

# ISOM5240

# Deep Learning Business Applications

# with Python

## Introduction to Deep Learning Models

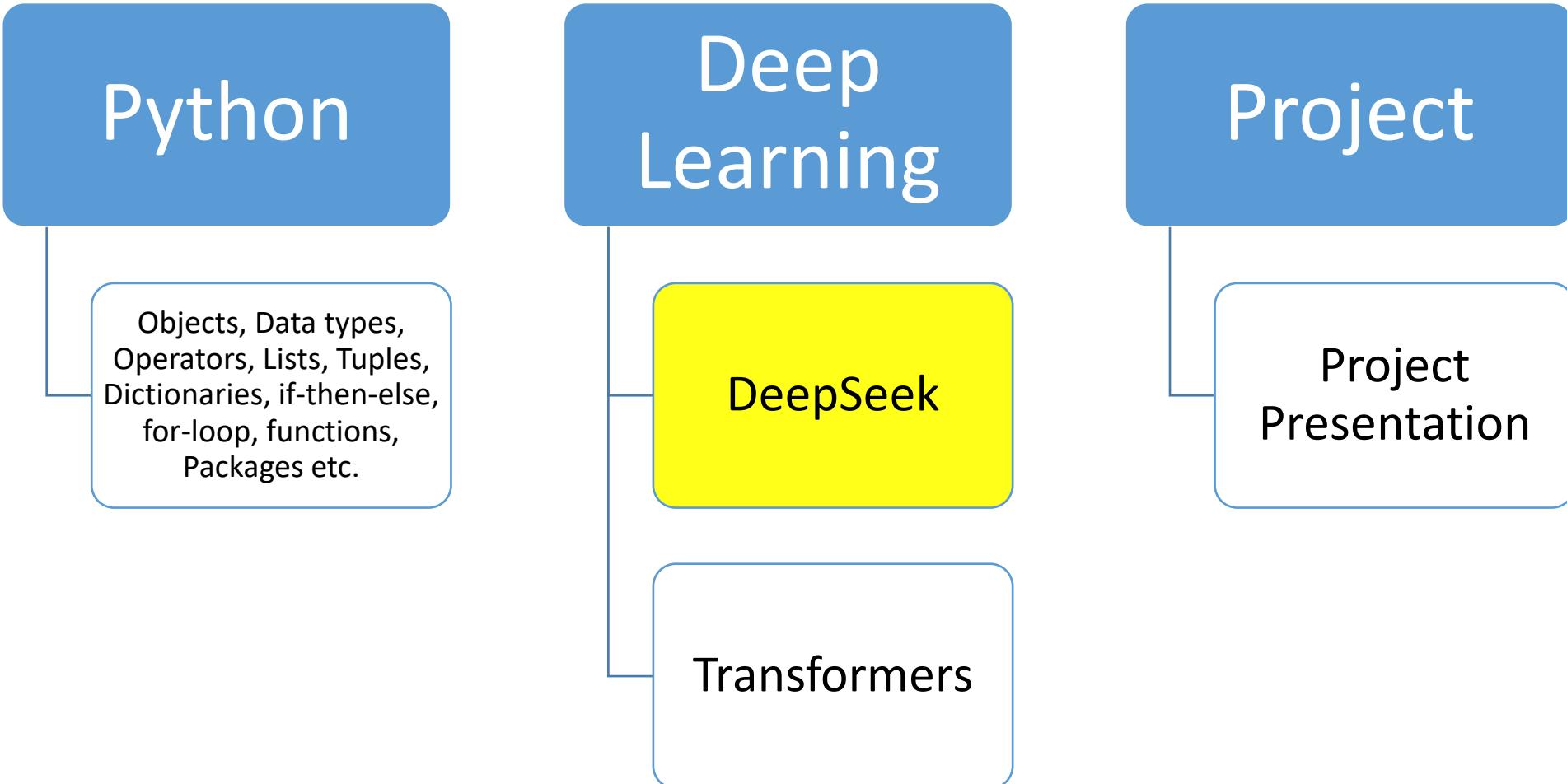
**Prof. James Kwok**

**Associate Professor of Business Education**

**Certified Information Systems Auditor (CISA)**

Email: [jkwok@ust.hk](mailto:jkwok@ust.hk)

# Course Plan – 7 parts in total





# Outline

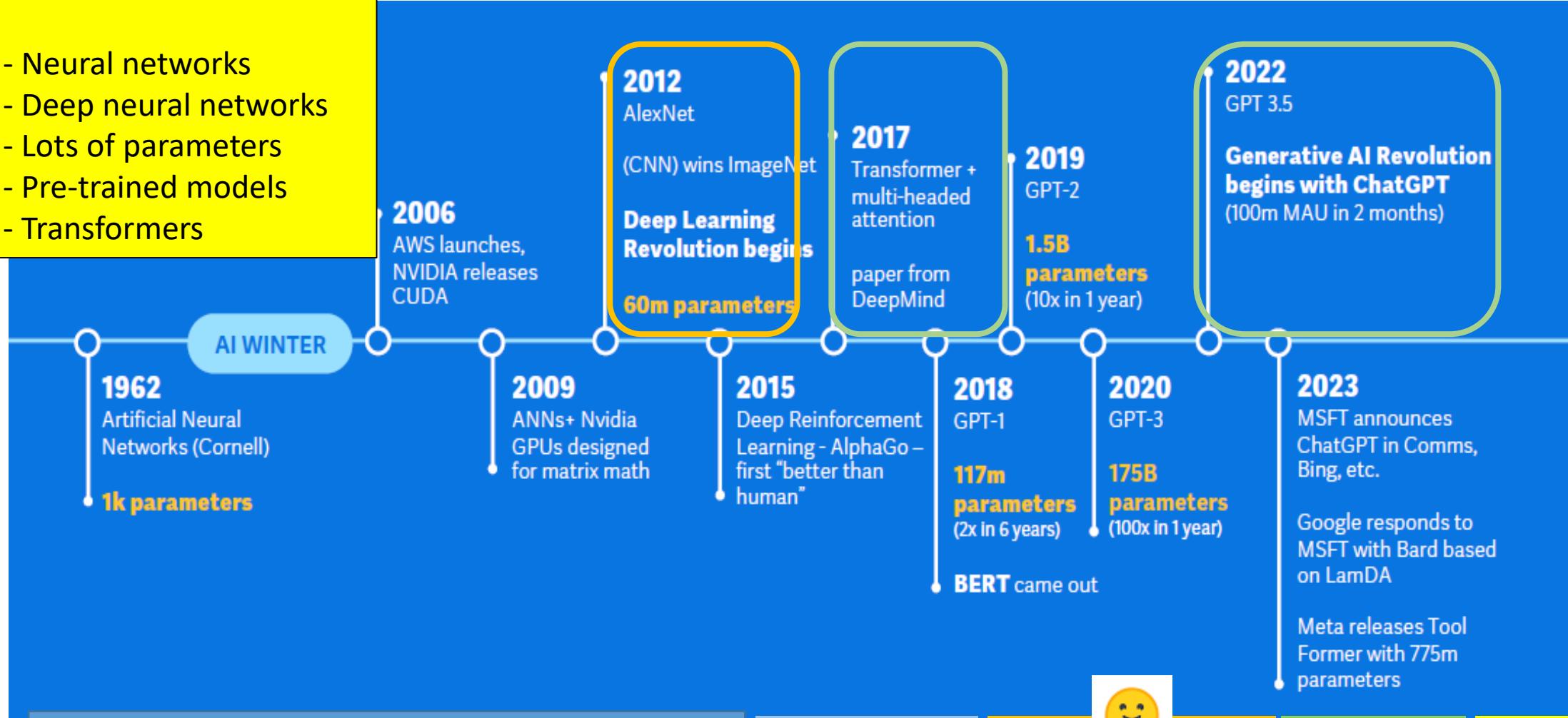
---

1. Artificial Intelligence (AI), Machine Learning, and Deep Learning
2. Human Brain Vs Deep Learning
3. Different Deep Neural Networks
4. Implementing Deep Learning in Business
5. <>Your First Deep Learning Business Application<>
6. Final Remarks

