

ISOM5240

Deep Learning Business Applications

with Python

Prof. James Kwok

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Certified Information Systems Auditor (CISA)

Email: jkwok@ust.hk



Attendance Requirement

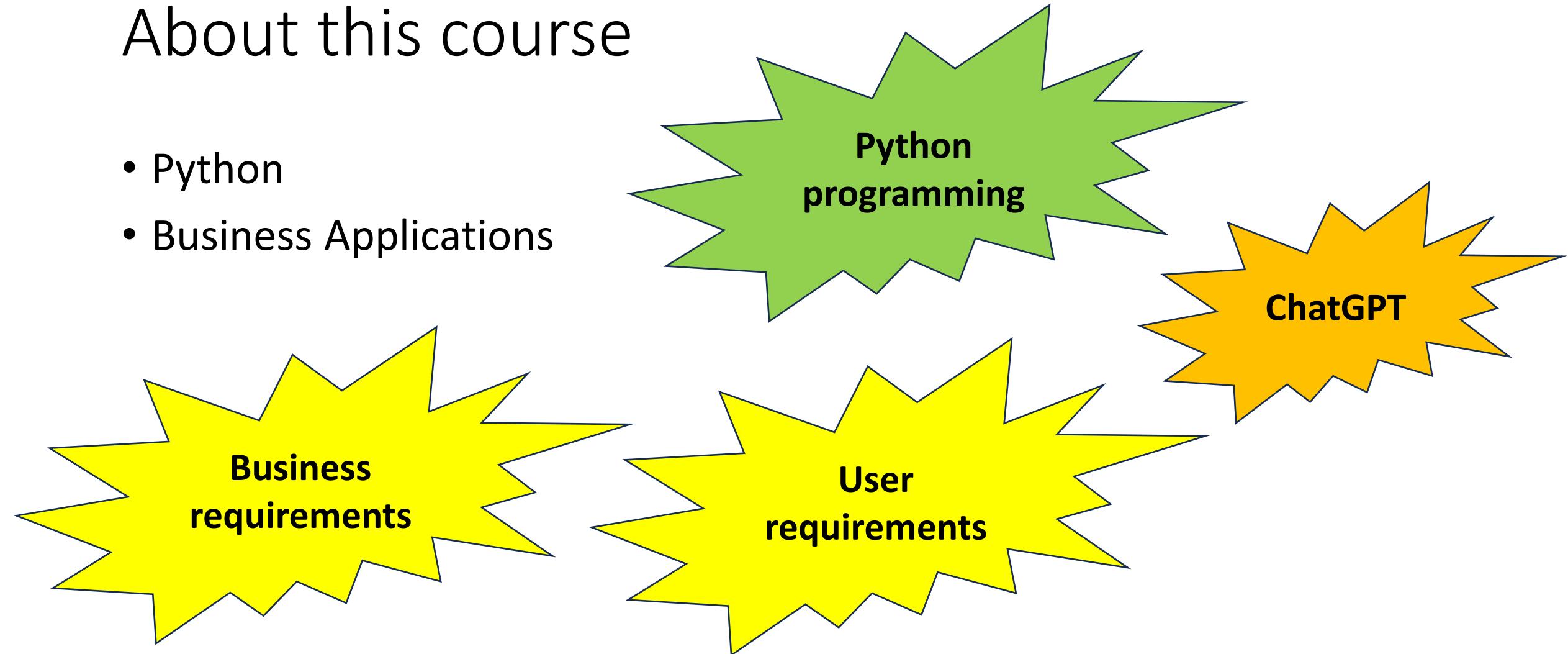
- Attendance at classes is **mandatory** for all courses.
- Students must notify the professor of the course and the HKUST MSBA Program Office **in advance** if they are unable to attend classes.
- Absent with any reason (e.g. sick leave with valid medical proof) will be treated as below:

Absent for	2-credit course (total 8 sessions)
1 st time	Allowed (Program Office will issue warning email to students)
2 nd time	Allowed (One-third grade reduction will be given)
3 rd time	"W" (representing withdrawal from class) will be shown on transcript

- Professors have the discretion to execute a stricter attendance policy at course level.
- Classes will **start on time**.
- Full-time student who are **more than 15 mins late** will be considered **Absent from Class**. Part-time students will be given **30 mins** for the buffer time.
- Students who leave the class early without informing the course instructor and the MSBA Program Office will be considered **absent**.

About this course

- Python
- Business Applications



What this course is about

- Deep learning business applications
 - NLP
- Transfer Learning – Pre-trained models
 - Fine-tuned Models
- Python programming
 - Why Python for deep learning
 - Readability
 - Less complexity
 - Easy to understand the code

Who can benefit from the course?

- Those who want to **develop deep learning business applications & models** that can be **used by other users** who need not be familiar with the model
- Those who want to apply **transfer learning** in business application development
- Those who want to **develop deep learning business applications** which make **tasks easier** for themselves
- Those who want to be aware of the power of Python programming

Important prerequisites for success

Get ready to get your hands dirty

- Learn by doing
 - One **CANNOT** benefit from the course by just **reading lecture materials**
- Learn by yourself (**because you are programmer and developer**)
 - Use google and other resources to learn from others
- Perseverance
 - **Time**
 - **Patience**
- Not scared of programming
 - New to programming: can work with a **partner**, and ask our **TA**

ChatGPT



Logout

ChatGPT

Usage: HK\$ 0.000000 of 8.000000

+ New Chat

Chat configuration

Please select a model

gpt-35-turbo

Temperature

0.00 2.00

Maximum response tokens

100 4000

Context templates

Assistant

Context

You are a helpful assistant that answers question as simple as possible.

Looking for help on writing prompts and more examples at <https://prompts.chat/>

Prompt: You are a helpful assistant that answers question as simple as possible.

0 of 20

Enter your question here

0/5000

Fair use and quota:
... a monthly quota of roughly **500 thousand tokens** and a limit of **20 prompts per chat session**

ChatGPT



Examples

"Explain quantum computing in simple terms"
→

"Got any creative ideas for a 10 year old's birthday?" →

"How do I make an HTTP request in Javascript?" →



Capabilities

Remembers what user said earlier in the conversation

Allows user to provide follow-up corrections

Trained to decline inappropriate requests



Limitations

May occasionally generate incorrect information

May occasionally produce harmful instructions or biased content

Limited knowledge of world and events after 2021

Send a message



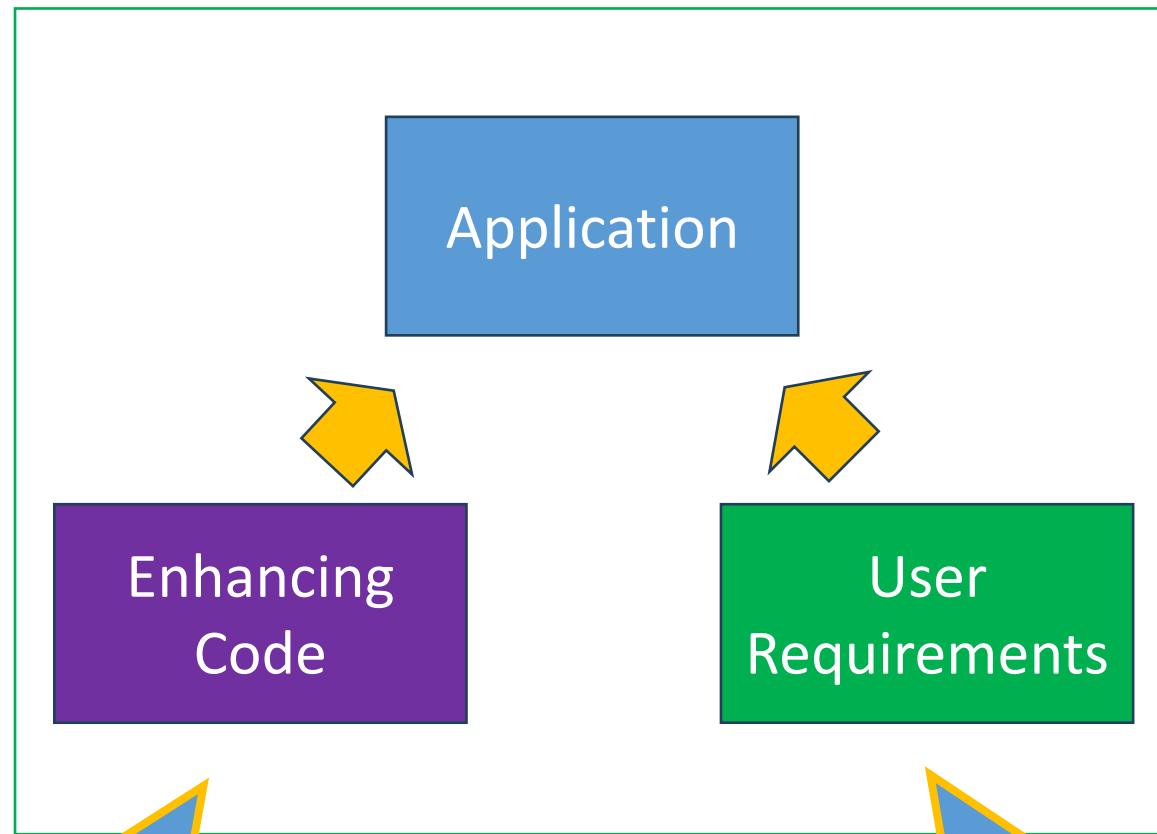
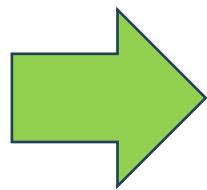
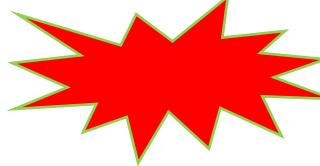
Free Research Preview. ChatGPT may produce inaccurate information about people, places, or facts. [ChatGPT May 24 Version](#)

