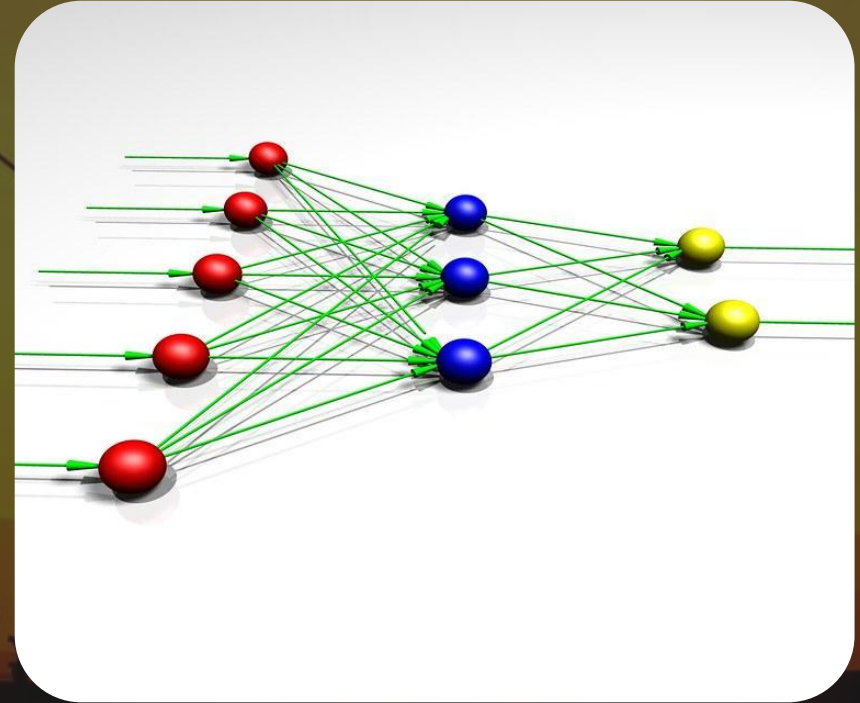


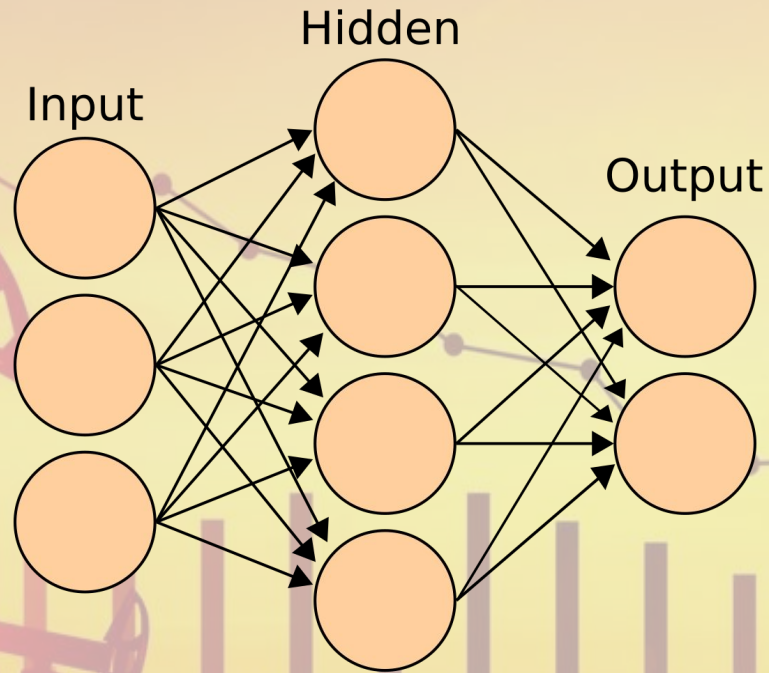
The background features a dark, monochromatic illustration. On the left, several oil pumpjacks are silhouetted against a lighter background. Overlaid on this is a line graph with a series of data points connected by a line, showing a general downward trend. Below the line graph is a bar chart with numerous vertical bars of varying heights. The entire scene is set against a gradient background that transitions from a dark brown at the bottom to a lighter, olive-greenish-brown at the top.