# 1. Artificial Intelligence (AI), Machine Learning, and Deep Learning

## Key takeaways:

- Neural networks
- Deep neural networks
- Lots of parameters
- Pre-trained models
- Transformers



1000 classes, **60 millions parameters** and  
650,000 neurons, 5 CNN layers

**Supervised Learning**

**Transformer**



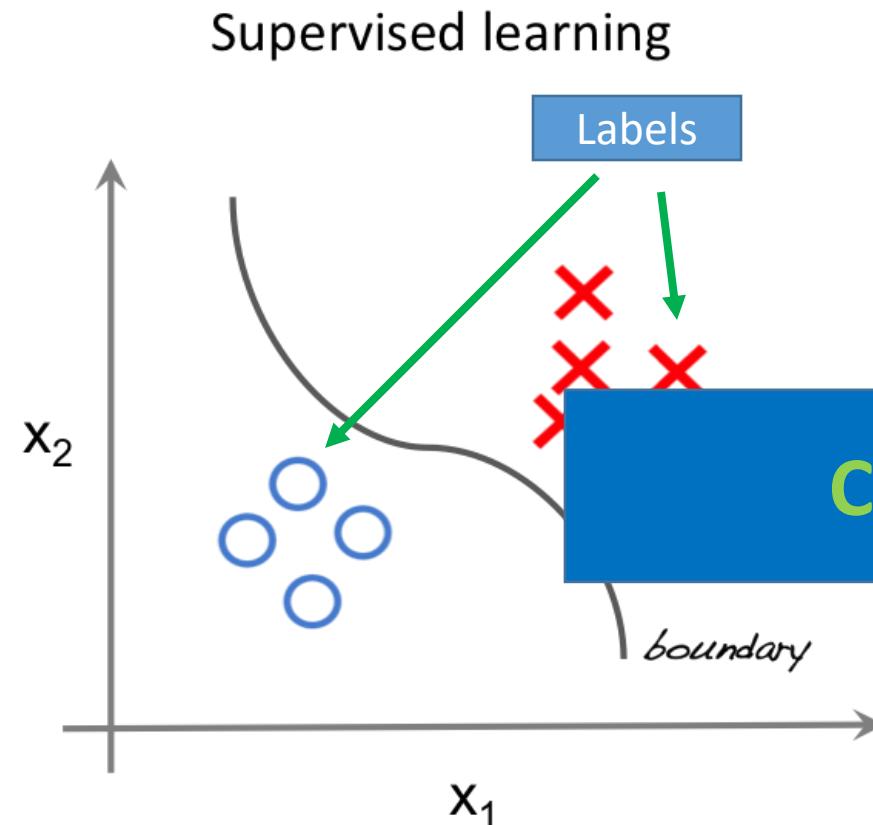
**Hugging Face  
Transformers**

**ChatGPT**

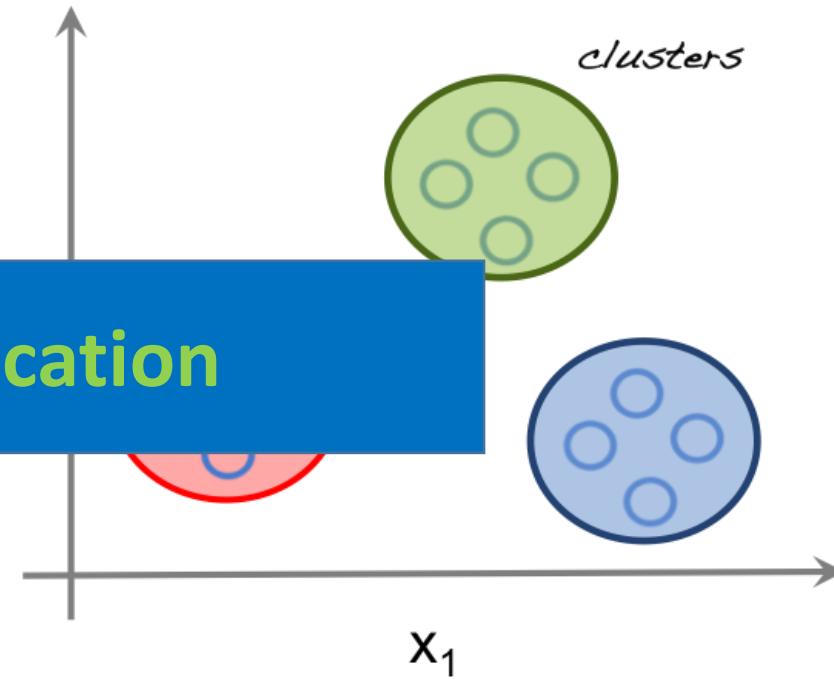
**DeepSeek**

# Supervised Learning Vs Unsupervised Learning

ChatGPT uses supervised learning



Unsupervised learning



Key takeaways:

- Supervised learning
- Classification

# Artificial Intelligence

## Machine Learning

### Deep Learning

**DL** is a specialized form of ML that involves neural networks with multiple layers. These deep neural networks aim to simulate the way the human brain works, allowing for more complex tasks.

**ML** is a type of AI that enables computers to **learn from data** without being explicitly programmed. It focuses on algorithms that improve their performance over time.