<https://chatgpt.ust.hk/>

<https://itsc.hkust.edu.hk/services/general-it-services/generative-ai-tools/help>

<https://chat.openai.com/>

Application Development in Python





“Skilled Developers No Need to Worry About ChatGPT”

“ChatGPT is Additional Asset to Developers; Not a Replacement”

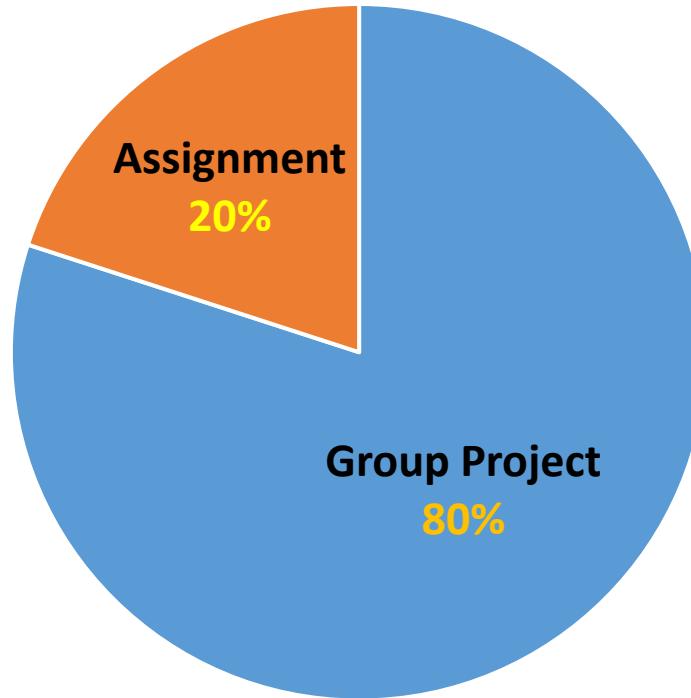
“ChatGPT Can’t Handle Complex Tasks”

“Developers Still Needed for Quality Checking”

“No Tech is Proven to Replace Creativity”

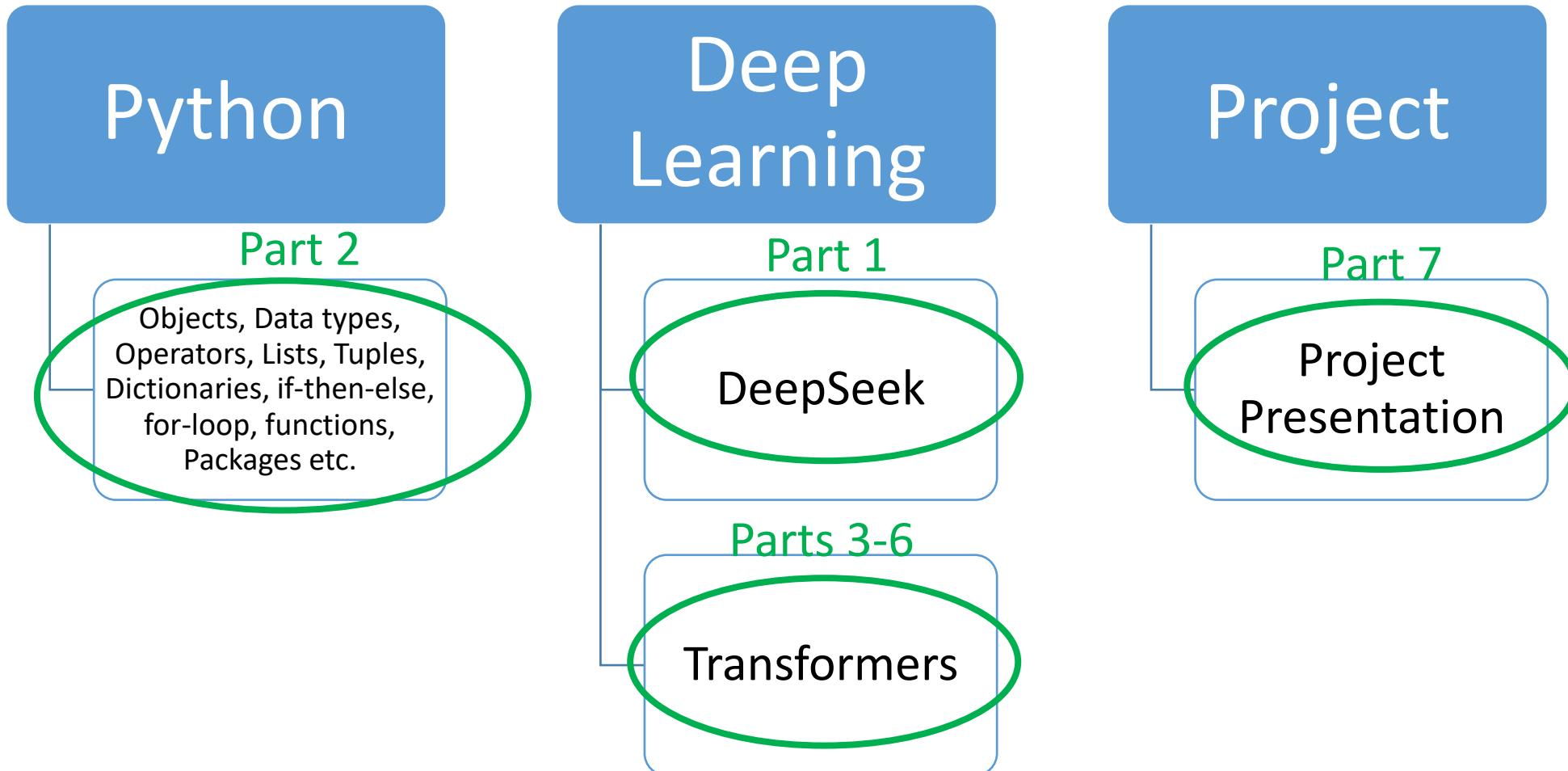
“AI Won’t Steal Your Job; Person Using AI Will”

Grading



- You may work **alone or in a group of two students** for project.
- The submission deadline of lab assignment will be announced during class.
- The topic of project should be discussed with the instructor beforehand.