What Are Artificial Neural Networks (ANNs)

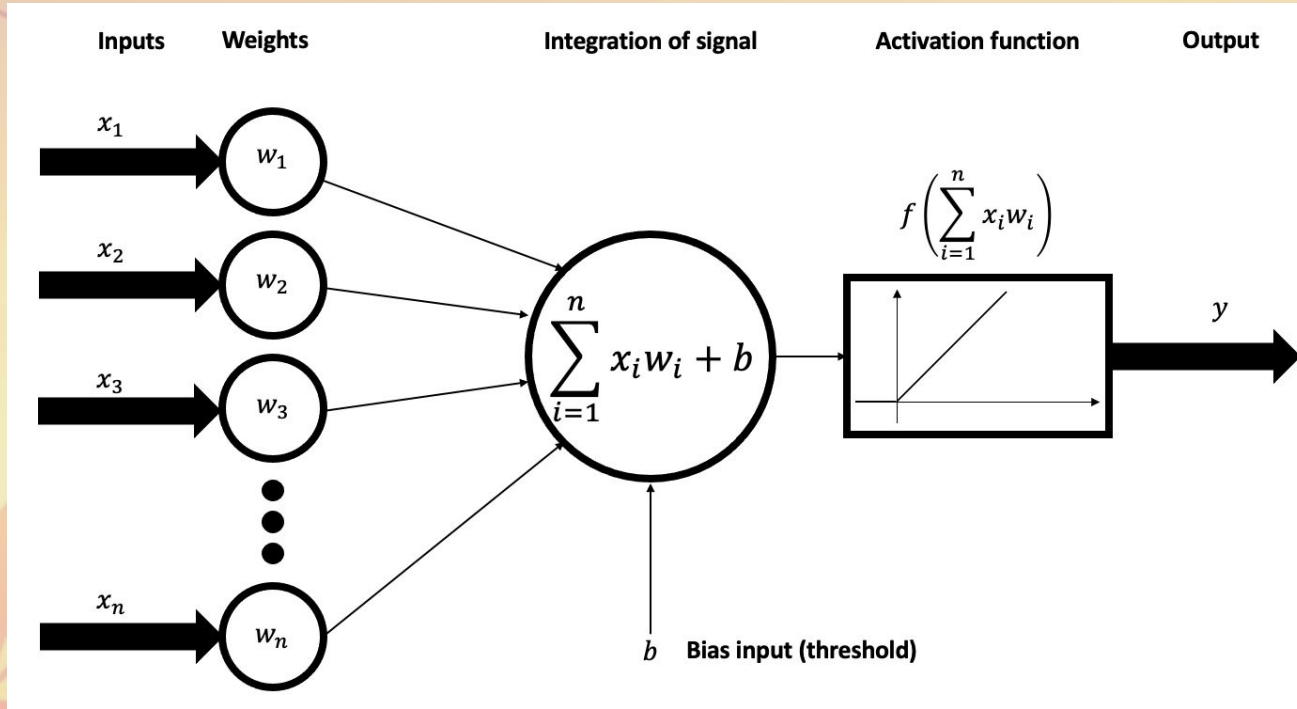
Definition

Artificial Neural Networks are computational models inspired by the human brain, consisting of interconnected nodes ("neurons") organized in layers.





Basic ANN Architecture (FFNN)



