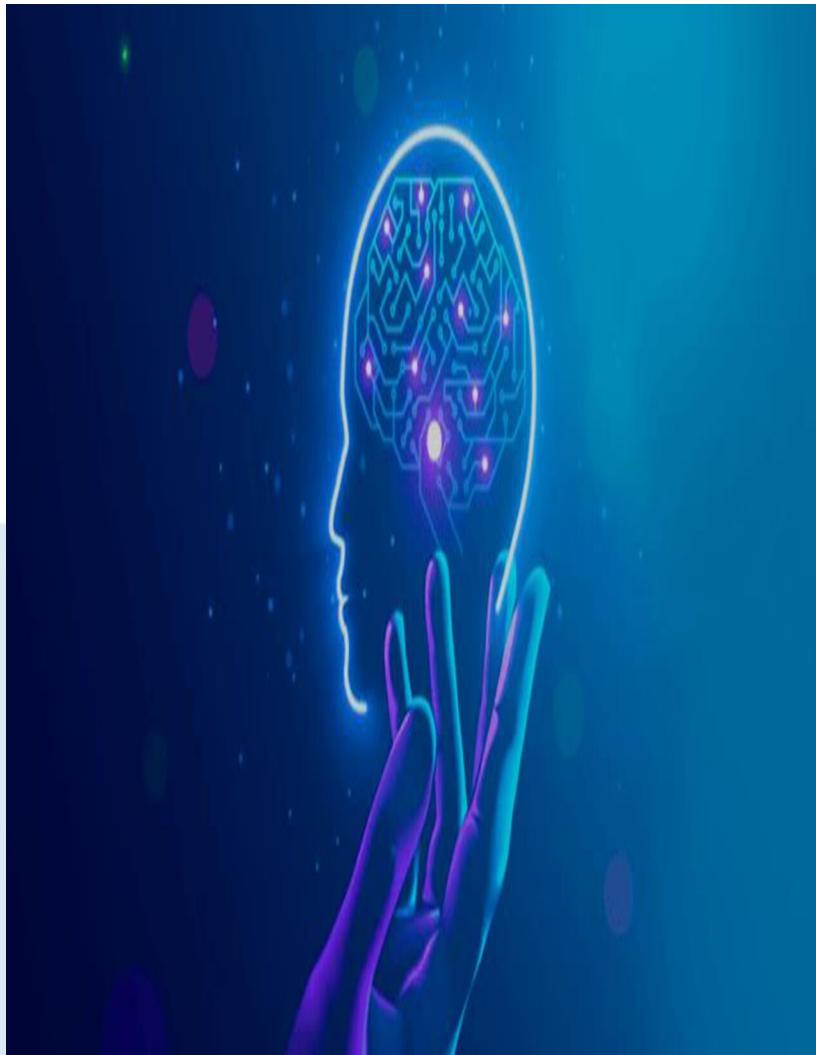
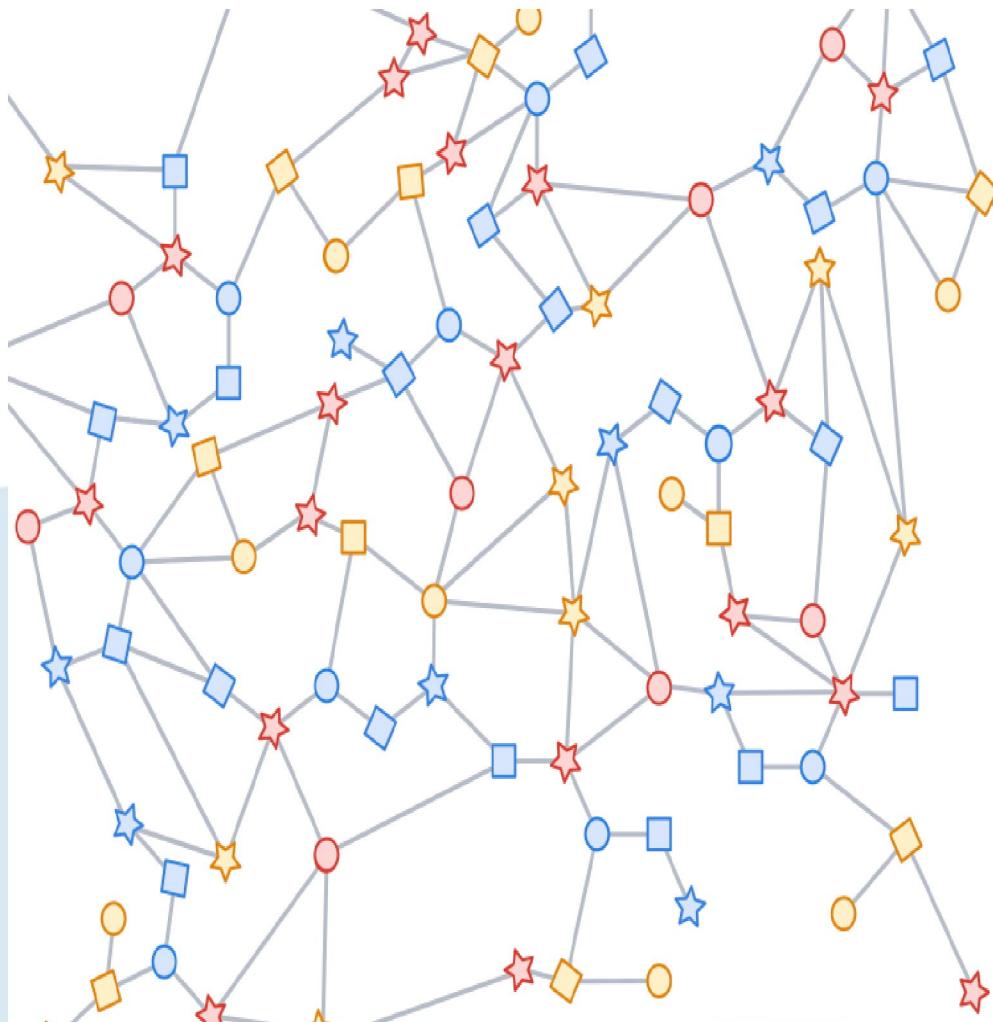