Course Plan – 7 parts in total



End

ISOM5240

Deep Learning Business Applications

with Python

Introduction to Deep Learning Models

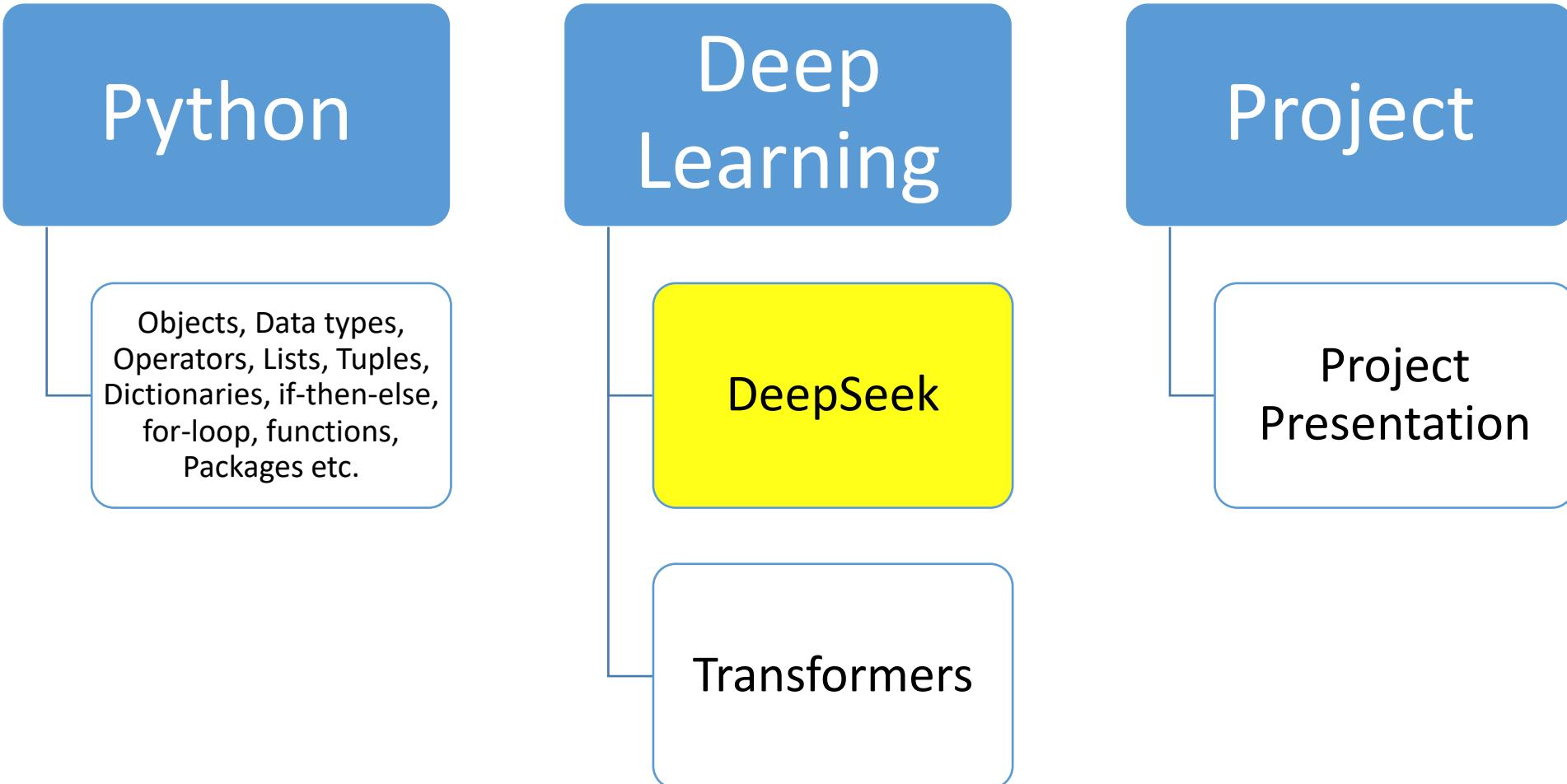
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Course Plan – 7 parts in total