**AI** refers to machines or computer systems that can perform tasks that typically require human intelligence.

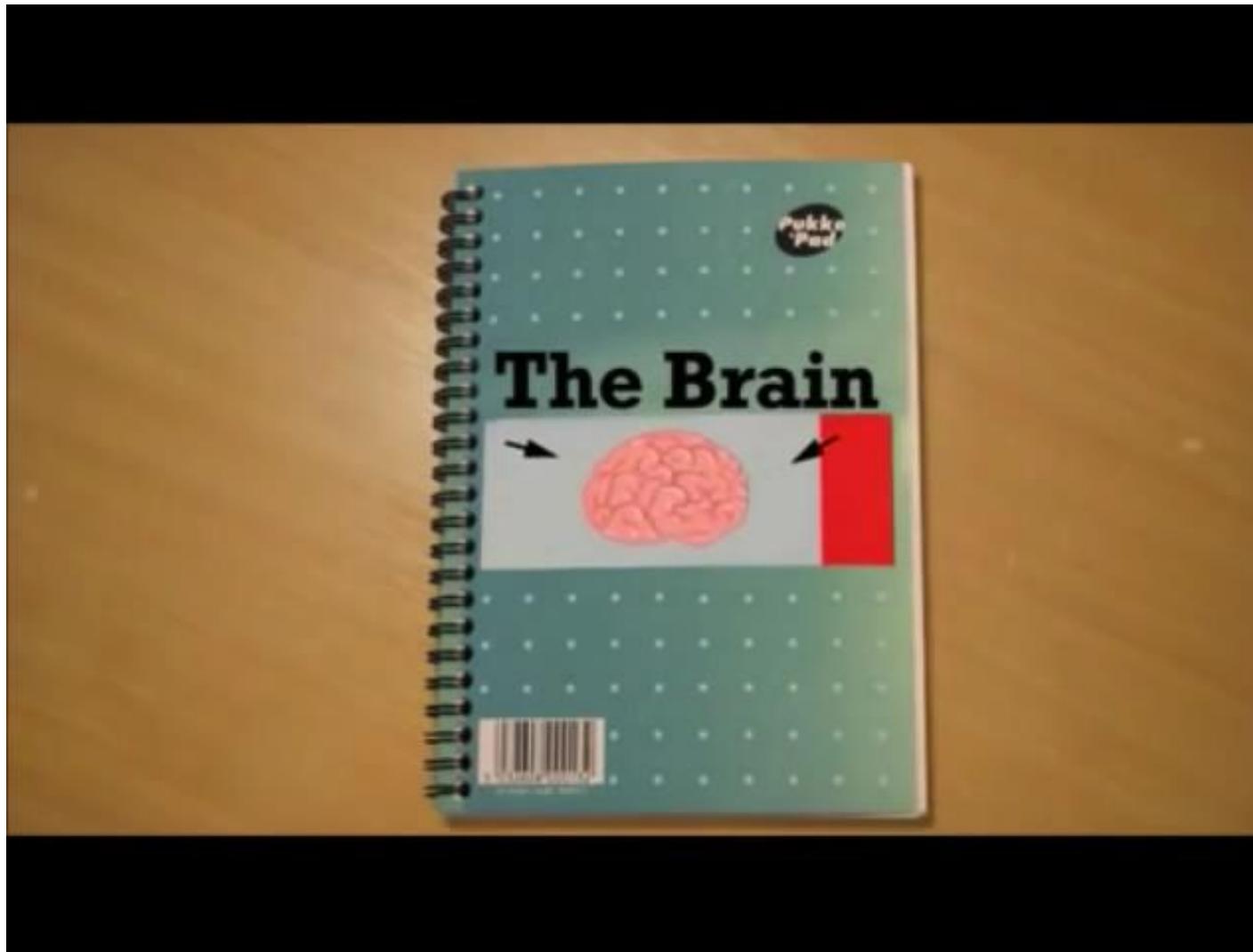
### Key takeaways:

- Lots of data

# 2. Human Brain vs. Deep Learning

# Deep Learning





**Overall:**

**Boss** – e.g., Learning

**Learning:** thinking, remembering, and feeling

**Weight:** 3 pounds

**Power:** 25 watts

**Structure:** cerebrum (2 halves)

**Control:** Solve problems, speaking, drawing, imagination

**Memory:** Short-term and Long-term

**Neurons:**

- over 100 billion
- Messages flow backwards and forwards

**Learning:**

- Messages travel from one neuron to another
- Brain starts to create connections or **pathways** between neurons
- Trial and error
- Creating pathways is how we learn and remember things

**Source:** <https://www.youtube.com/watch?v=cgLkV689s4>

### Human Brain:

**Boss** – e.g., Learning

**Learning**: thinking, remembering, and feeling

**Weight**: 3 pounds

**Power**: 25 watts

**Structure**: cerebrum (2 halves)

**Control**: Solve problems, speaking, drawing, imagination

**Memory**: Short-term and Long-term

### Neurons:

- over 100 billion
- Messages flow backwards and forwards

### Learning:

- Messages travel from one neuron to another
- Brain starts to create connections or **pathways** between neurons
- Trial and error
- Creating pathways is how we learn and remember things

### Deep Learning:

**Boss** – e.g., Learning

**Learning**: thinking, remembering, and feeling

**Weight**: \_\_\_\_\_

**Power**: \_\_\_\_\_

**Structure**: \_\_\_\_\_

**Control**: Solve problems, speaking, drawing, imagination

**Memory**: Short-term and Long-term

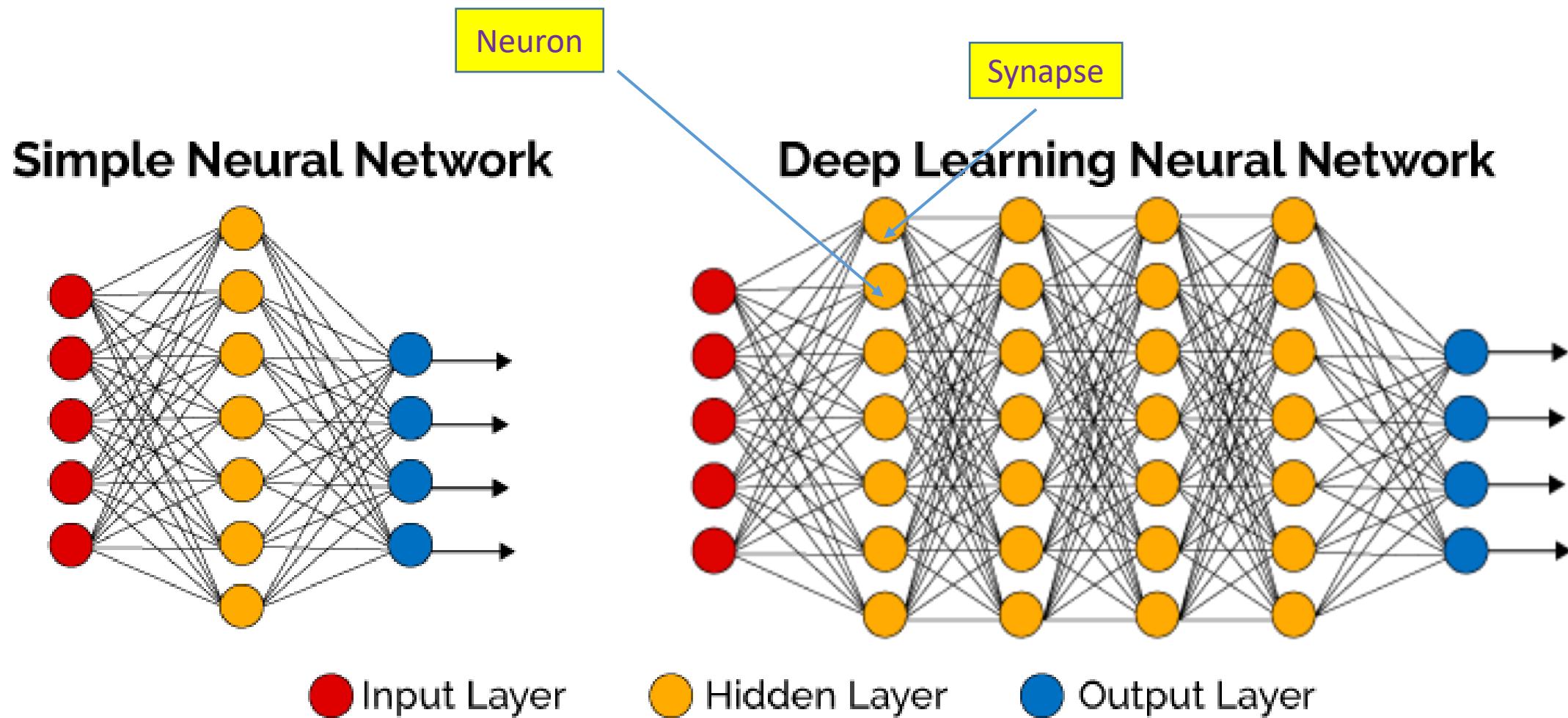
### Neurons:

- over 100 billion
- Messages flow backwards and forwards

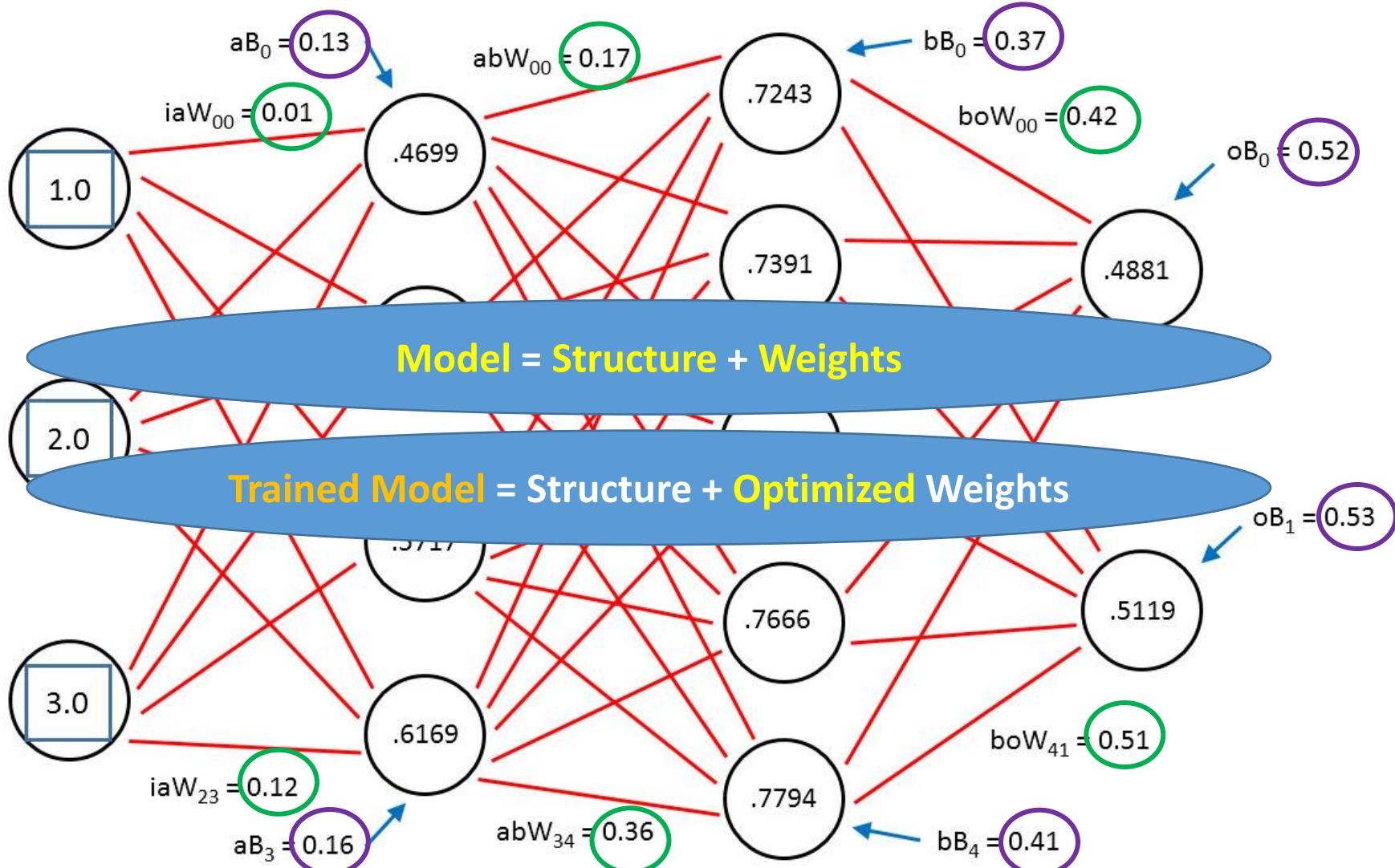
### Learning:

- Messages travel from one neuron to another
- Brain starts to create connections or pathways between neurons
- Trial and error
- Creating pathways is how we learn and remember things

