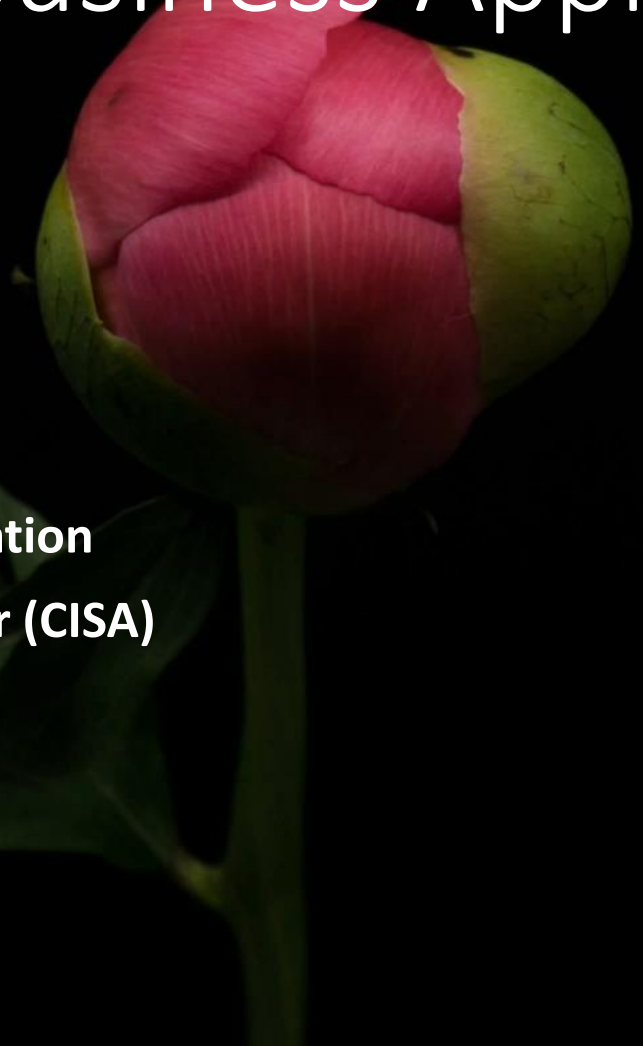
ISOM5240
Deep Learning Business Applications with Python



Prof. James Kwok

Associate Professor of Business Education

Certified Information Systems Auditor (CISA)

Email: jkwok@ust.hk

Attendance Requirement

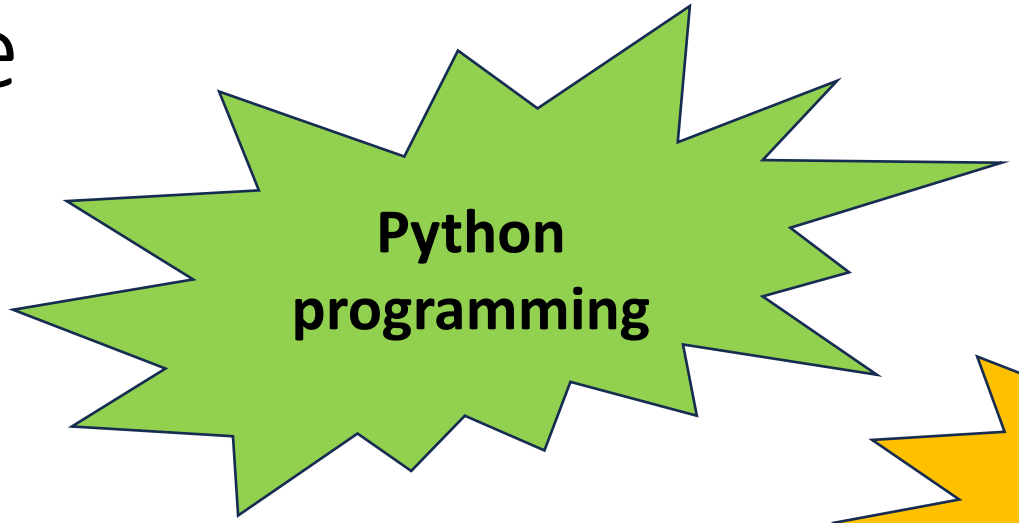
- Attendance at classes is **mandatory** for all courses.
- Students must notify the professor of the course and the HKUST MSBA Program Office **in advance** if they are unable to attend classes.
- Absent with any reason (e.g. sick leave with valid medical proof) will be treated as below:

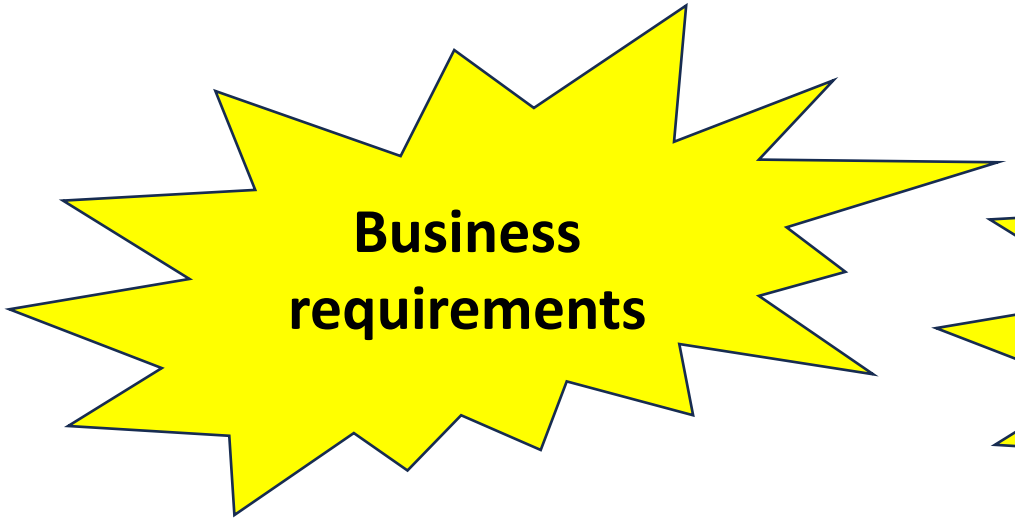
Absent for	2-credit course (total 8 sessions)
1st time	Allowed (Program Office will issue warning email to students)
2nd time	Allowed (One-third grade reduction will be given)
3rd time	"W" (representing withdrawal from class) will be shown on transcript