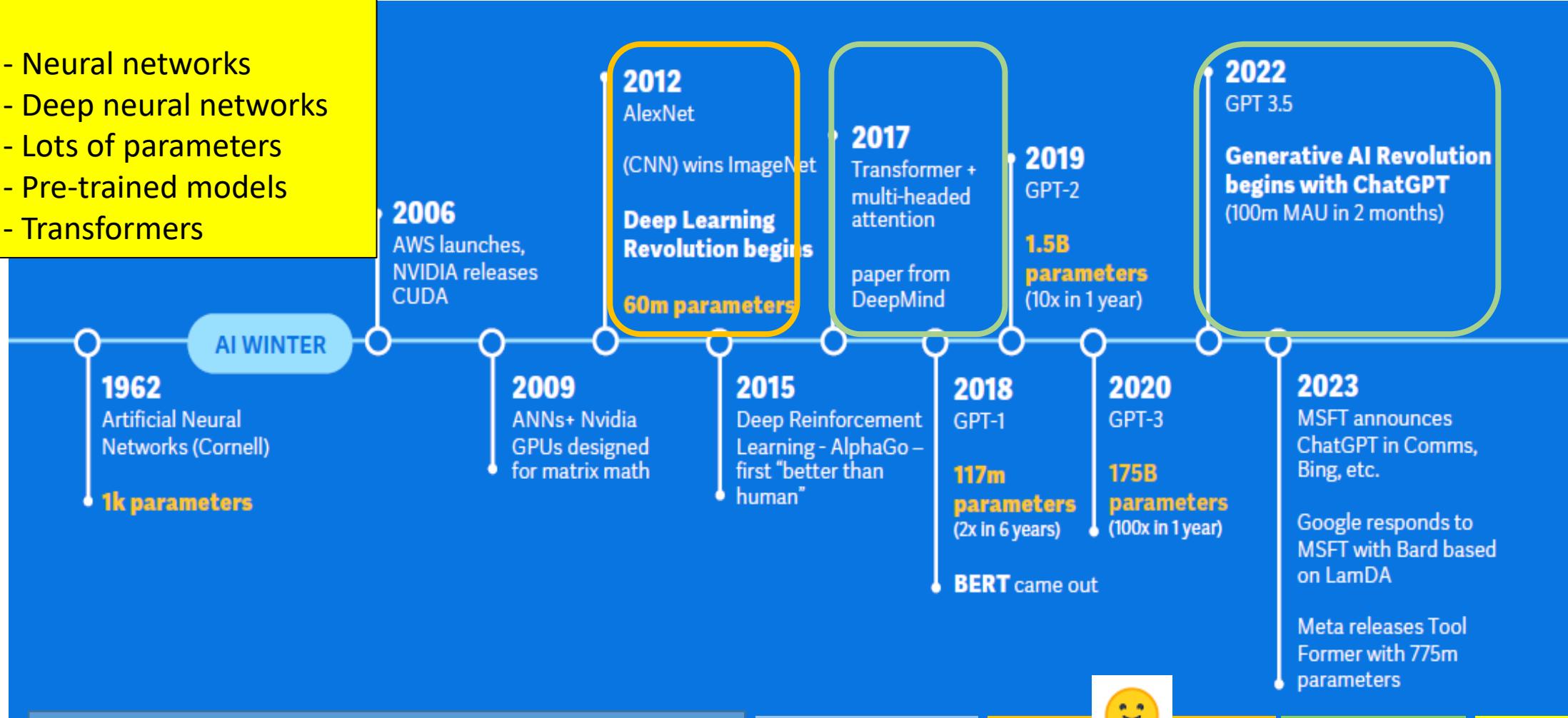
Outline

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



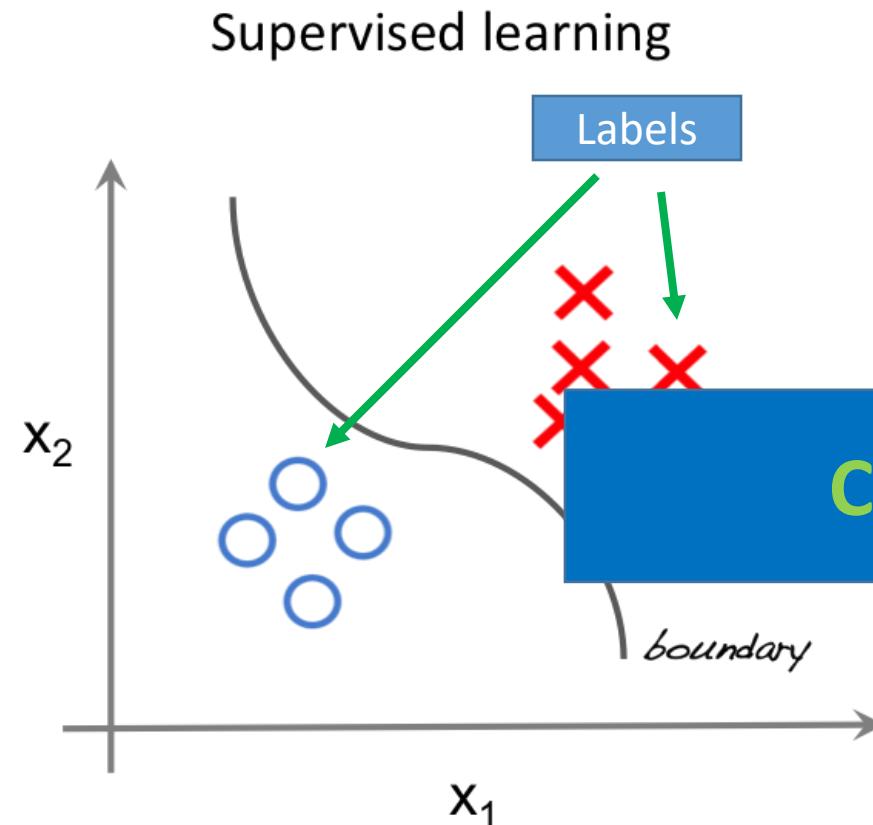
Hugging Face
Transformers

ChatGPT

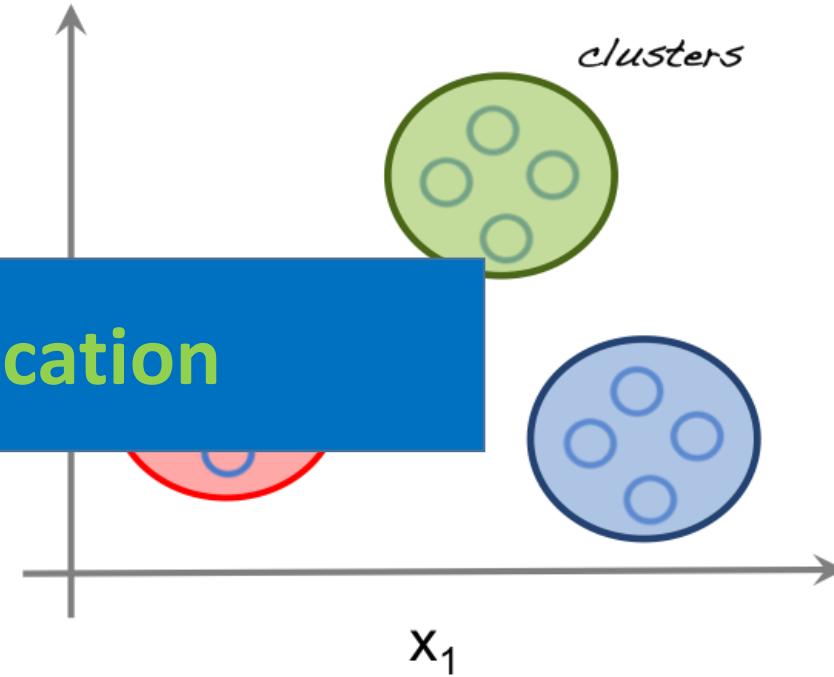
DeepSeek

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.

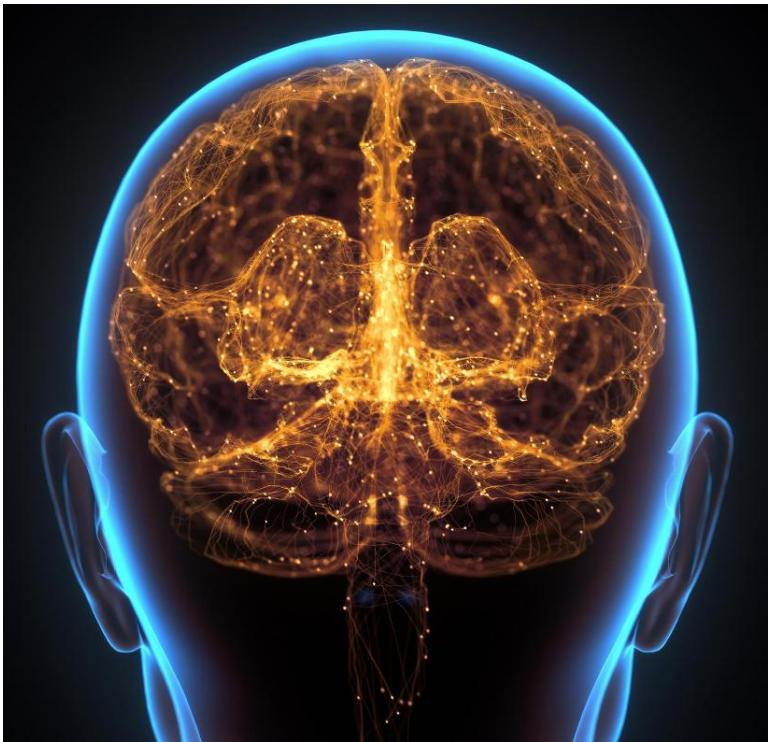
AI refers to machines or computer systems that can perform tasks that typically require human intelligence.

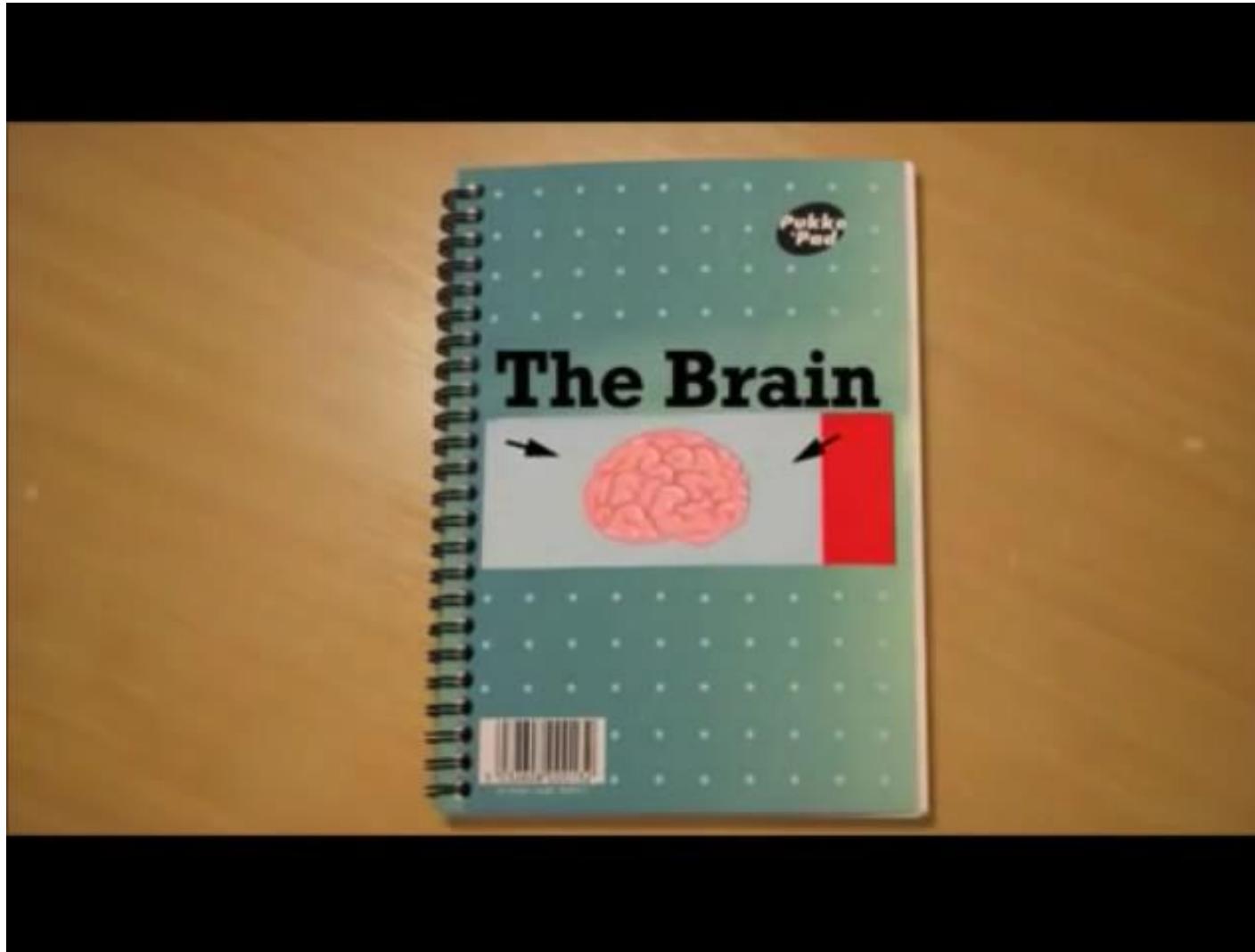
Key takeaways:

- 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

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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