# Deep Learning Neural Network Model



# Deep Learning Neural Network Model



# An Example of Deep Learning Neural Network

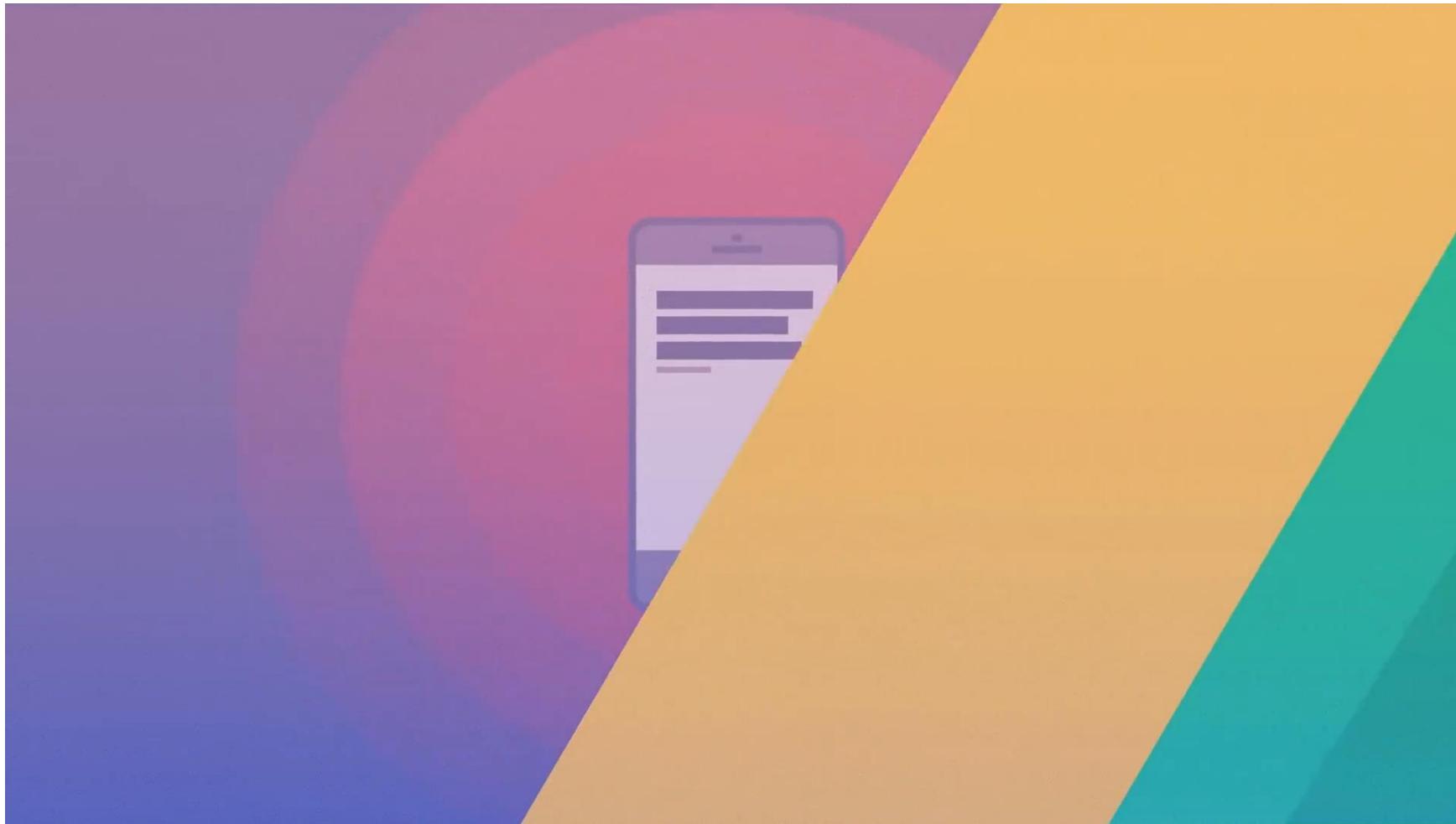
Programming Approach

Deep Learning (or ML)  
Approach

Try to do: Identify it as a **Cat**



# Program vs. Deep Learning



**Source:** <https://www.youtube.com/watch?v=mJeNghZXtMo>

# An Example of Deep Learning

**Key takeaways:**

- Train models
- Use Trained models

## Programming Approach

### Programming Logic:

#### At Pixel level

- (body) Lots of black white colors mixed together
- (eye) black colors surrounded by yellow color (two if them)

**Problem:** Different **Cats**

**Try to do:** Identify it as a **Cat**



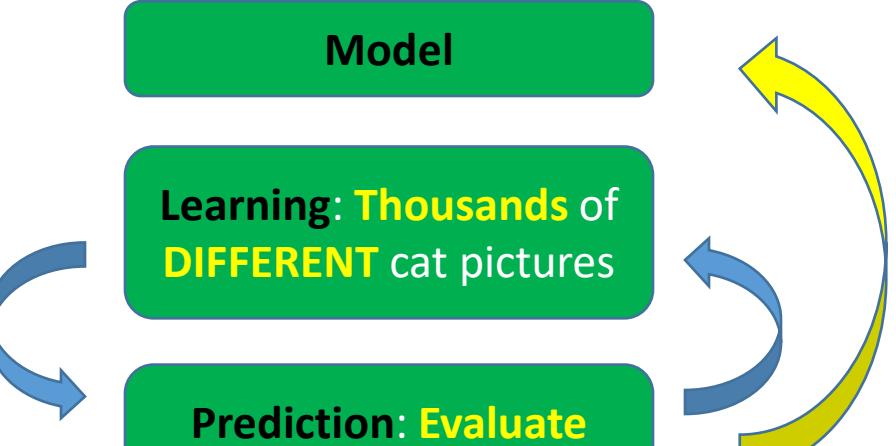
## Deep Learning Approach

### Model

**Learning:** **Thousands** of **DIFFERENT** cat pictures

**Prediction:** Evaluate the performance

**Problem:** Wrong model, data etc.



# An Example of Deep Learning

## Programming Approach

Try to do: Identify it as a **Cat**

### Programming Logic:

#### At Pixel level

- (body) Lots of black white colors mixed together
  - (eye) black colors surrounded by yellow color (two if them)