TensorFlow for Deep Learning



TensorFlow

TensorFlow for Deep Learning



TensorFlow

About the Author



- Created By: Mohammad Salman
- Experience: 19 Years +
- Designation: Corporate Trainer

Microsoft
CERTIFIED
Professional

Microsoft
Specialist

Microsoft
CERTIFIED
Solutions Developer



Icons Used



Questions



Tools



Hands-on Exercise



Coding Standards



Questions?



Reference



Try it Out



Informative
Slide



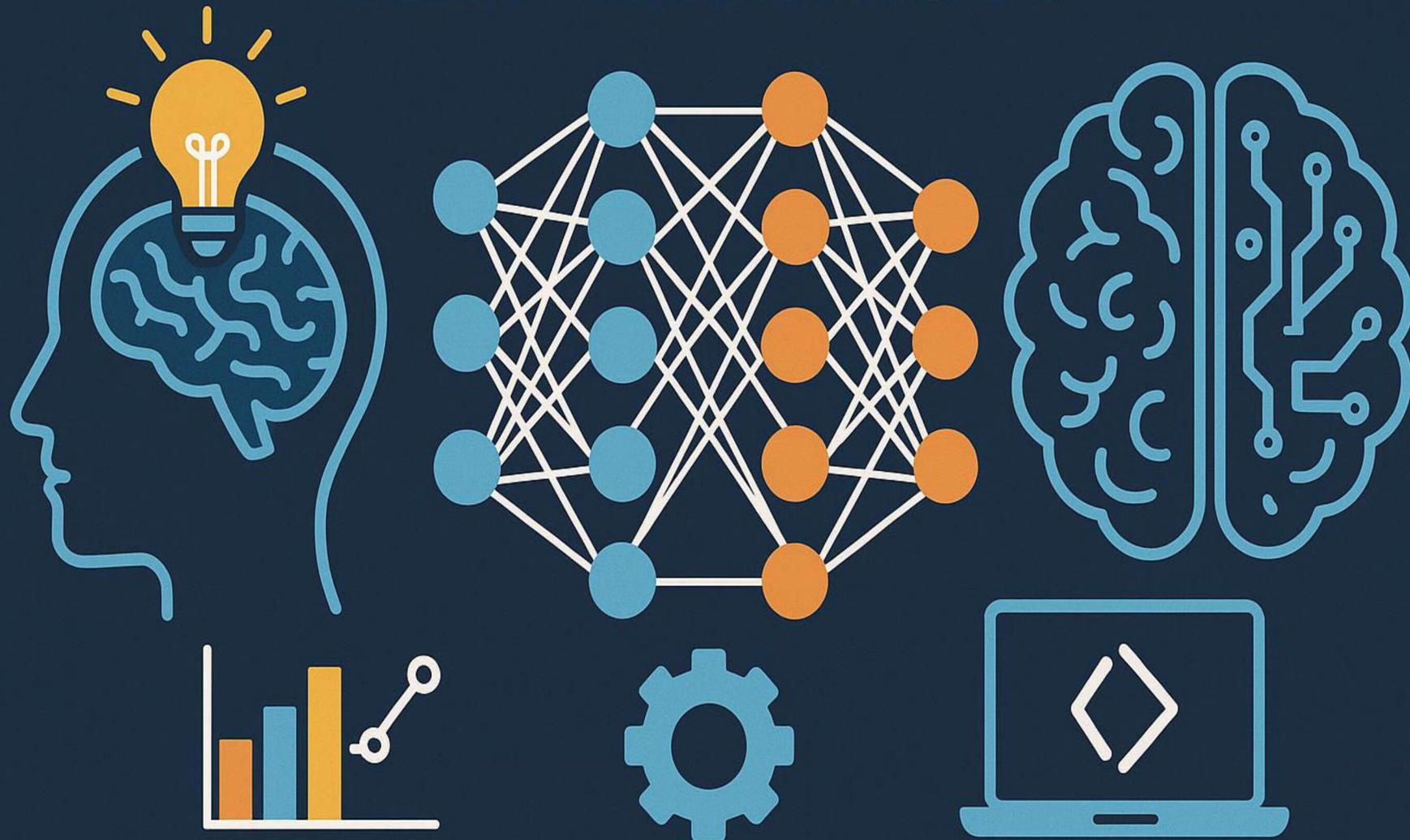