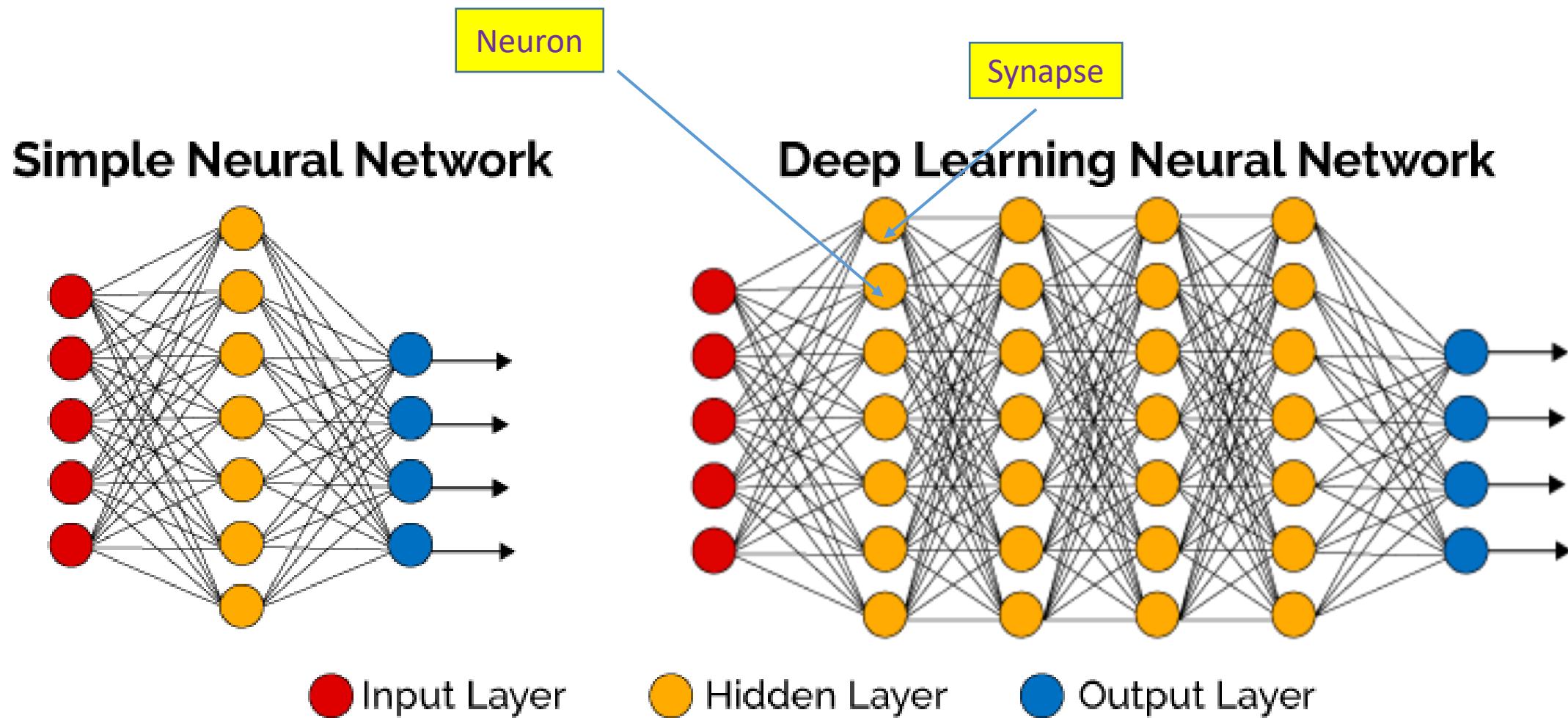
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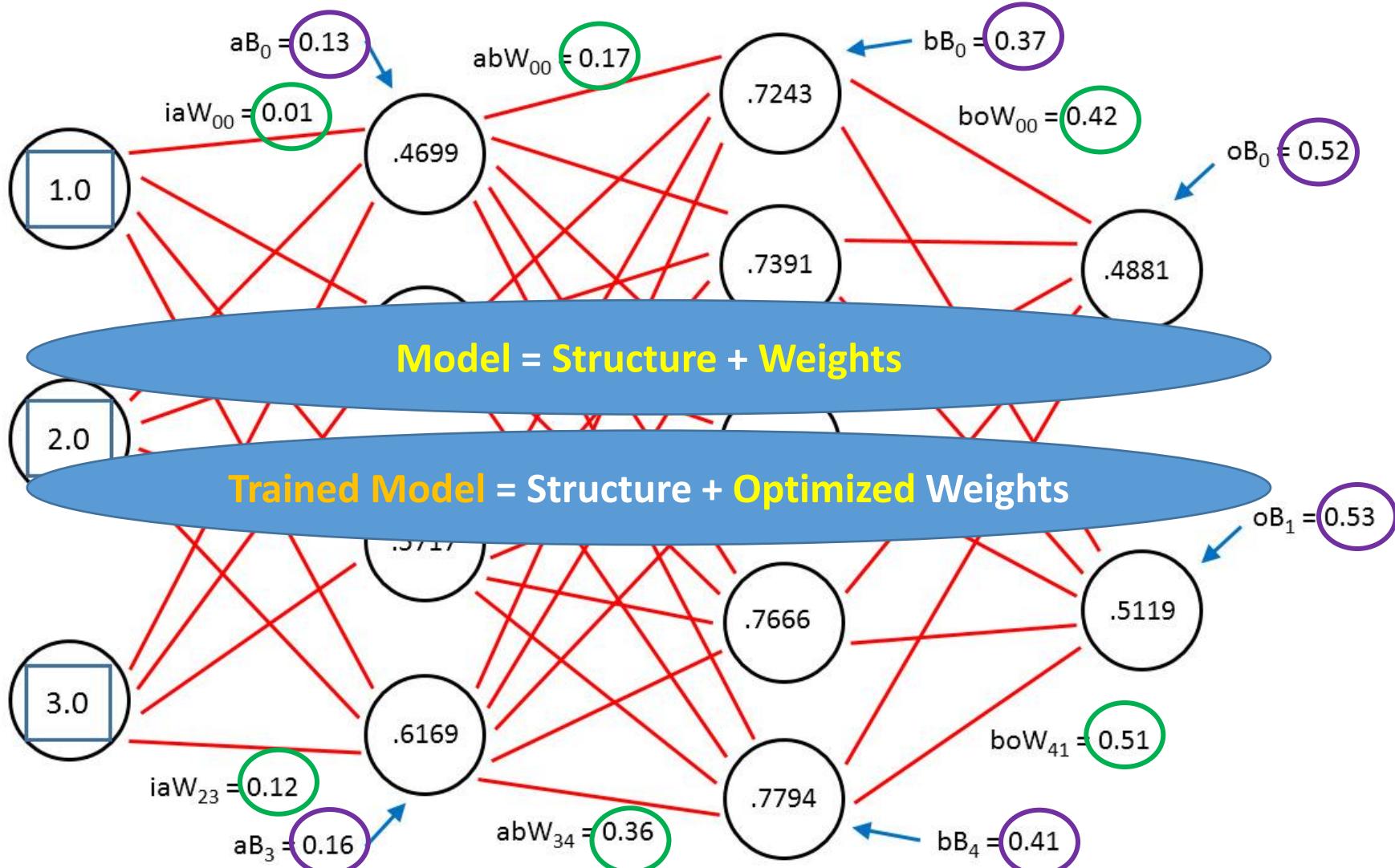
Learning:

- 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

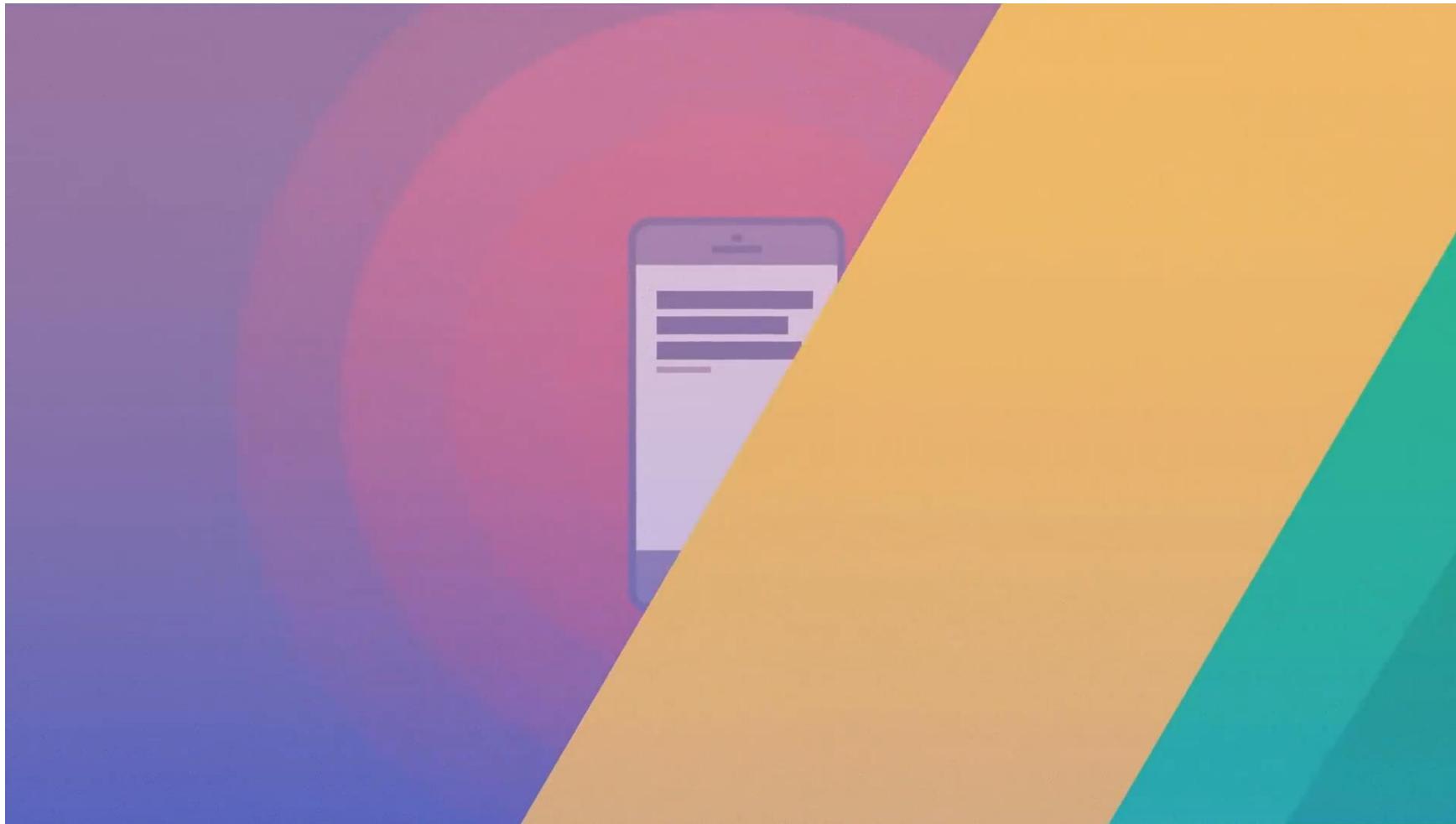
Programming Approach

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**



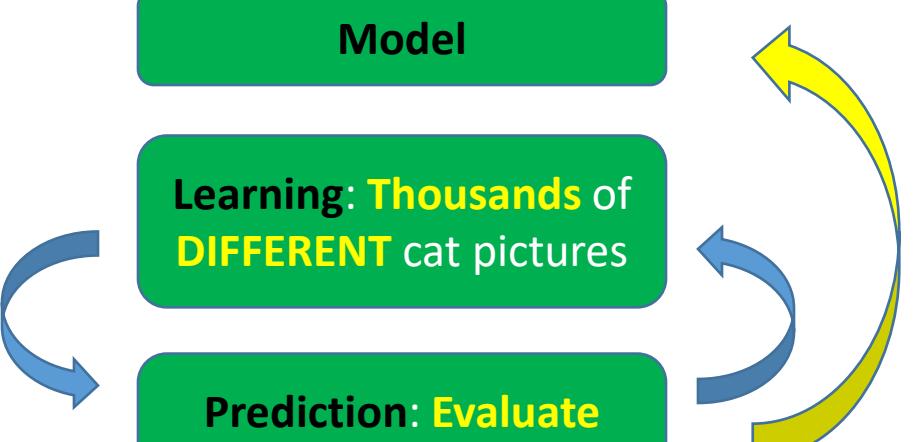
Deep Learning Approach

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**

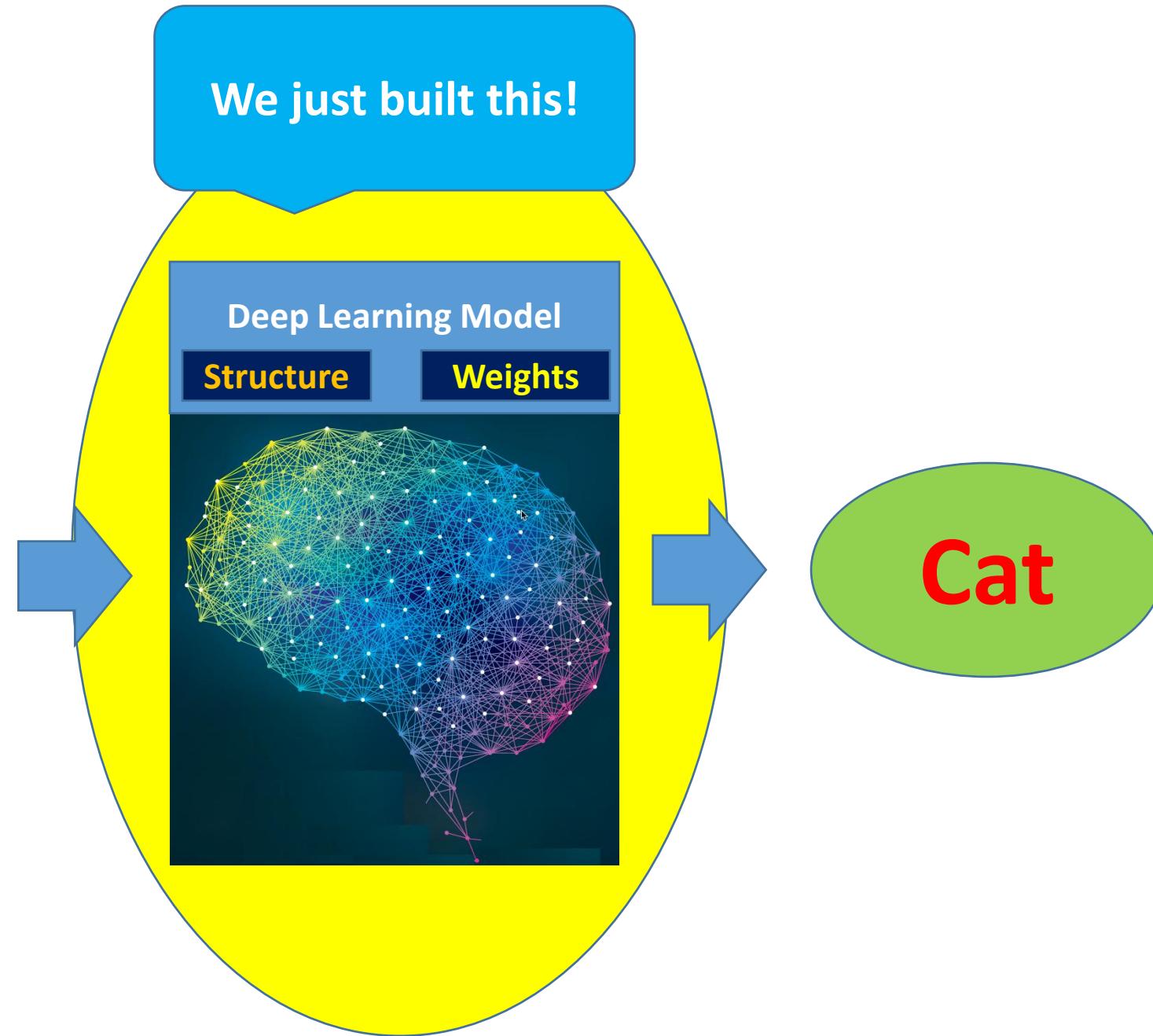


Deep Learning Approach

Trained Model

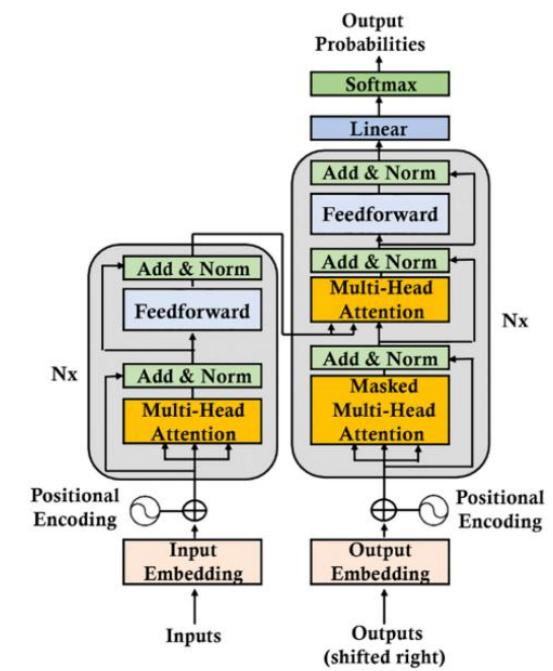
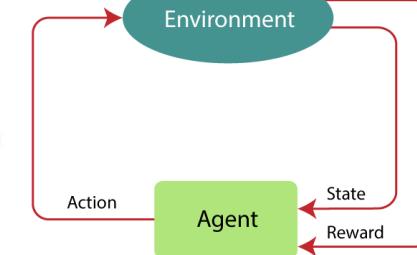
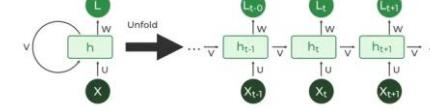
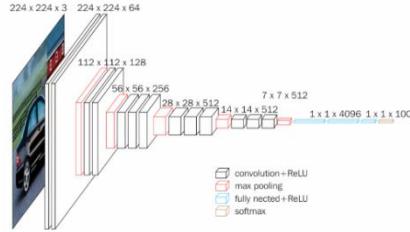
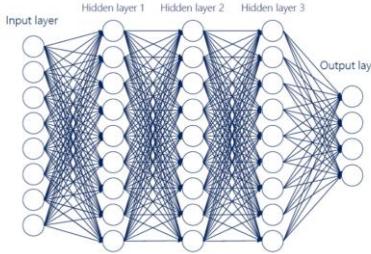
Problem: Wrong model,
data etc.