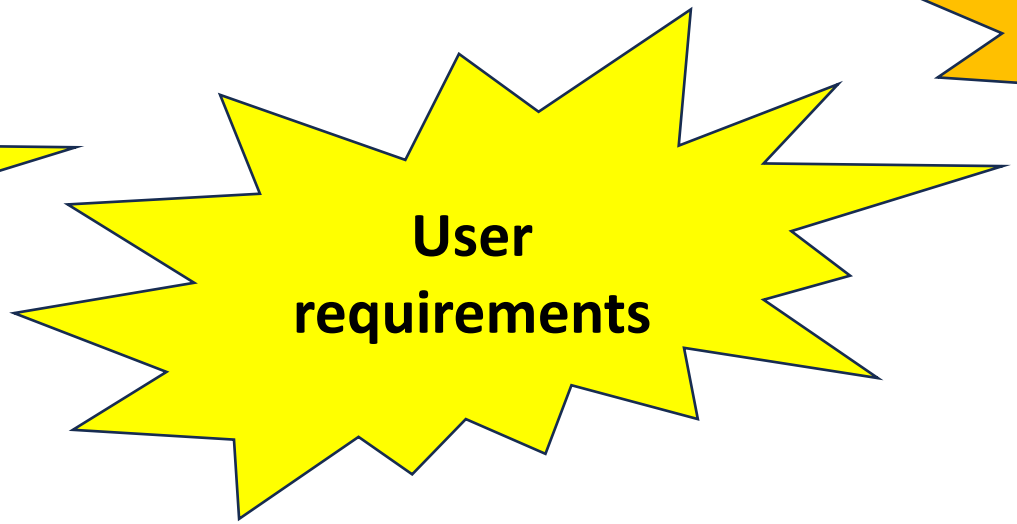
- Professors have the discretion to execute a stricter attendance policy at course level.
- Classes will **start on time.**
- Full-time student who are **more than 15 mins late** will be considered **Absent from Class.** Part-time students will be given **30 mins** for the buffer time.
- Students who 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?

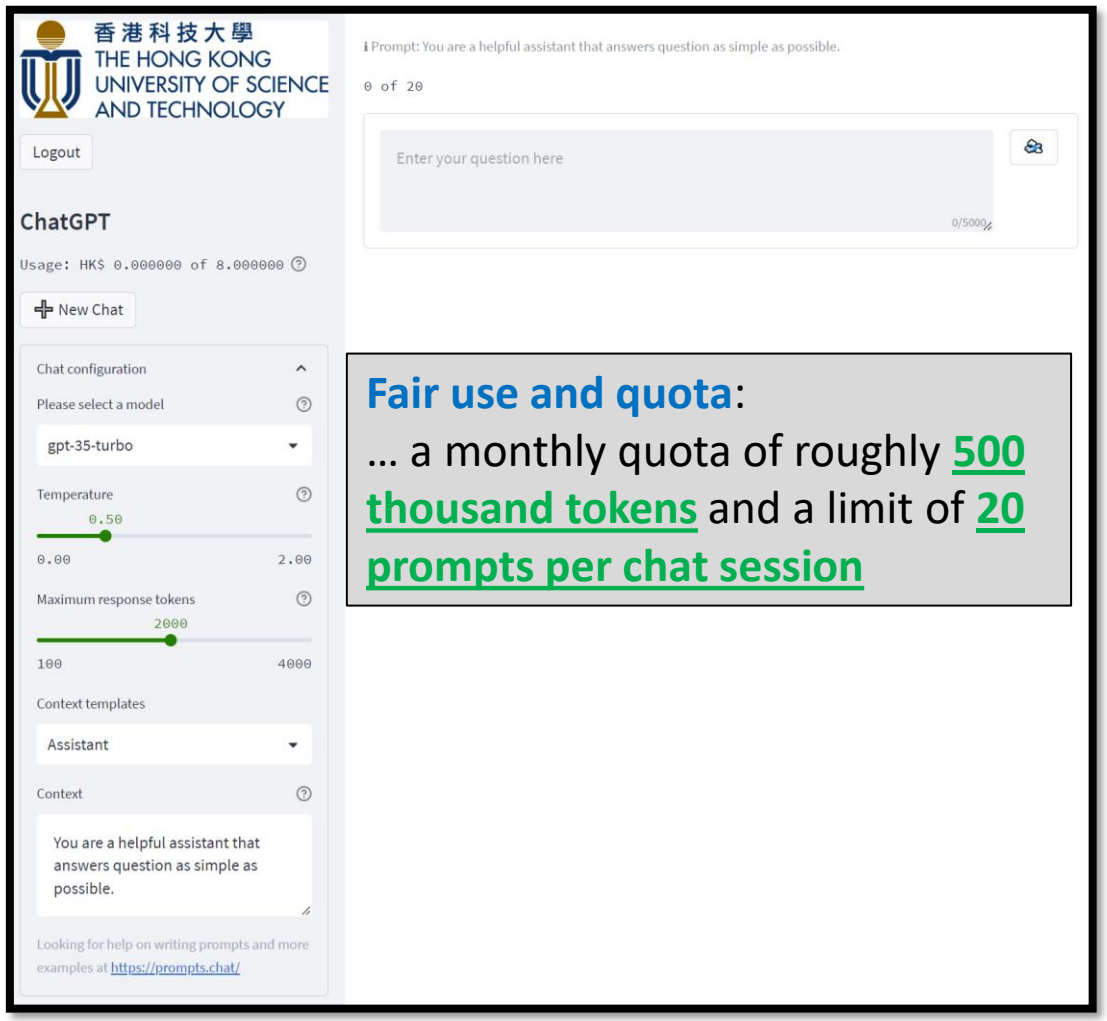
- Those who want to develop deep learning business applications & models that can be used by other users who need not be familiar with the model
- Those who want to apply transfer leaning in business application development
- Those who want to develop deep learning business applications which make tasks 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**