**Problem:** Different **Cats**

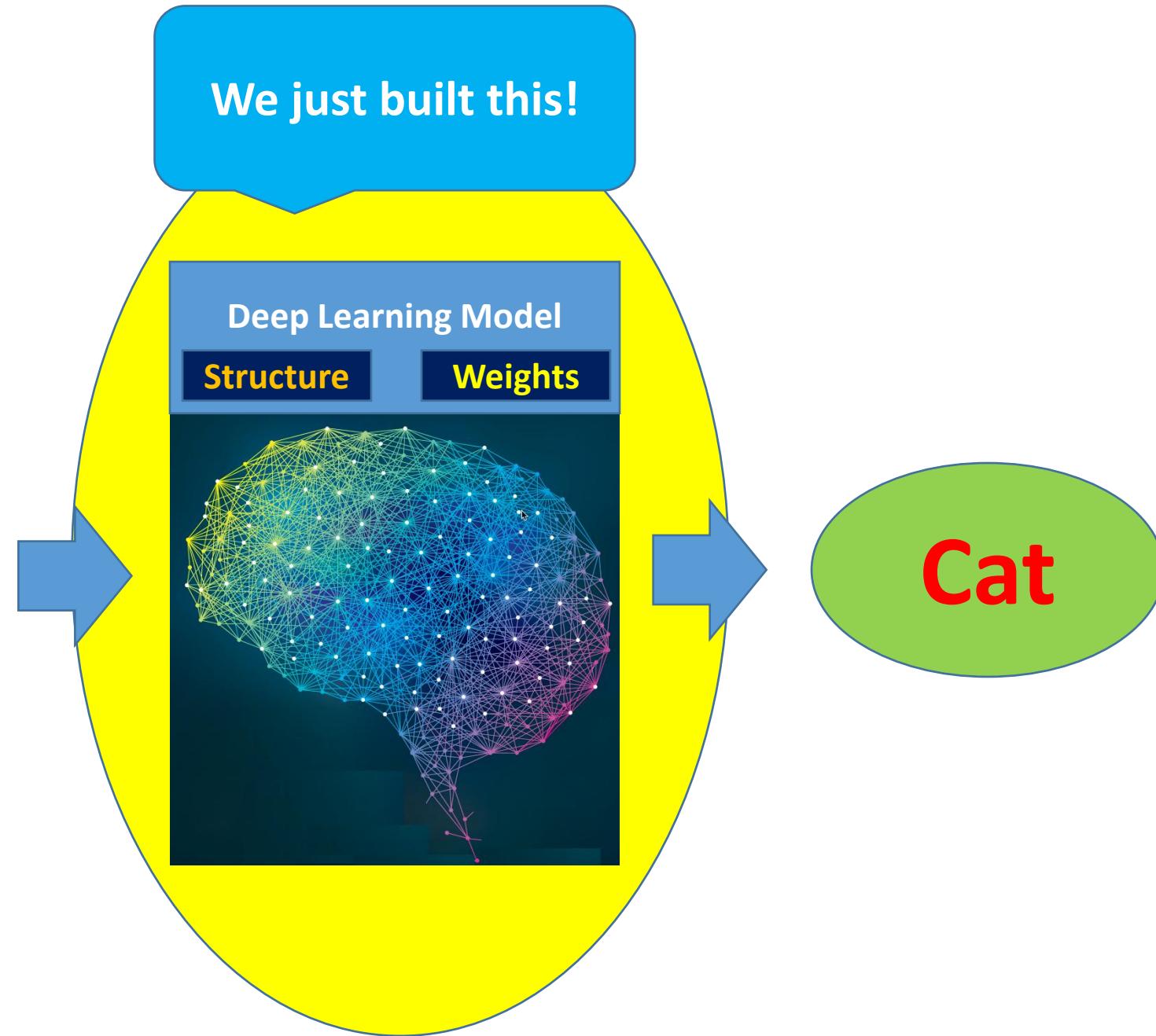


## Deep Learning Approach

**Trained Model**

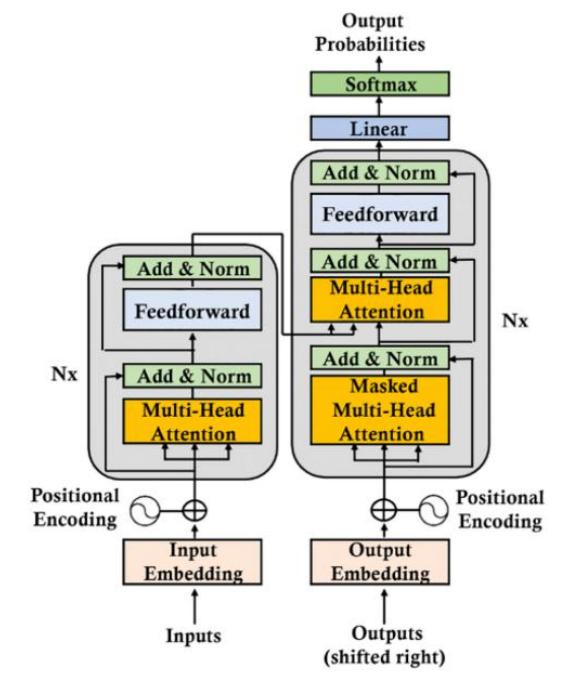
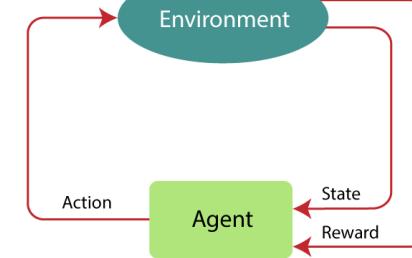
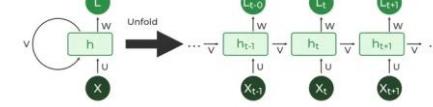
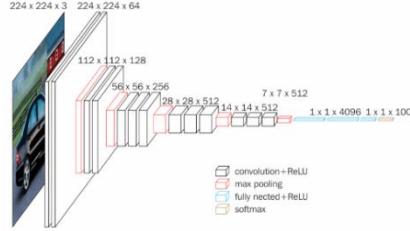
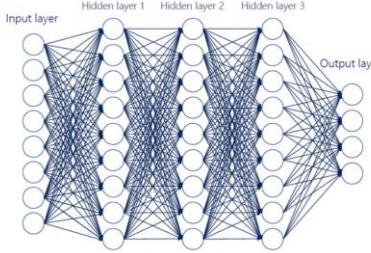
**Problem:** Wrong model,  
data etc.

# Summary



### **3. Different Deep Neural Networks**

# Different Deep Neural Networks



Deep Neural Network (DNN)

Convolutional Neural Network (CNN)

Recurrent Neural Network (RNN)  
Long Short Term Memory (LSTM)

Reinforcement Learning (RL)

Transformer

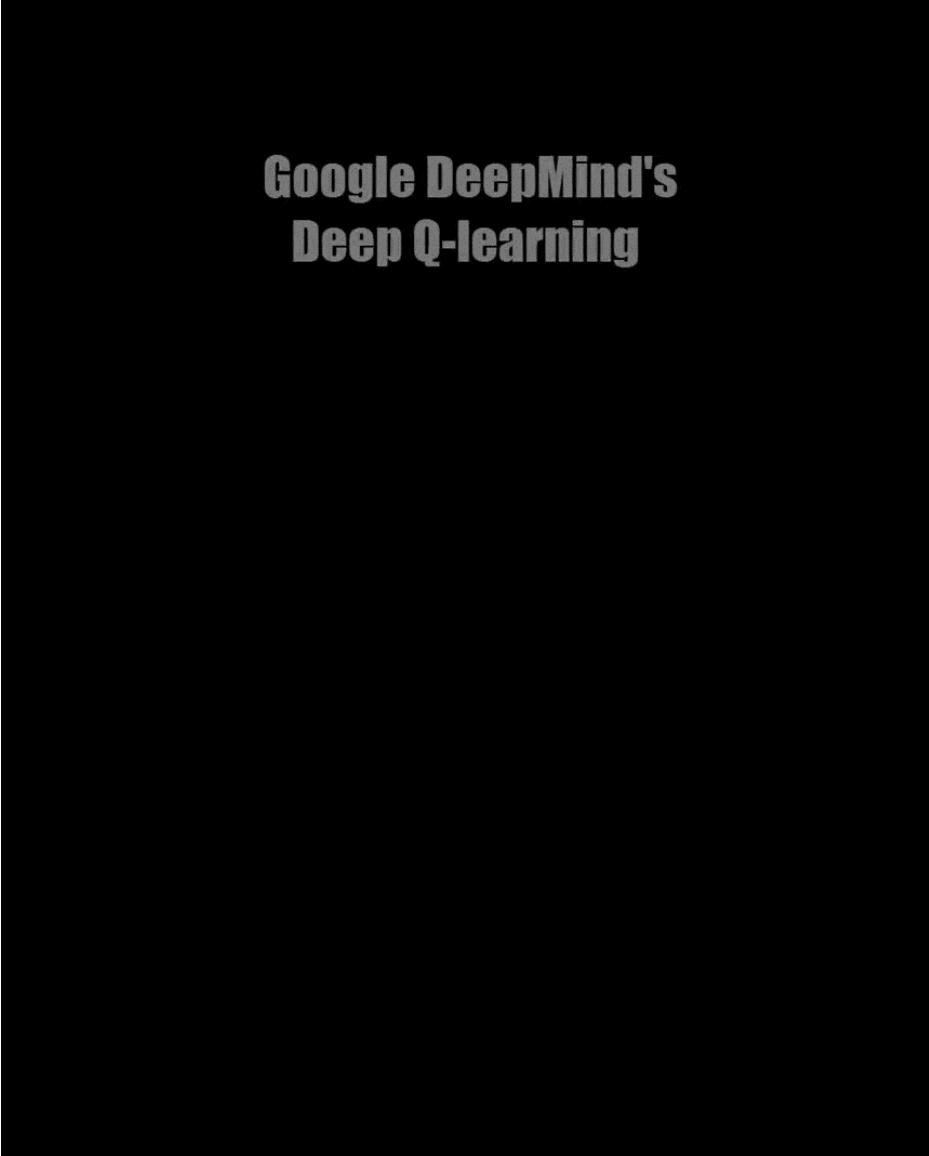
**Transformer**



# The Aficionado

Deep music classification. Real time.