Mandatory
Slide



Welcome Break



DEEP LEARNING



Trainer: Mohd Salman – TensorFlow For Deep Learning

“WHAT IS DEEPMLEARNING?”

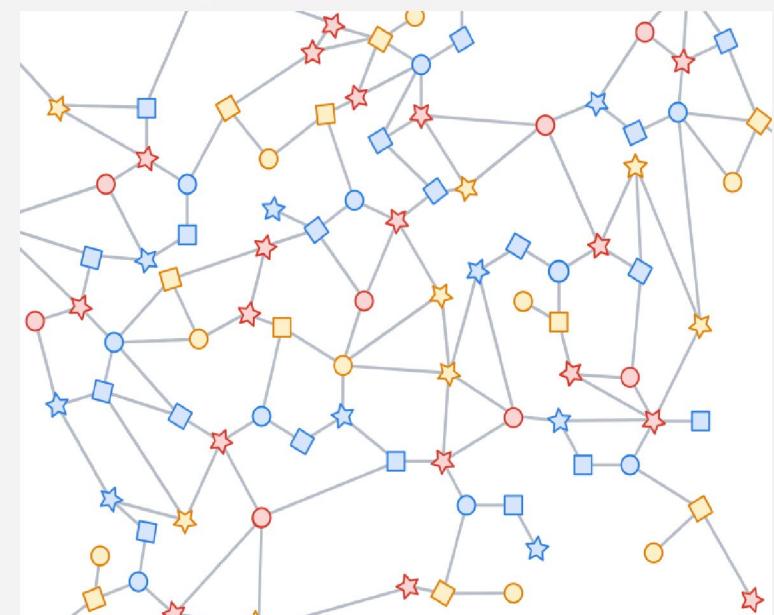


- ▶ Machine Learning (ML) is a subset of Artificial Intelligence that enables systems to learn from data and make predictions without explicit programming.
- ▶ Flow diagram → Data → Model → Prediction → Feedback
Key Point:
- ▶ ML = Learning patterns from data.