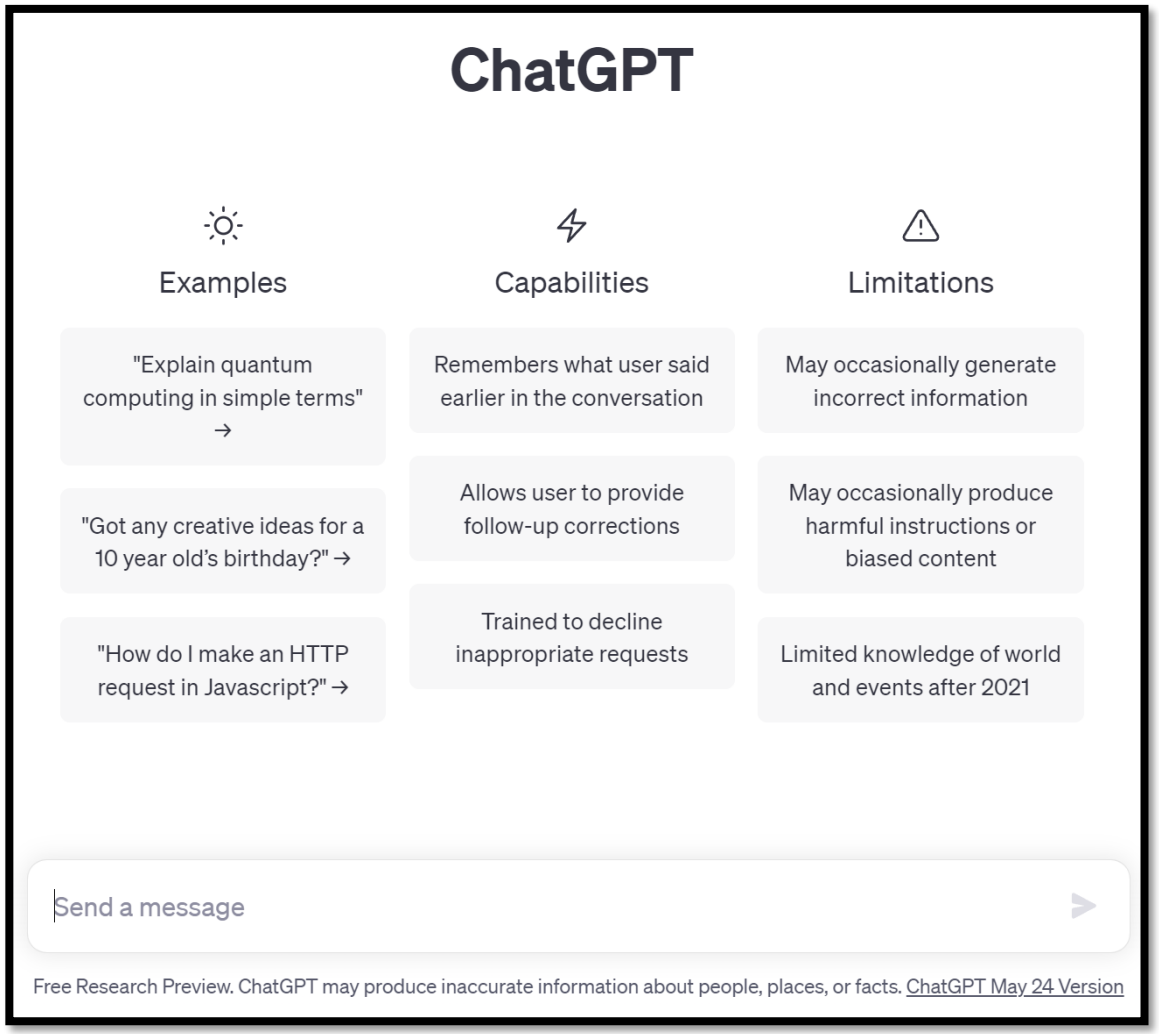
ChatGPT



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

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”

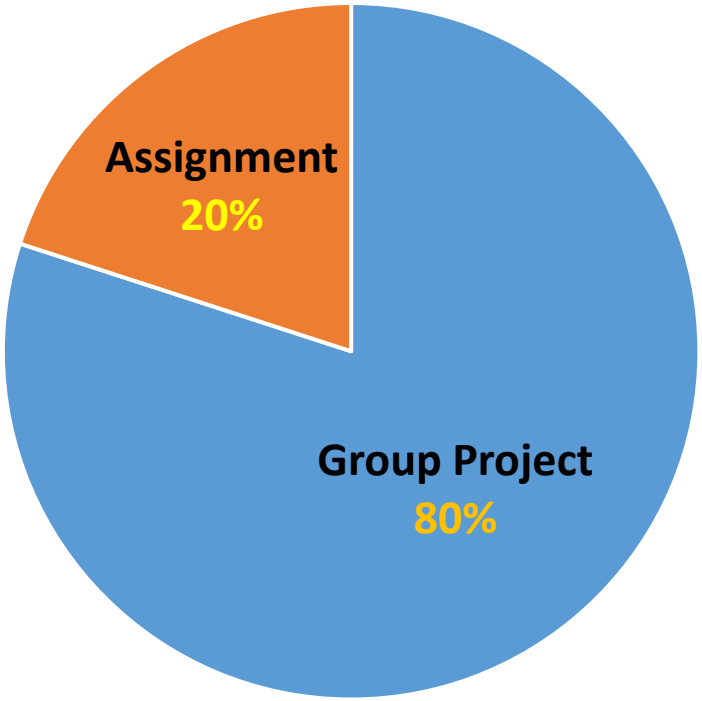
“ChatGPT Can’t Handle Complex Tasks”

“Developers Still Needed for Quality Checking”

“No Tech is Proven to Replace Creativity”