**Source:** [https://www.youtube.com/watch?v=nOdz80J4\\_Rc](https://www.youtube.com/watch?v=nOdz80J4_Rc)

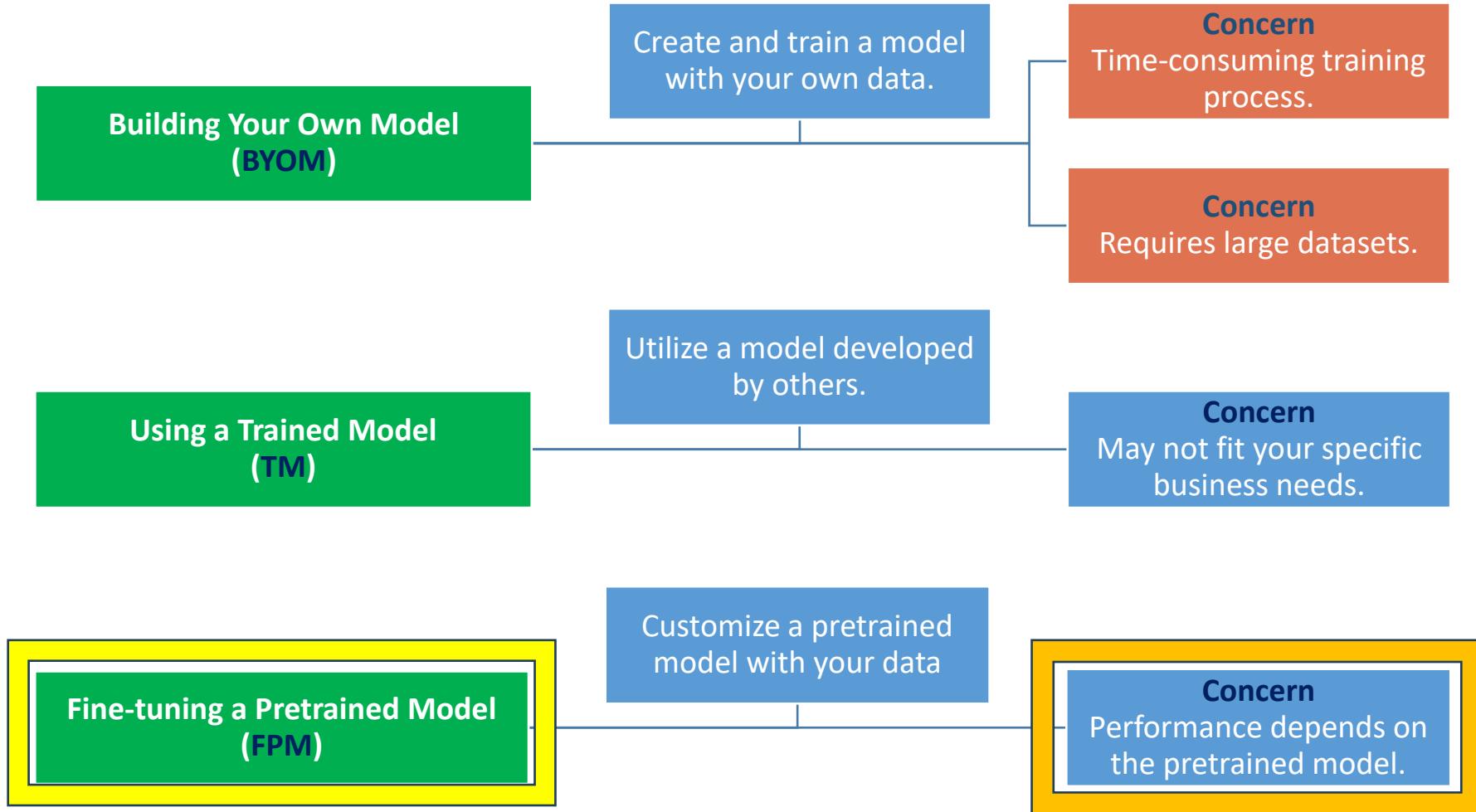


## **Google DeepMind's Deep Q-learning**

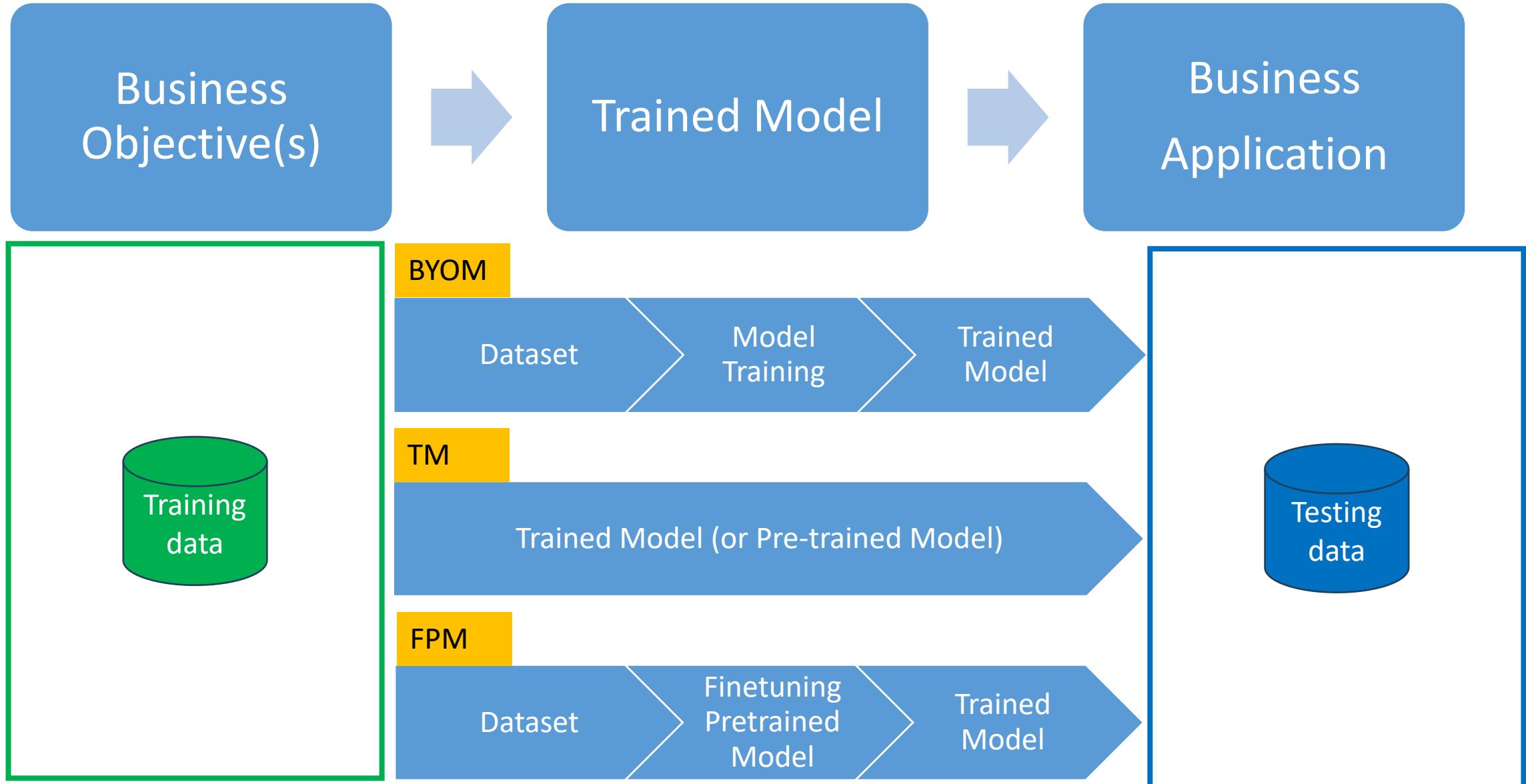
**Source:** <https://www.youtube.com/watch?v=V1eYniJ0Rnk>