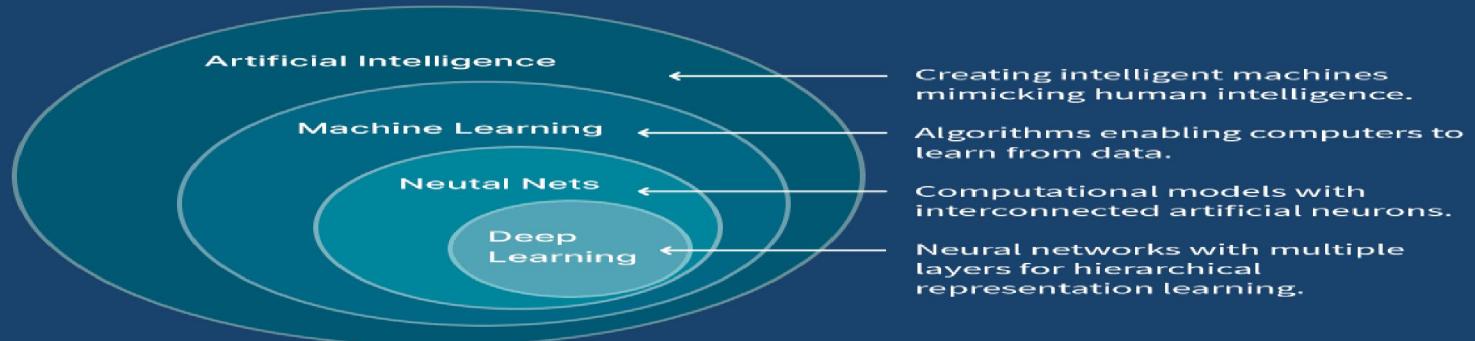
WHAT IS MACHINE LEARNING



1. Deep learning uses multi-layered neural networks.
2. Learns from large datasets to make predictions automatically.



WHAT IS DEEP LEARNING



➤ **DEEP LEARNING (DL)** IS A SUBFIELD OF **MACHINE LEARNING (ML)** THAT USES **ARTIFICIAL NEURAL NETWORKS (ANNs)** WITH MULTIPLE LAYERS.

AUTOMATICALLY LEARN COMPLEX PATTERNS AND REPRESENTATIONS FROM LARGE AMOUNTS OF DATA.

IT MIMICS THE STRUCTURE AND FUNCTION OF THE HUMAN BRAIN — EACH NEURON PROCESSES INPUTS AND PASSES THE RESULT TO OTHER NEURONS, ENABLING THE SYSTEM TO LEARN HIERARCHIES OF FEATURES FROM RAW DATA.