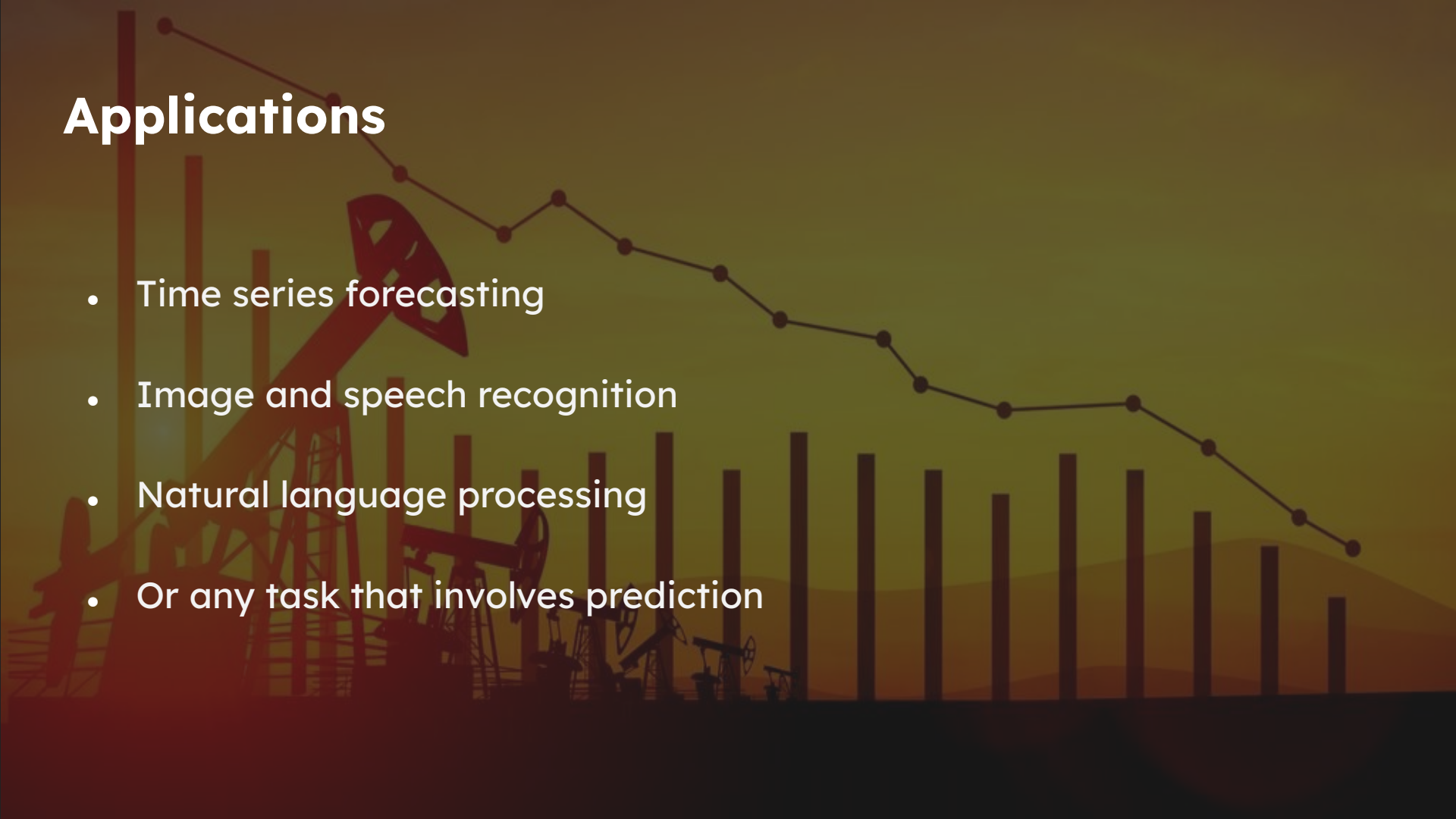
How does a neuron work?

Key Features

- Learn complex patterns from data
- Composed of input, hidden, and output layers
- Each connection has a weight, adjusted during training

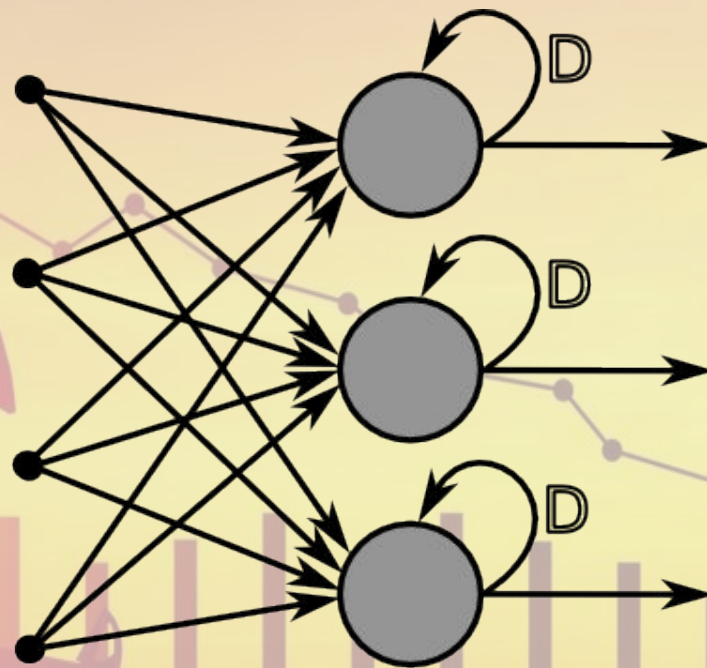
Applications

- Time series forecasting
- Image and speech recognition
- Natural language processing
- Or any task that involves prediction



What are the type of ANNs?