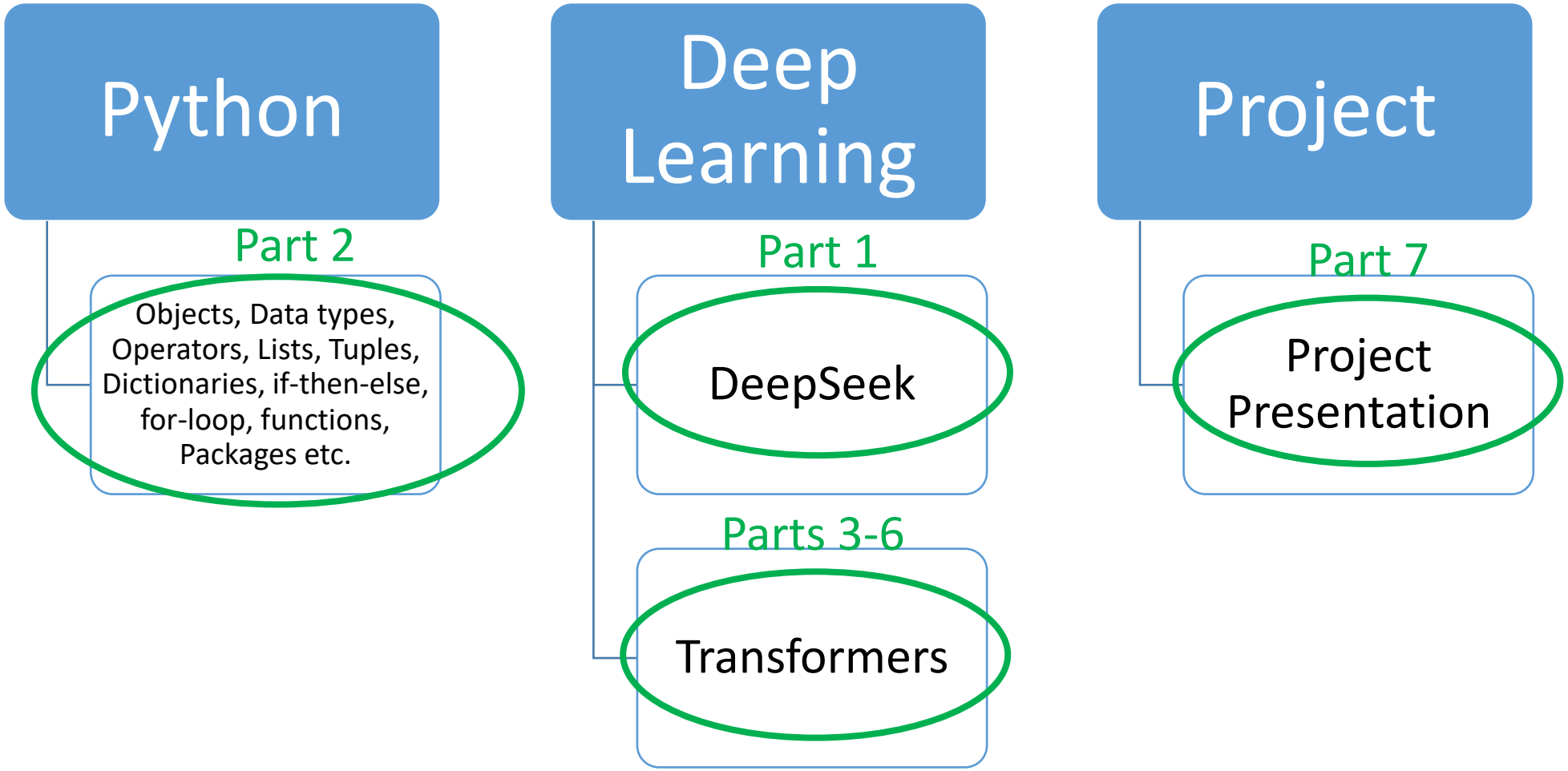
“AI Won’t Steal Your Job; Person Using AI Will”

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



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Introduction to Deep Learning Models