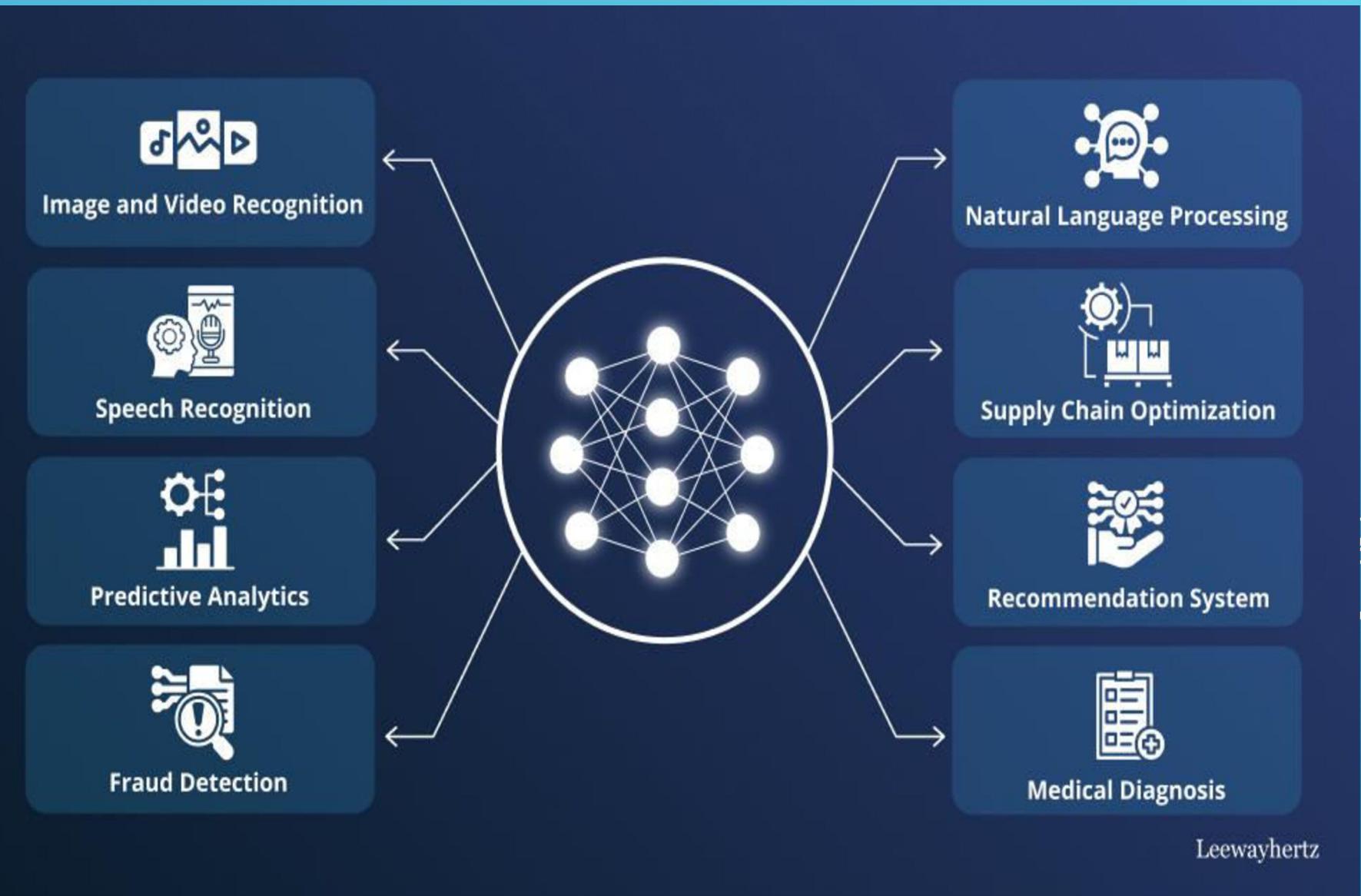
DEEPLearning USE CASES

- **Problems with long lists of rules—when the traditional approach fails, machine learning/deep learning may help.**
- **Continually changing environments—deep learning can adapt ('learn') to new scenarios.**
- **Discovering insights within large collections of data—can you imagine trying to hand-craft rules for what 101 different kinds of food look like?**

“WHAT IS DEEP LEARNING ACTUALLY
USED FOR?”



DEEP LEARNING USE CASES



DEEPLARNING IS NOT PERFECTLY FIT FOR

- When you need explainability—the patterns learned by a deep learning model are typically uninterpretable by a human.
- When the traditional approach is a better option — if you can accomplish what you need with a simple rule-based system.
- When errors are unacceptable — since the outputs of deep learning model aren't always predictable.
- When you don't have much data — deep learning models usually require a fairly large amount of data to produce great results.