- CNNs
- RNNs (Recurrent Neural Networks)
- GANs (Generative Adversarial Networks)



output layer

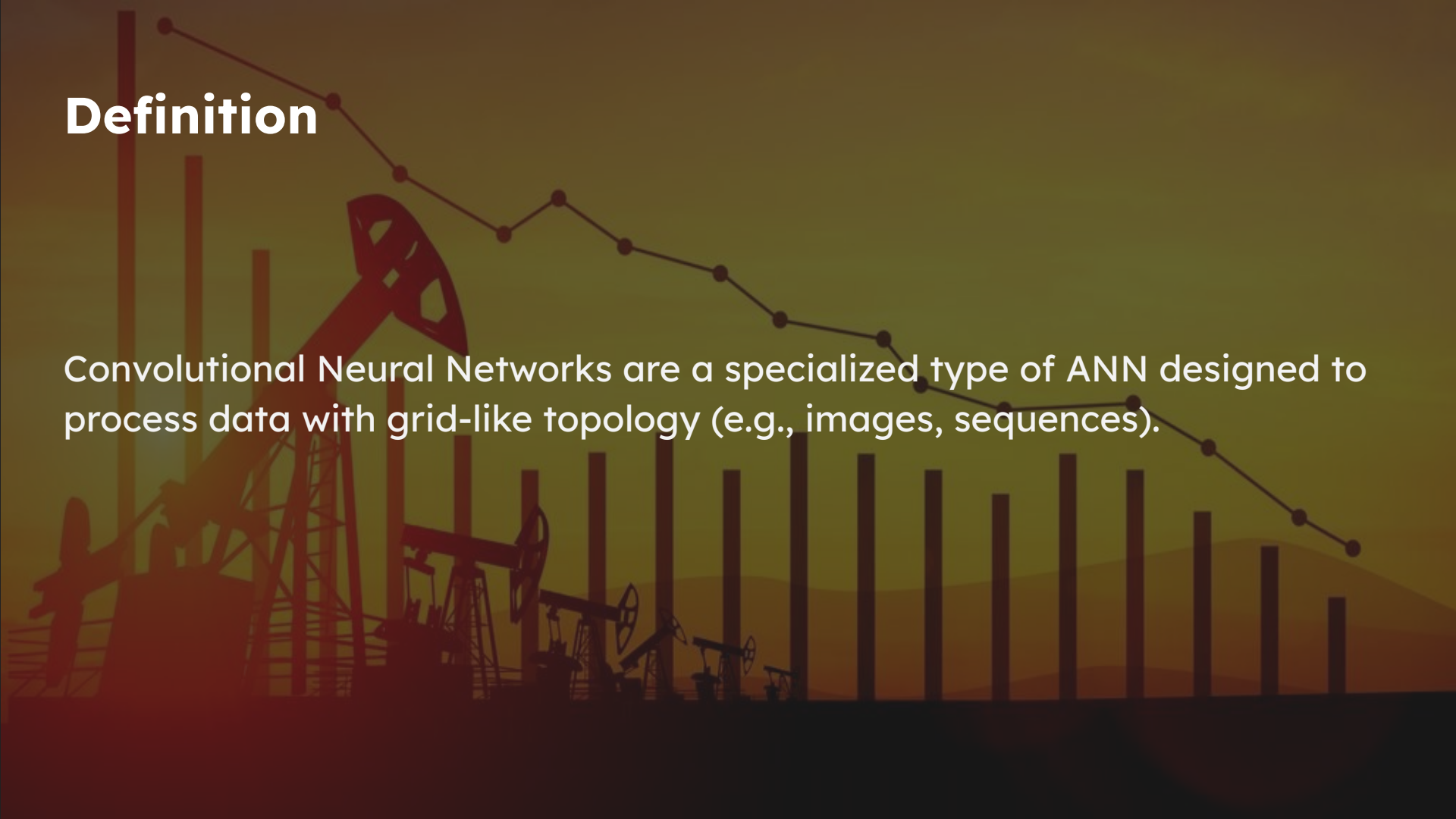
RNN Architecture

The background of the slide features a dark, monochromatic illustration. On the left, several oil pumpjacks are visible, their mechanical forms silhouetted against a dark sky. Overlaid on this scene are two data visualizations. A line graph with circular markers starts at the top left