Prof. James Kwok

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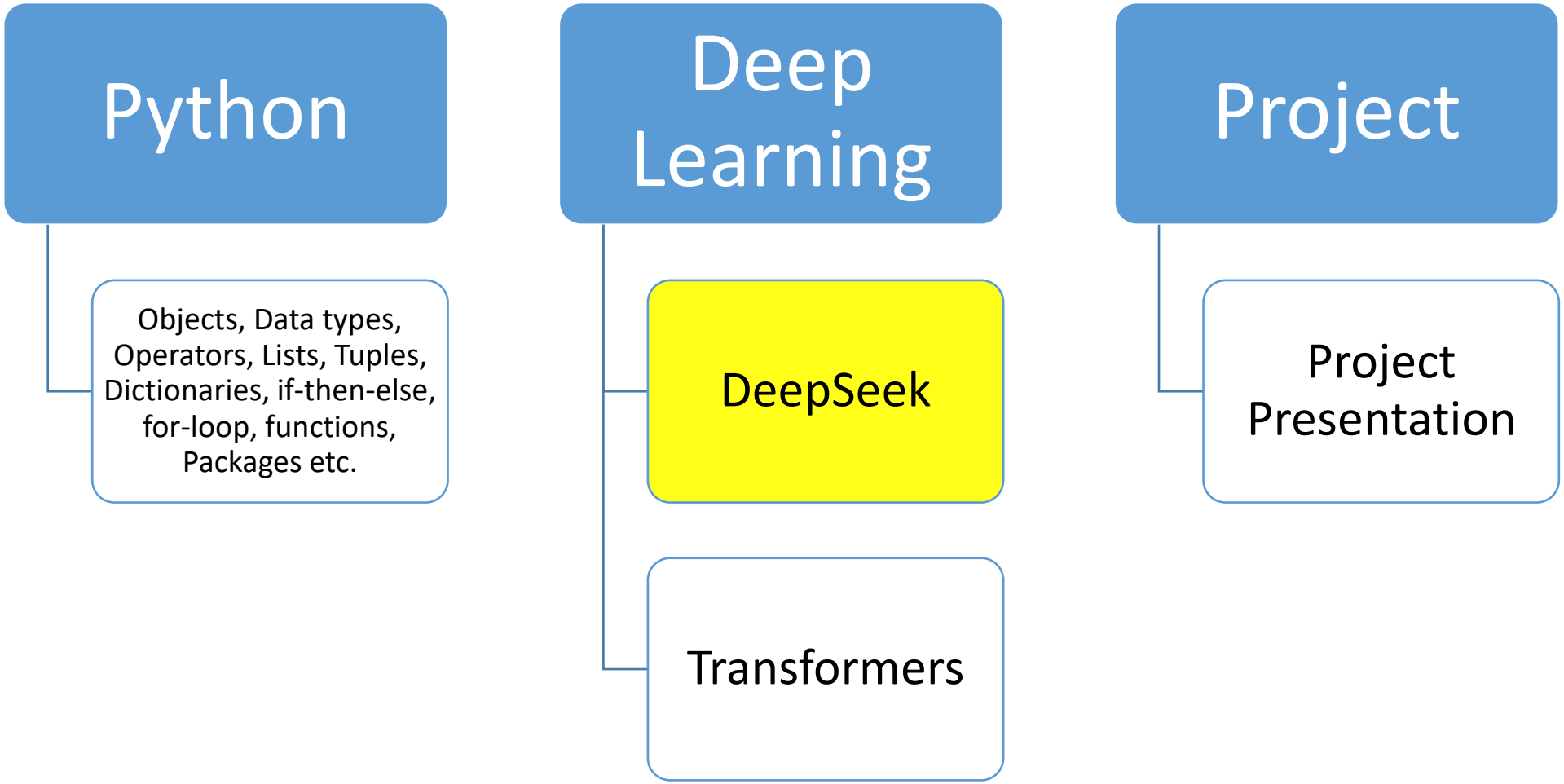
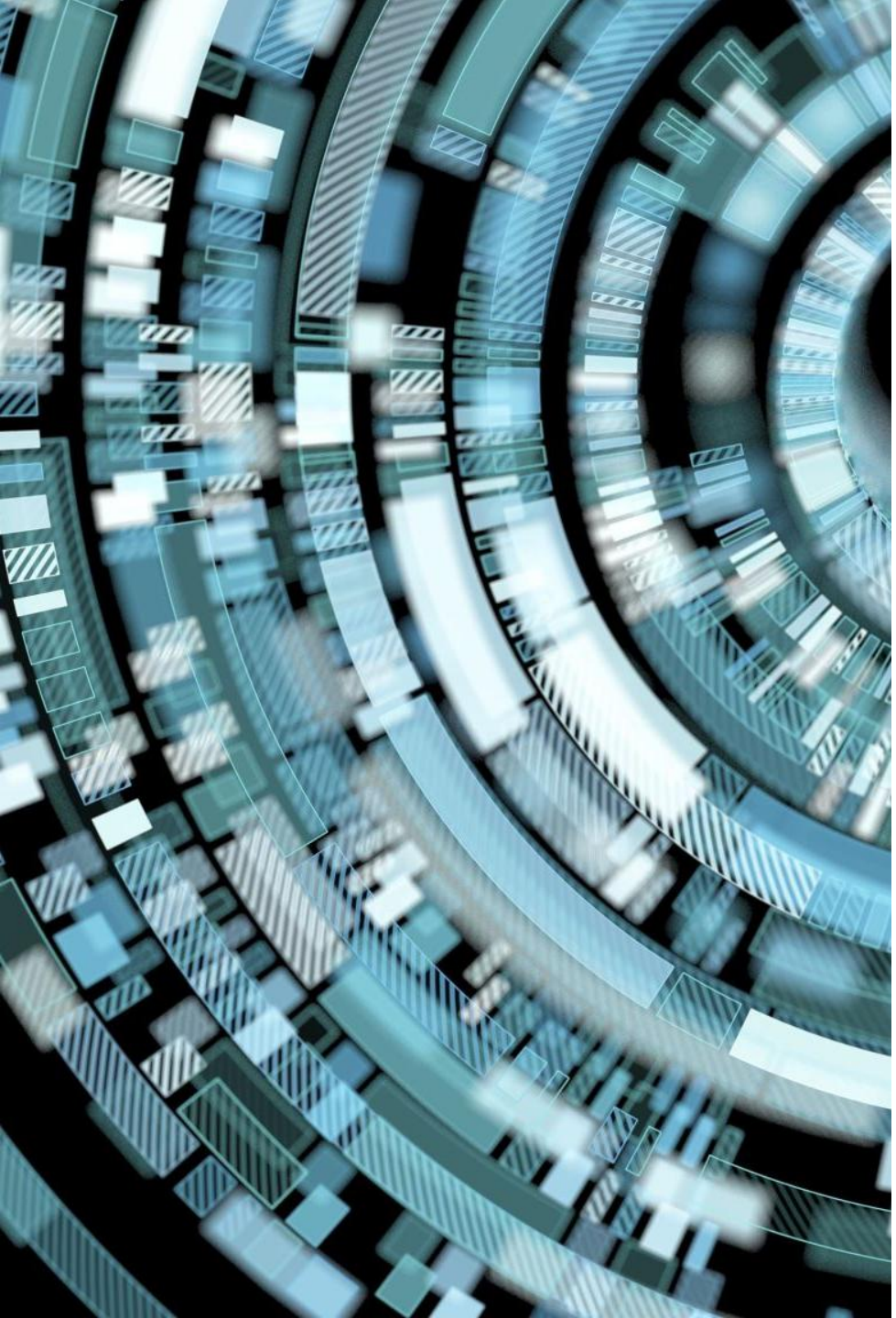
Email: jkwok@ust.hk