# 4. Implementing Deep Learning in Business

# Implementing Deep Learning in Business

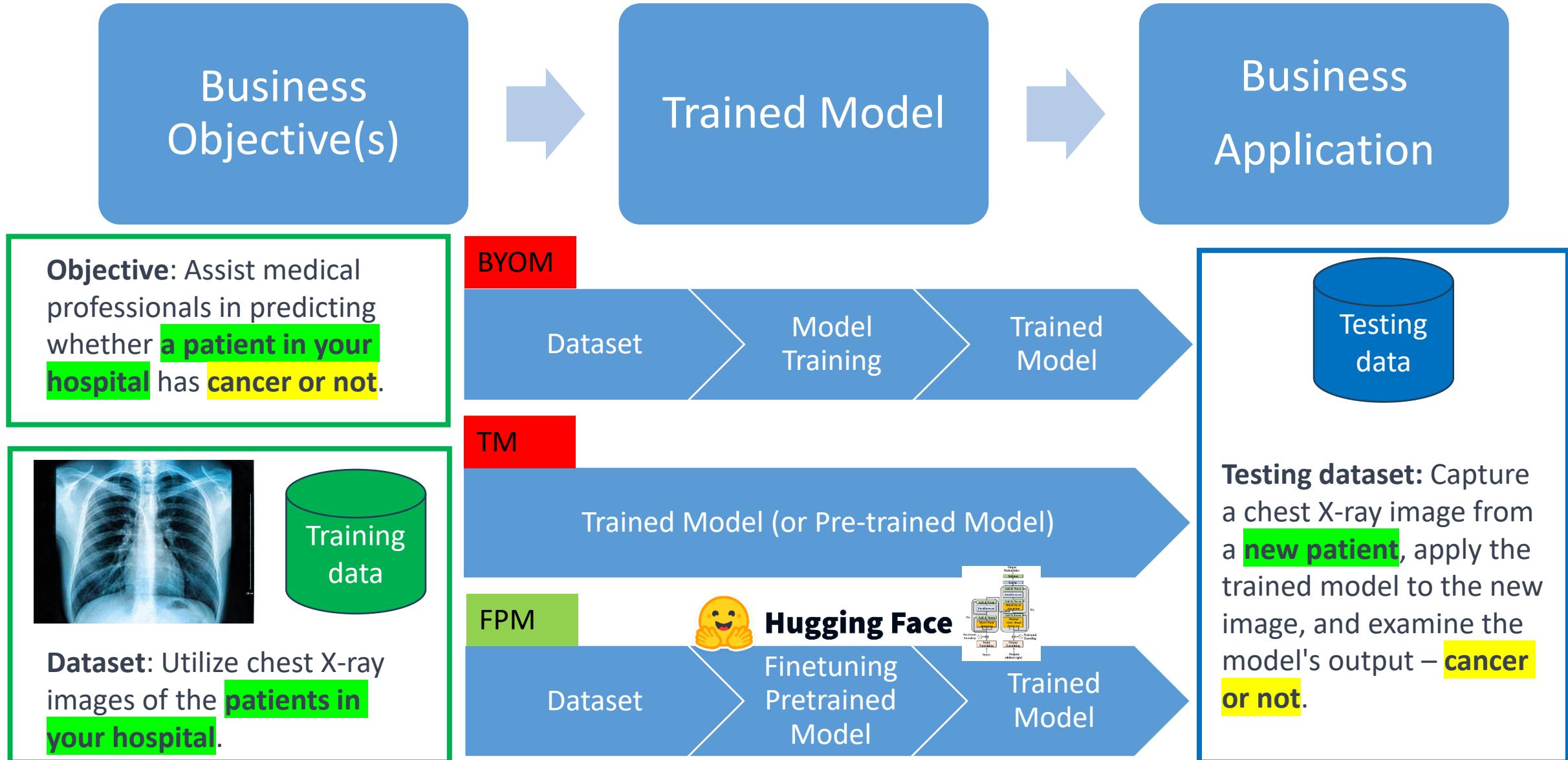


# Deep Learning Business Application



# Deep Learning Business Application: Example

Key takeaways:  
- Business Obj  
- Testing acc





**In-class  
Activity**

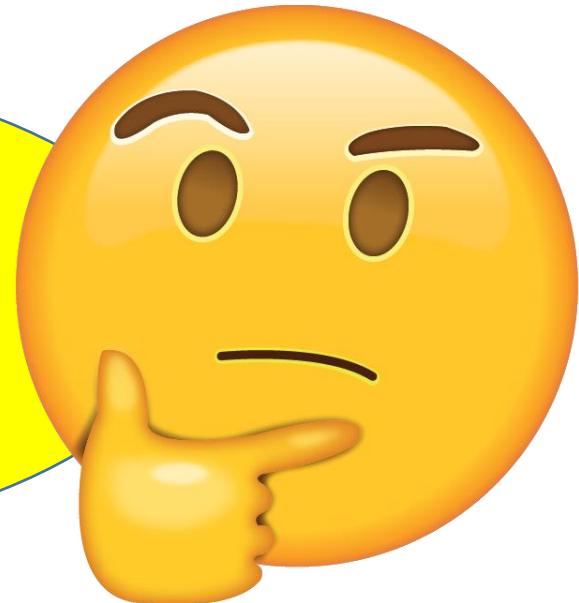
# 5. Your First Deep Learning Business Application

## 6. Final Remarks

# Final Remarks

- Deep learning is the future

Would AI replace  
Human?



# No evidence of jobs being entirely automated by AI, analysis shows

Anthropic's assessment of over 4 million user-submitted AI prompts found that most workers used the technology to augment their work, not replace it.

Published Feb. 11, 2025

<https://www.hrdive.com/news/anthropic-report-AI-software-engineers-automation-augmentation/739833/>

## The Anthropic Economic Index

Feb 10, 2025 • 9 min read

Computer & Mathematical	37.2%	Arts & Media	10.3%	Education & Library	9.3%	Office & Administrative	7.9%	Life, Physical & Social Science	6.4%	Business & Financial	5.9%
Top Titles		Top Titles		Top Titles		Top Titles		Top Titles		Top Titles	
Computer Programmers	6.1%	Technical Writers	1.8%	Tutors	1.6%	Bioinformatics Technicians	2.9%	Clinical Psychologists	0.5%	Security Management Specialists	0.5%
Software Developers, Systems Software	5.3%	Copy Writers	1.6%	Archivists	1.5%	Statistical Assistants	0.4%	Historians	0.4%	Credit Counselors	0.4%
Software Developers, Applications	3.4%	Editors	1.3%	Instructional Designers	0.8%	Word Processors	0.4%	Anthropologists	0.4%	Financial Analysts	0.4%
Top Tasks		Top Tasks		Top Tasks		Top Tasks		Top Tasks		Top Tasks	
Develop and maintain software applications and websites	16.8%	Produce and perform in film, TV, theater, and music	1.8%	Design and develop comprehensive educational curricula and materials	1.9%	Perform routine IT system administration and maintenance	1.8%	Conduct academic research and disseminate findings	1.2%	Analyze financial data & develop investment & budgeting strategies	0.8%
Program and debug computer systems and machinery	6.9%	Manage organizational public relations & strategic comms	1.3%	Teach and instruct diverse subjects across educational settings	1.7%	Provide comprehensive customer service and support	0.7%	Record, analyze, and report operational and research data	0.5%	Provide personal financial advice and education	0.8%
Design & maintain database systems for data management and analysis	2.3%	Develop & execute multi-industry marketing & promotional strategies	1.2%	Manage book and document publishing processes	1.4%	Record, analyze, and report operational and research data	0.6%	Conduct chemical analyses and experiments on various substances	0.3%	Record, analyze, and report operational and research data	0.4%

<https://www.anthropic.com/news/the-anthropic-economic-index>

End