and trends downwards towards the right. Below the line graph, a bar chart with numerous vertical bars of varying heights is displayed. The entire composition is set against a dark, textured background.

What Are Convolutional Neural Networks (CNNs)?

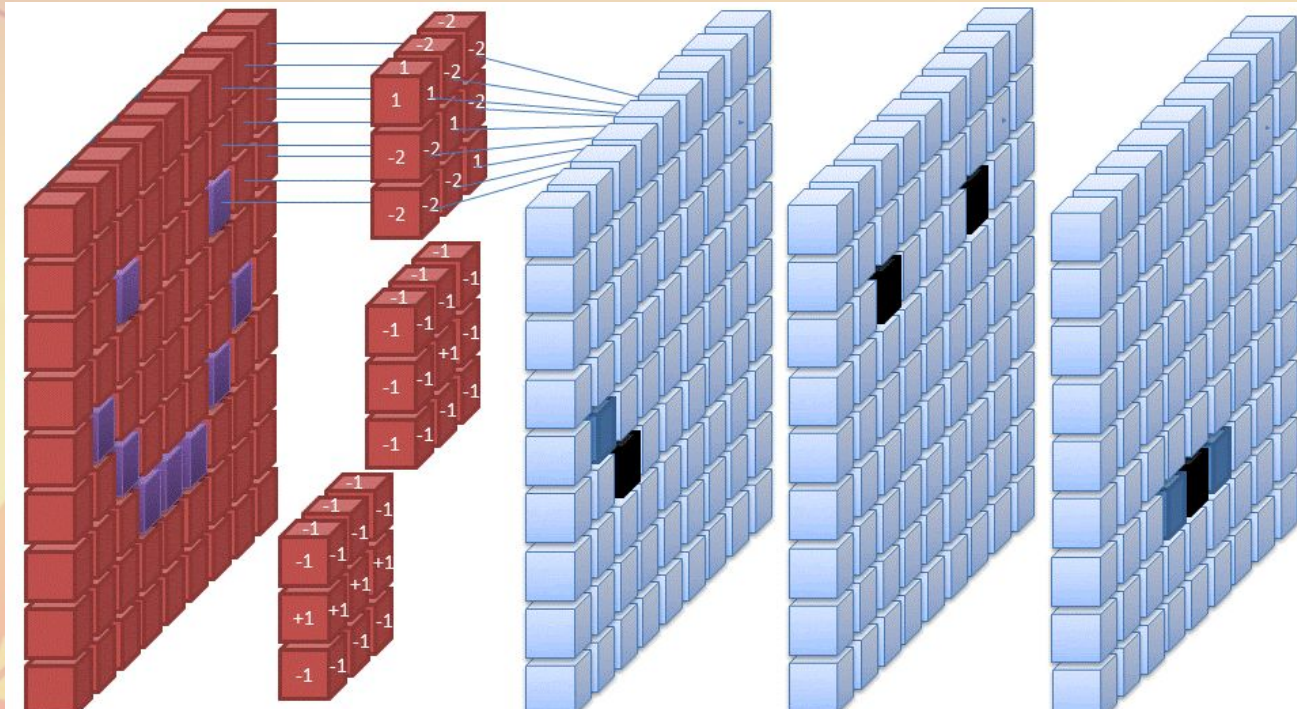
Definition

Convolutional Neural Networks are a specialized type of ANN designed to process data with grid-like topology (e.g., images, sequences).