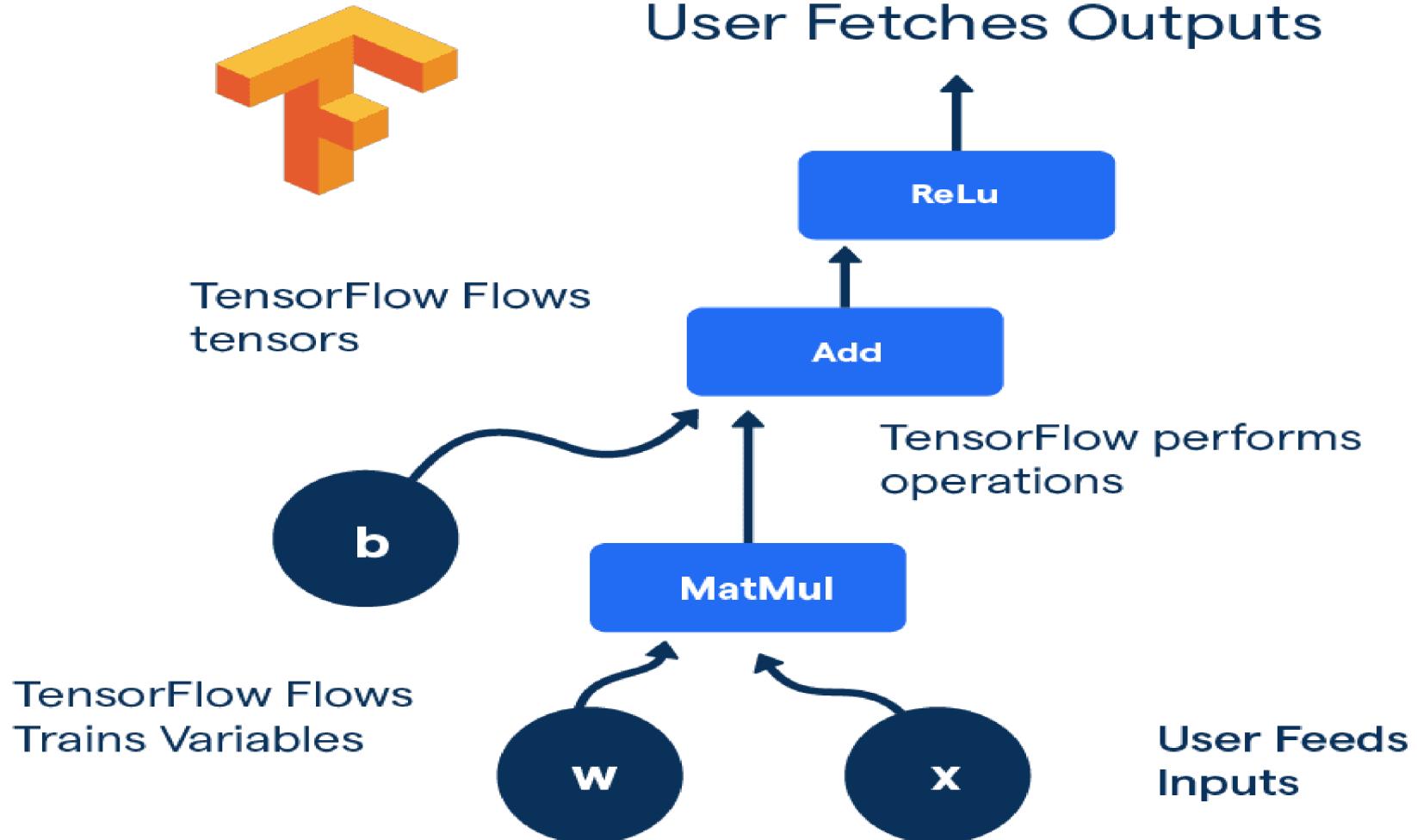
(though we'll see how to get great results without huge amounts of data)



TensorFlow

TENSORFLOW IS AN OPEN-SOURCE MACHINE LEARNING
FRAMEWORK BY GOOGLE.
USED FOR BUILDING AND TRAINING NEURAL NETWORKS.

Tensorflow



- ▶ TensorFlow basics & fundamentals
- ▶ Preprocessing data (getting it into tensors)
- ▶ Building and using pretrained deep learning models
- ▶ Fitting a model to the data (learning patterns)
- ▶ Making predictions with a model (using patterns)
- ▶ Evaluating model predictions
- ▶ Saving and loading models
- ▶ Using a trained model to make predictions on custom data

AGENDA



- ▶ TensorFlow is an open-source machine learning framework by Google.
- ▶ Used for building and training neural networks.
- ▶ Supports both CPU and GPU computation.
- ▶ Integrates easily with NumPy and Keras.

INTRODUCTION TO TENSORFLOW



- ▶ Core data structure in TensorFlow.
- ▶ Represents data as multidimensional arrays.
- ▶ Types: Scalar (0D), Vector (1D), Matrix (2D), and Higher-D tensors.
- ▶ Tensor attributes: shape, rank, dtype.

WHAT ARE TENSORS?



- ▶ Use `tf.constant()`, `tf.Variable()`, `tf.zeros()`, `tf.ones()`, `tf.random()`.
- ▶ Example: `tensor = tf.constant([[1, 2], [3, 4]])`
- ▶ Variables can change; constants cannot.
- ▶ Random tensors are often used to initialize model weights.

CREATING TENSORS

- ▶ Arithmetic operations: `+`, `-`, `*`, `/`, `tf.square()`, `tf.sqrt()`.
- ▶ Matrix operations: `tf.matmul()` or '@' operator.
- ▶ Element-wise vs matrix operations.
- ▶ TensorFlow tracks operations for automatic differentiation.

TENSOR OPERATIONS



- ▶ Rank: Number of dimensions.
- ▶ Shape: Size along each dimension.
- ▶ Data Type: Numeric type (float32, int64, etc.).
- ▶ Device placement: Runs on CPU or GPU automatically.