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

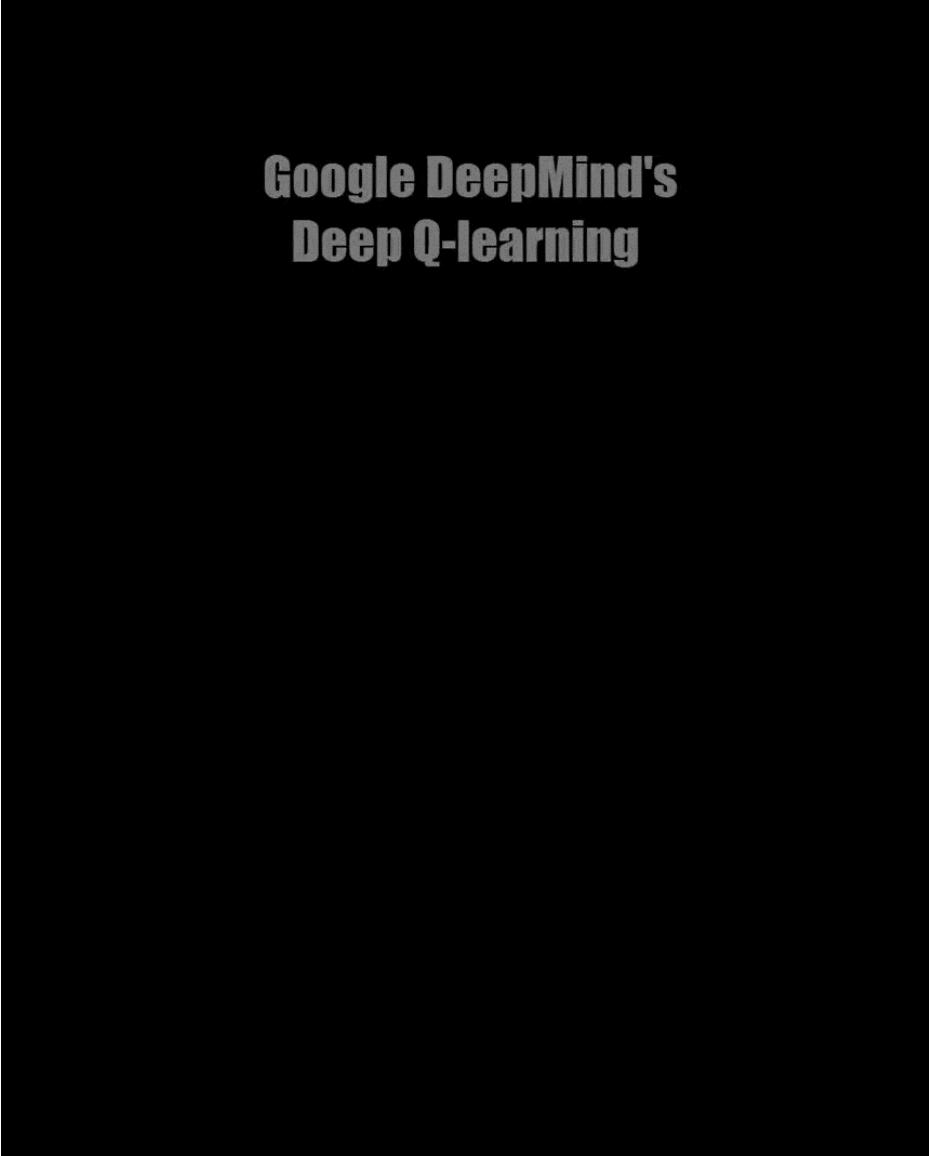
Transformer



The Aficionado

Deep music classification. Real time.