Key Components

- Convolutional layers: Extract local patterns using filters
- Pooling layers: Downsample feature maps
- Flatten and Dense layers: Combine extracted features for prediction



CNN Architecture

Why CNNs for Time Series and Not RNNs?

- Capture temporal patterns and local dependencies in sequential data
- Efficient for small & large-scale, structured time series like oil prices
- Easier and faster to train than RNNs
- No Vanishing Or Exploding Gradient Problems (even though we have LSTMs)

The background is a stylized illustration of an oil field at sunset or sunrise. Several pumpjacks are visible in the foreground and middle ground, their silhouettes dark against the warm, orange-brown sky. In the background, there are rolling hills and a series of vertical bars of varying heights, resembling a bar chart. A line graph with circular markers is overlaid on the scene, starting high on the left and trending downwards towards the right, with some minor fluctuations. The overall color palette is dominated by warm tones of orange, yellow, and brown.


Let's Code



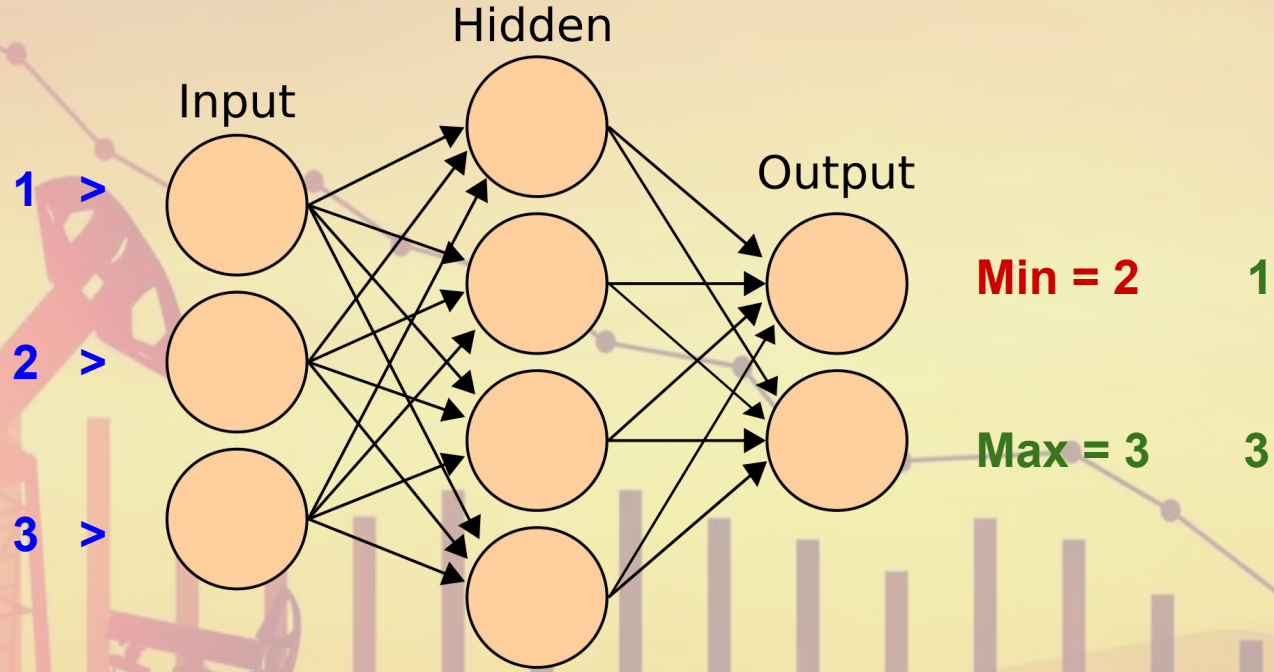
Github repo link



Google Colab Link

The background of the slide features a dark, monochromatic illustration. On the left, several oil pumpjacks are silhouetted against a gradient background. Overlaid on this are two data visualization elements: a line graph with circular markers at the top and a bar chart with vertical bars of varying heights on the right. The text is centered in a bold, white, sans-serif font.