TENSOR PROPERTIES

- ▶ `tf.random.Generator.from_seed()` for reproducibility.
- ▶ `tf.zeros()`, `tf.ones()`, `tf.eye()` for initialization.
- ▶ Use seeds for repeatable experiments.
- ▶ Helps initialize model parameters randomly.

RANDOM AND SPECIAL TENSORS



- ▶ Reshape tensors using `tf.reshape(tensor, new_shape)`.
- ▶ Transpose tensors with `tf.transpose()`.
- ▶ Important for aligning tensor dimensions before multiplication.
- ▶ Does not alter data — only the view of it.

RESHAPING AND TRANSPOSING



Operation	TensorFlow API	What it does	Shape rule
Matrix Multiplication	<code>tf.matmul(A, B)</code>	Dot product of rows and columns	For 2D, $(m, n) @ (n, p) \rightarrow (m, p)$
Transpose	<code>tf.transpose(X)</code>	Swaps axes (for 2D, rows \leftrightarrow columns)	$(m, n) \rightarrow (n, m)$
Reshape	<code>tf.reshape(X, new_shape)</code>	Changes shape (data unchanged)	Product of dims must match original size

MATRIX MULTIPLICATION RESHAPING AND TRANSPOSING

- ▶ Tensors can be converted to NumPy arrays using `.numpy()`.
- ▶ NumPy arrays can be converted to tensors with `tf.constant()`.
- ▶ TensorFlow operations are compatible with NumPy syntax.
- ▶ Seamless interoperability between the two frameworks.

TENSORFLOW AND NUMPY INTEGRATION



- ▶ 1. Creating a tensor and performing arithmetic.
- ▶ 2. Reshaping and slicing tensors.
- ▶ 3. Using random tensors for weight initialization.
- ▶ 4. Converting between TensorFlow and NumPy.

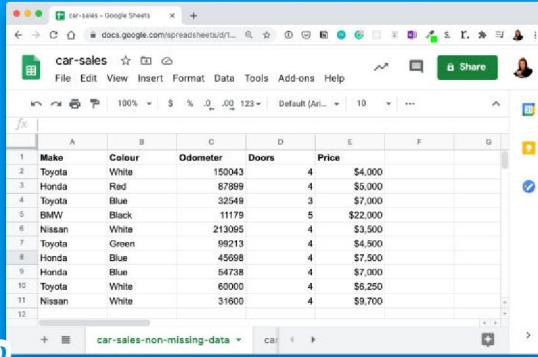
PRACTICAL EXAMPLES



“WHY USE MACHINE LEARNING (OR
DEEP LEARNING)?”



Machine Learning

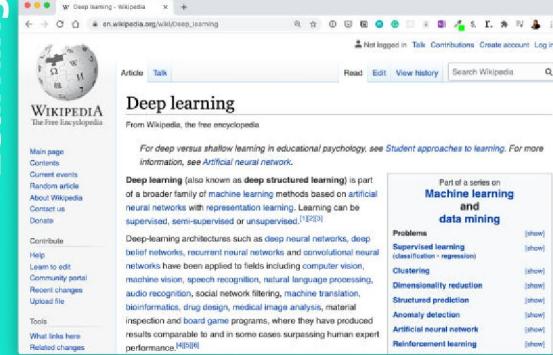


Make	Colour	Odometer	Doors	Price
Toyota	White	150043	4	\$4,000
Honda	Red	87899	4	\$5,000
Toyota	Blue	32549	3	\$7,000
BMW	Black	11179	5	\$22,000
Nissan	White	213095	4	\$3,500
Toyota	Green	98213	4	\$4,500
Honda	Blue	45698	4	\$7,500
Honda	Blue	54738	4	\$7,000
Toyota	White	60000	4	\$6,250
Nissan	White	31600	4	\$9,700



Structured
data

Deep Learning



The Deep learning page on Wikipedia includes sections on Main page, Contents, Current events, About this article, About Wikipedia, Contact us, Donate, Contribute, Help, Learn to edit, Community portal, Recent changes, Upload file, Tools, What links here, and Related changes.

Deep learning

From Wikipedia, the free encyclopedia

For deep versus shallow learning in educational psychology, see Student approaches to learning. For more information, see Artificial neural network.