Course Plan – 7 parts in total





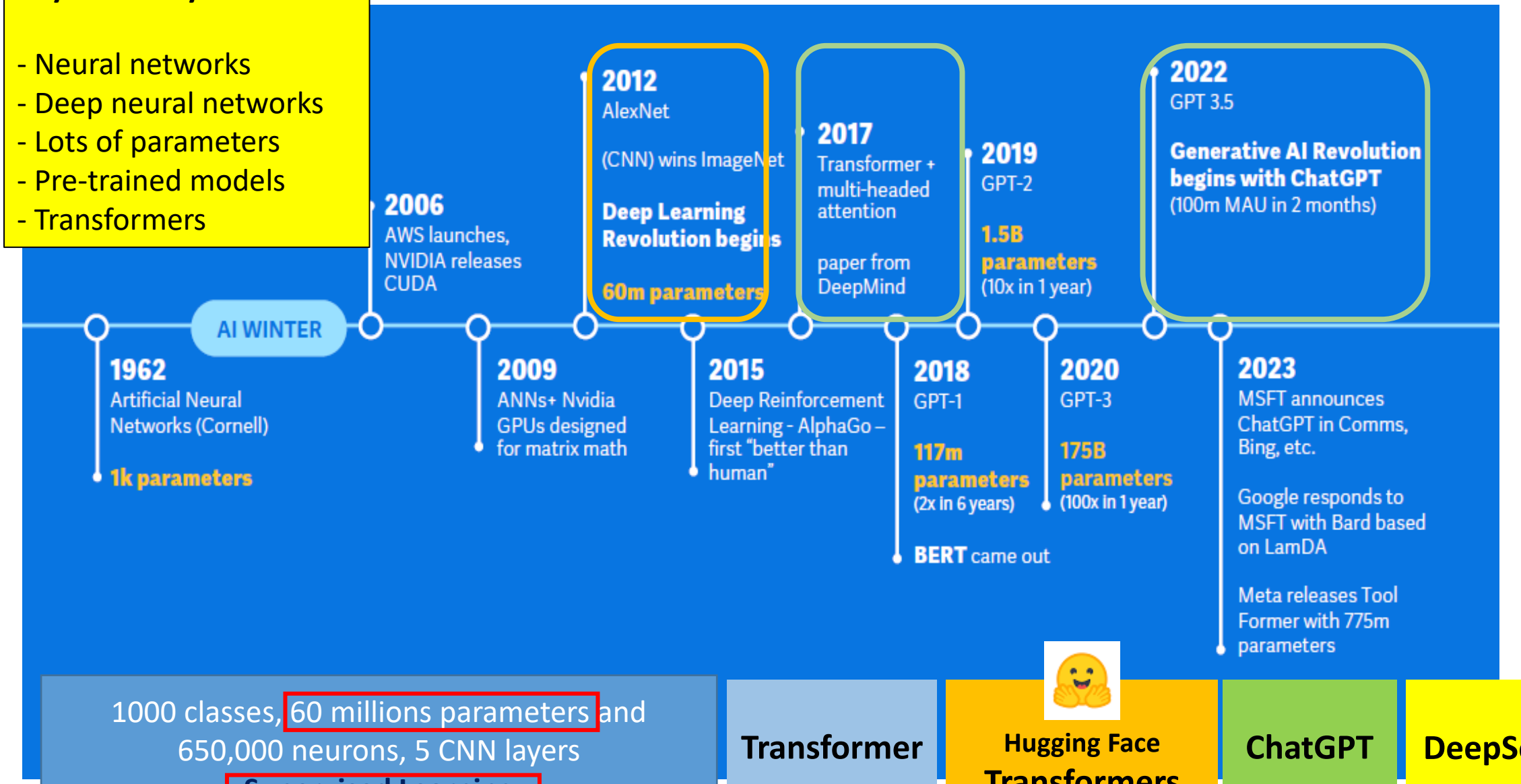
Outline

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

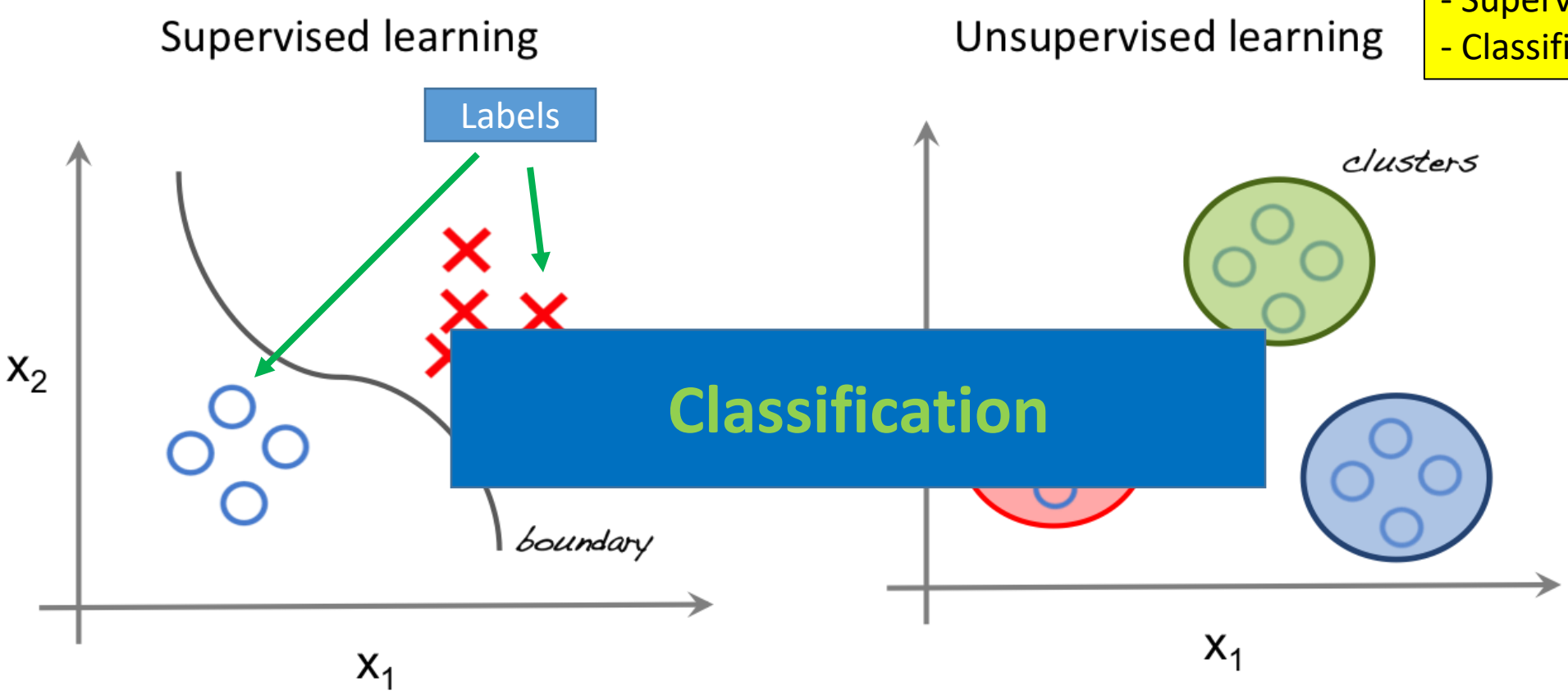