How Neural Networks Are Trained on Sequential Data



Classical ANN Training

ANN Training on a sequence of data

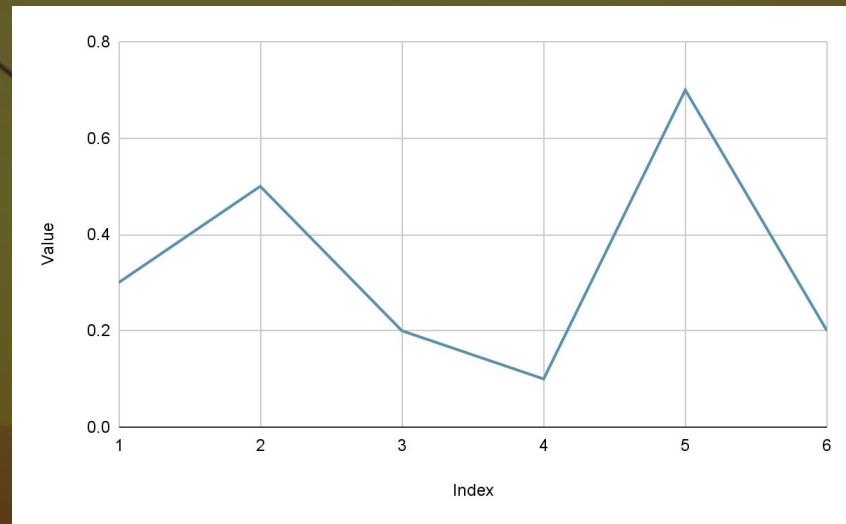
How does a sequence look like?

Index

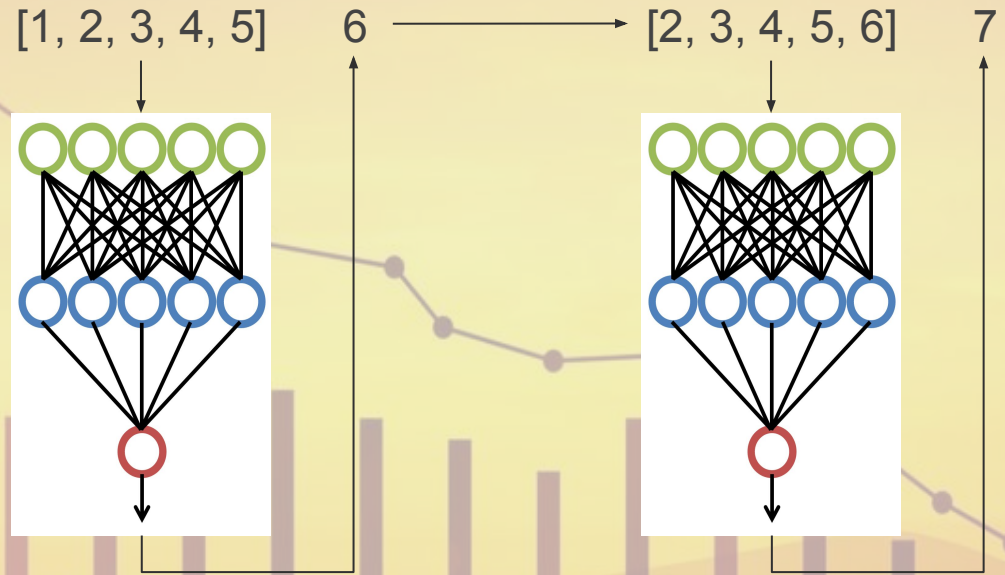
[1, 2, 3, 4, 5, 6]

Value

[0.3, 0.5, 0.2, 0.1, 0.7, 0.2]



Window Size = 5



ANN Training on a sequence of data



Candlestick Representation

The background of the slide features a stylized illustration of an oil field at sunset or sunrise. Several pumpjacks are visible in the foreground and middle ground, their forms silhouetted against a warm, orange-brown sky. In the background, a series of vertical bars of varying heights, resembling a bar chart, are superimposed over the landscape. A line graph with circular markers is also present, starting at a high point on the left and trending downwards towards the right, with some minor fluctuations. The overall color palette is dominated by warm, earthy tones.

Thanks !

The background of the slide features a dark, brownish-green color scheme. On the left side, there is a silhouette of an oil pumpjack. Overlaid on the right side is a bar chart with approximately 15 vertical bars of varying heights. A line graph with circular markers is also overlaid, starting at the top left and trending downwards towards the bottom right, passing over the bar chart.

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