Deep learning (also known as deep structured learning) is part of a broader family of machine learning methods based on artificial neural networks with representation learning. Learning can be supervised, semi-supervised or unsupervised.^{[1][2][3]}

Deep-learning architectures such as deep neural networks, deep belief networks, recurrent neural networks and convolutional neural networks have been applied to fields including computer vision, machine vision, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, bioinformatics, drug design, medical image analysis, material inspection and board game programs, where they have produced results comparable to and in some cases surpassing human expert performance.^{[4][5][6]}

Part of a series on **Machine learning and data mining**

Problems

- Supervised learning (classification - regression)
- Clustering
- Dimensionality reduction
- Structured prediction
- Anomaly detection
- Artificial neural network
- Reinforcement learning

Unstructured
data



Daniel Bourke @mrdbourke · Nov 1
"How do I learn #machinelearning?"

What you want to hear:

1. Learn Python
2. Learn Math/Stats/Probability
3. Learn software engineering
4. Build

What you need to do:

1. Google it
2. Go down the rabbit hole
3. Resurface in 6-9 months and reassess

See you on the other side.



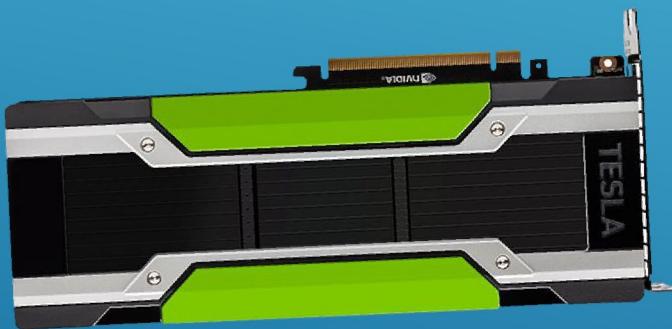


TensorFlow



“WHAT IS TENSORFLOW?”

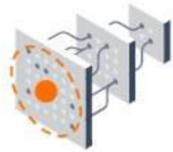




GPU (Graphics Processing Unit)



TPU (Tensor Processing Unit)



Easy model building

Build and train ML models easily using intuitive high-level APIs like Keras with eager execution, which makes for immediate model iteration and easy debugging.



Robust ML production anywhere

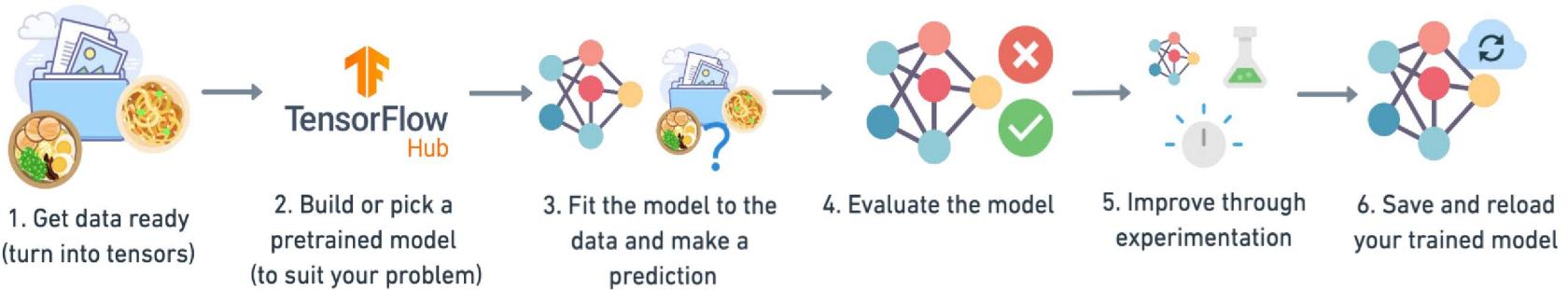
Easily train and deploy models in the cloud, on-prem, in the browser, or on-device no matter what language you use.



Powerful experimentation for research

A simple and flexible architecture to take new ideas from concept to code, to state-of-the-art models, and to publication faster.

WHY TENSORFLOW



TENSORFLOW WORKFLOW

Tensors are the fundamental building blocks in TensorFlow.

Tensor operations allow efficient numerical computation.

TensorFlow integrates well with NumPy.

Next: Apply these concepts in Neural Network Regression.

SUMMARY — KEY TAKEAWAYS



THANK YOU!

Trainer: Mohd Salman — TensorFlow For Deep Learning