Source: https://www.youtube.com/watch?v=nOdz80J4_Rc

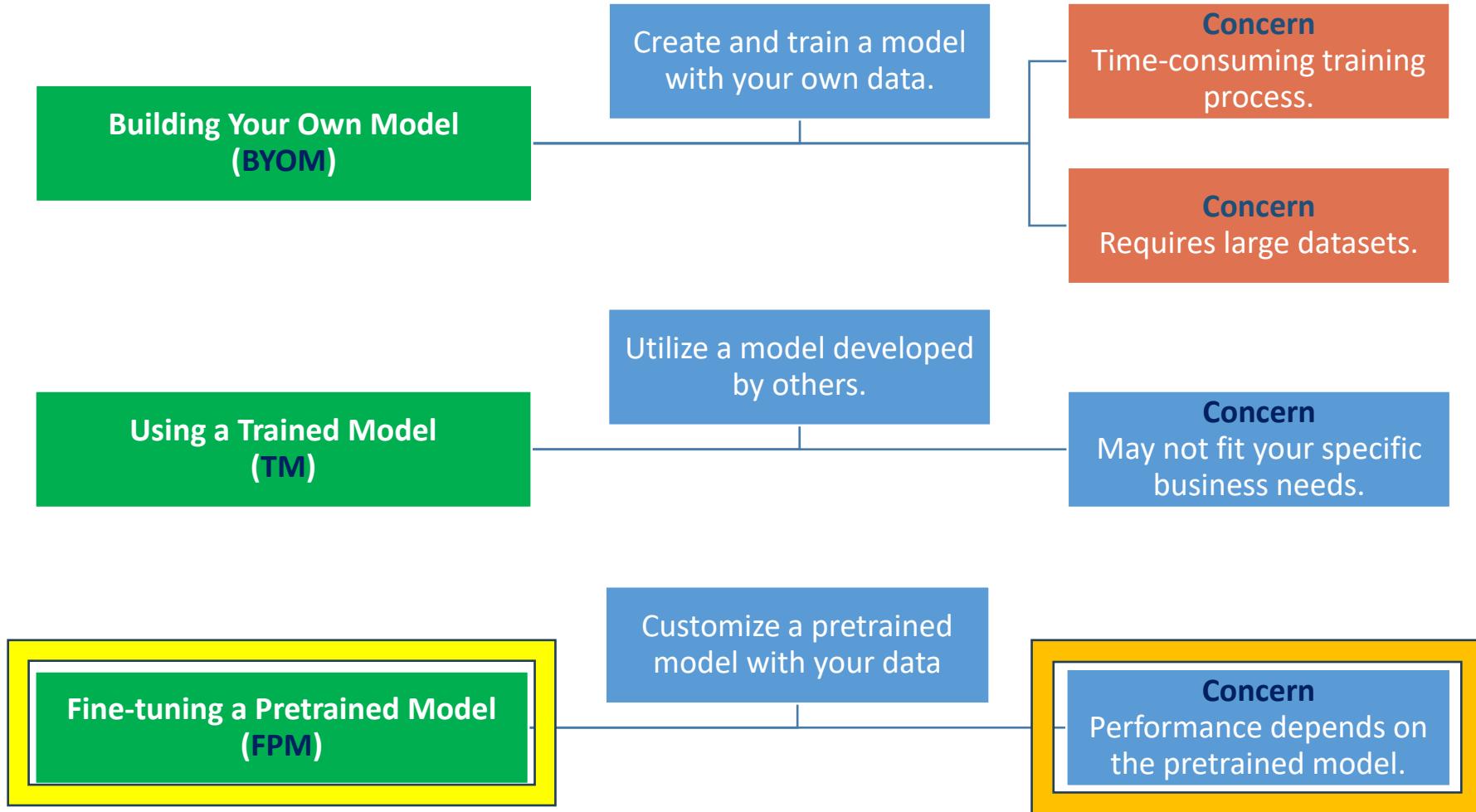


Google DeepMind's Deep Q-learning

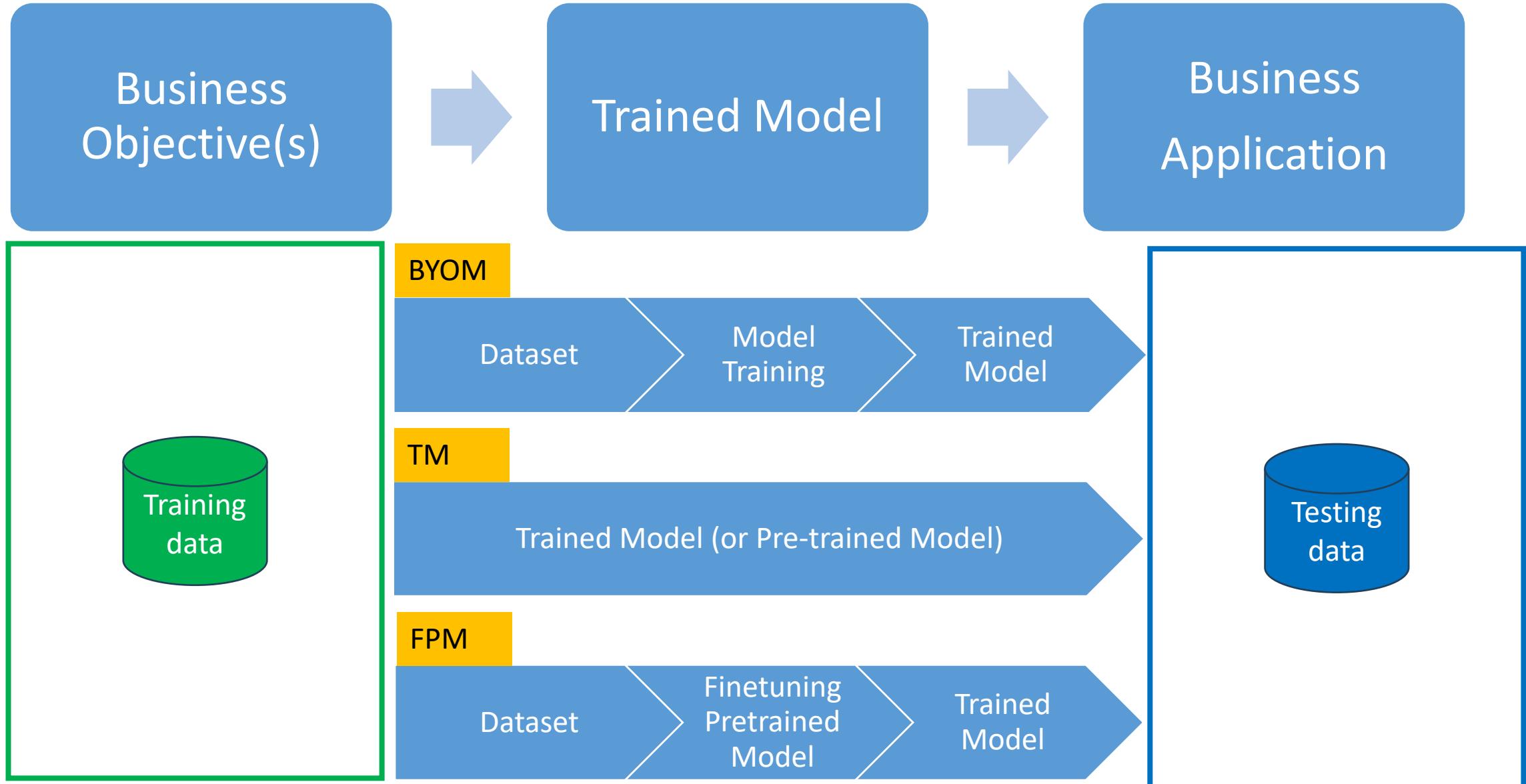
Source: <https://www.youtube.com/watch?v=V1eYniJ0Rnk>

4. Implementing Deep Learning in Business

Implementing Deep Learning in Business

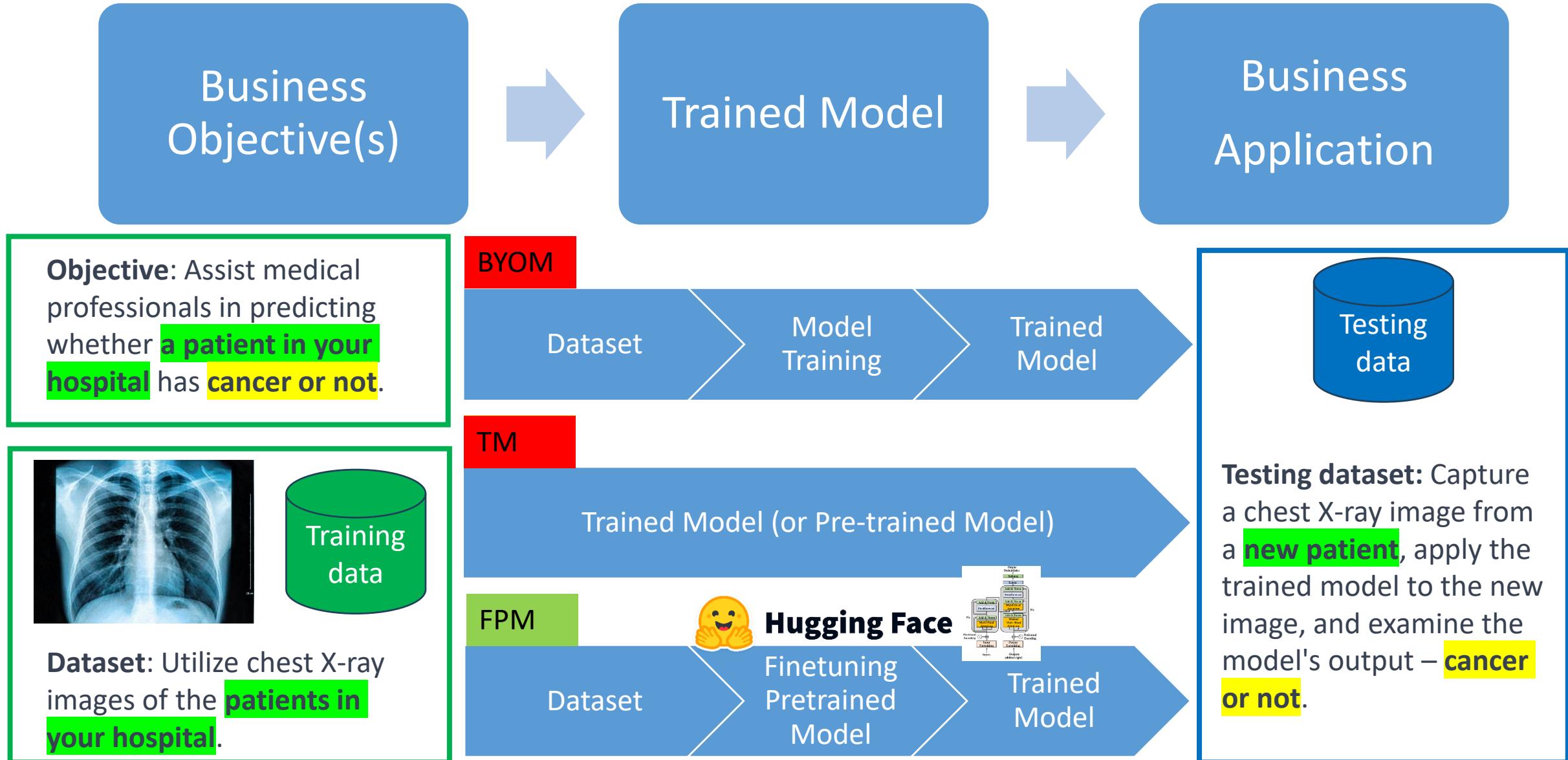


Deep Learning Business Application



Deep Learning Business Application: Example

Key takeaways:
- Business Obj
- Testing acc





**In-class
Activity**

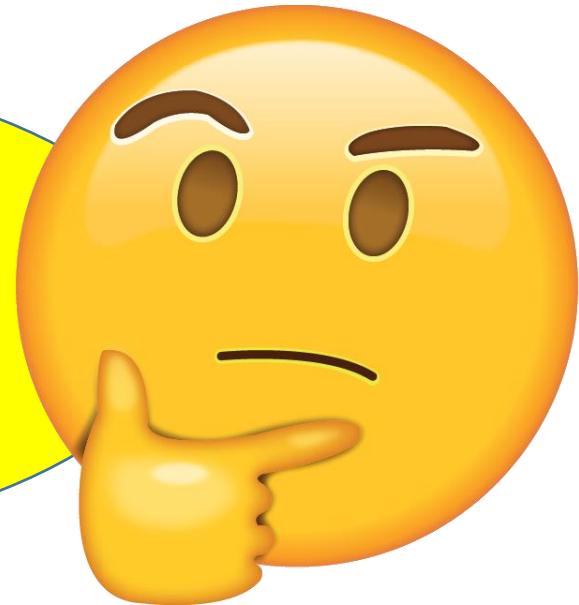
5. Your First Deep Learning Business Application

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