DeepSeek

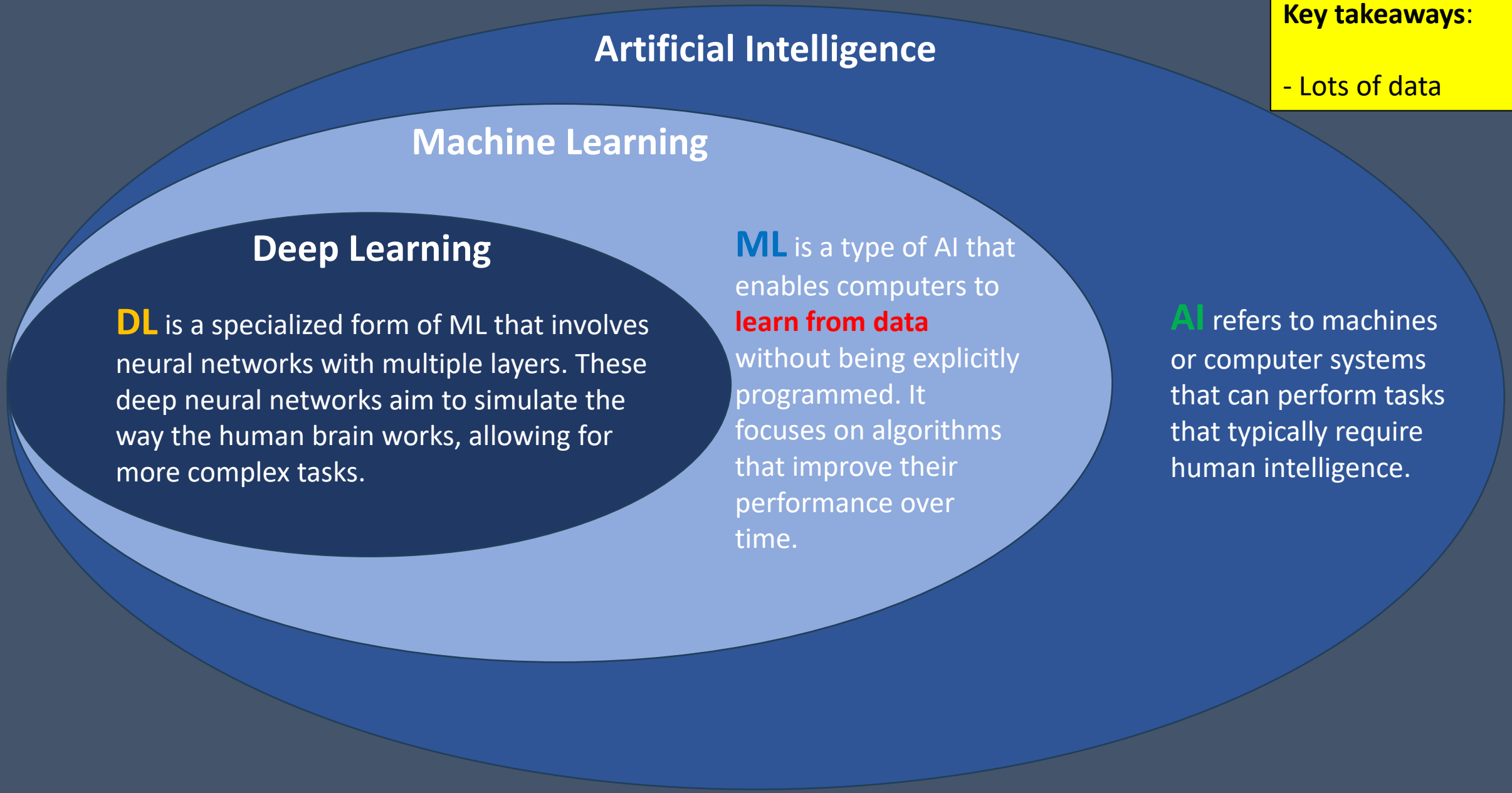
Supervised Learning Vs Unsupervised Learning

ChatGPT uses supervised learning

Key takeaways:

- Supervised learning
- Classification



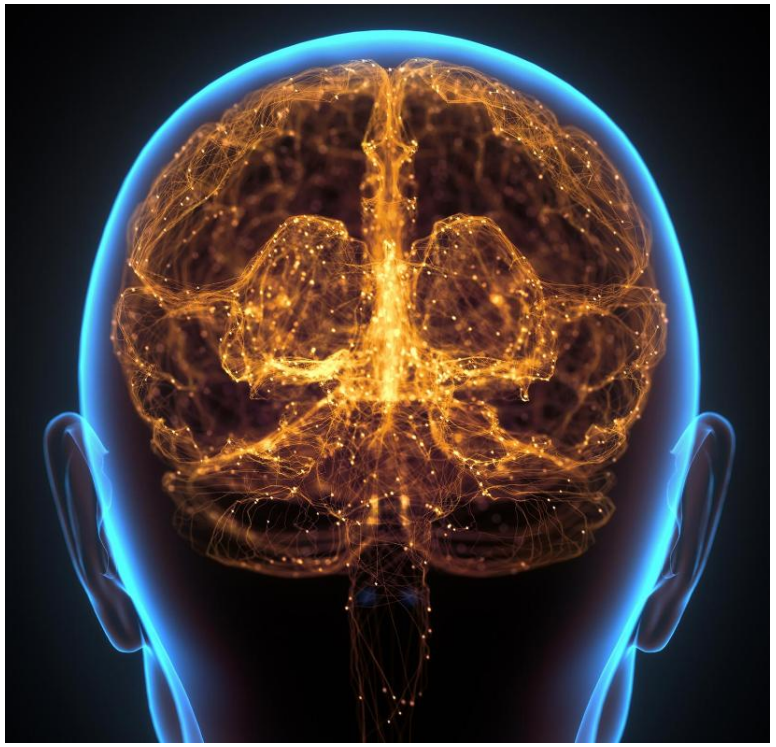


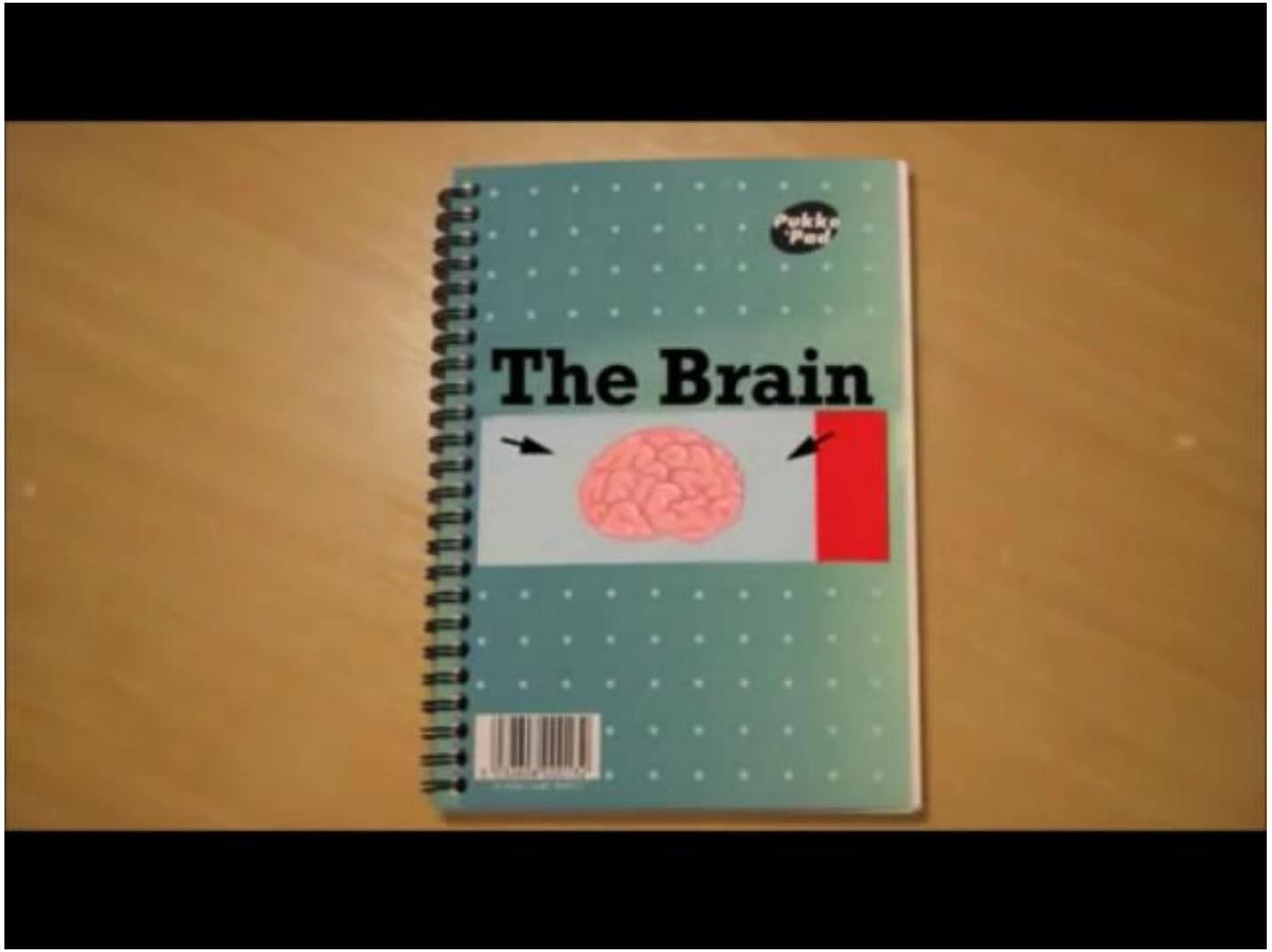
Key takeaways:

- 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=cgLYkV689s4

Human Brain:
Boss – e.g., Learning
Learning: thinking, remembering, and feeling
Weight: 3 pounds
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Deep Learning:
Boss – e.g., Learning
Learning: thinking, remembering, and feeling
Weight: _____
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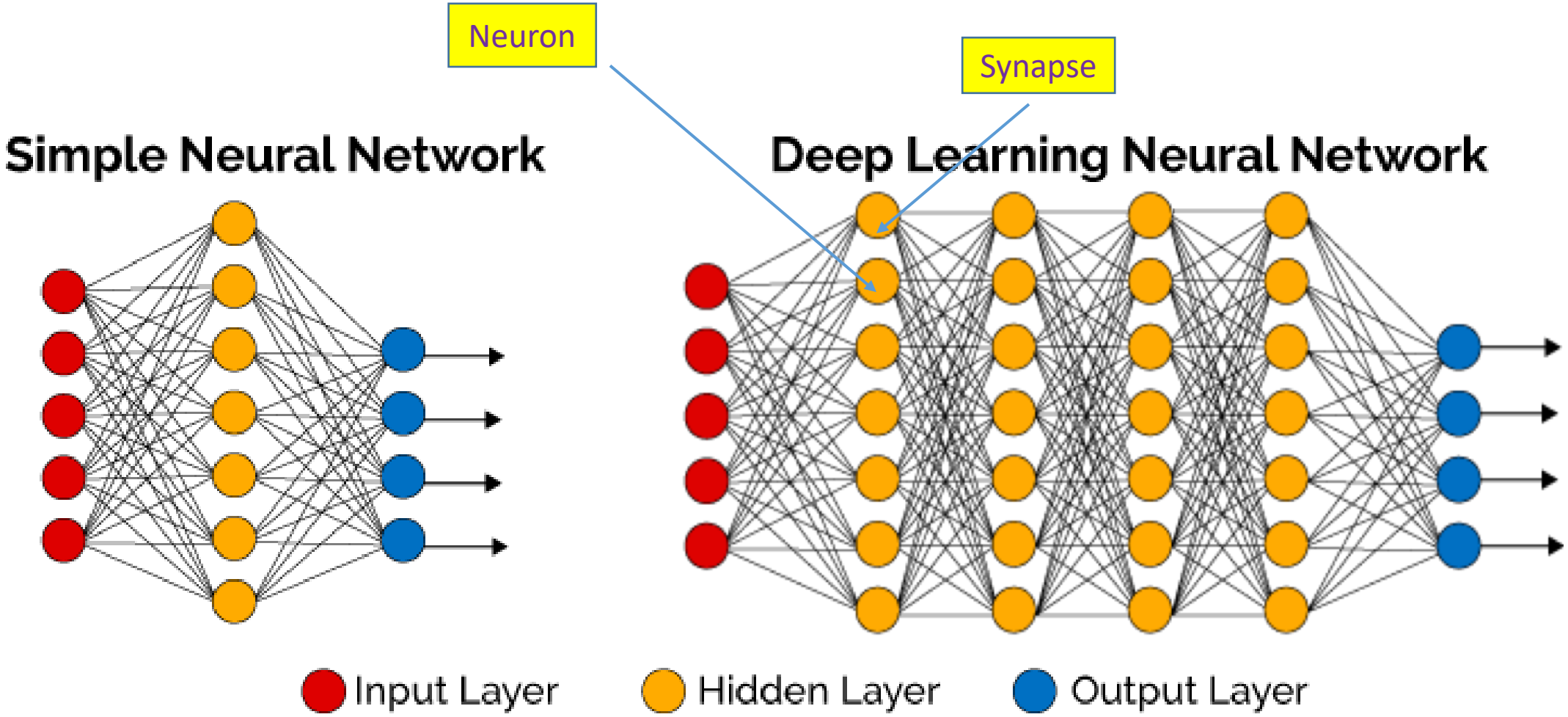
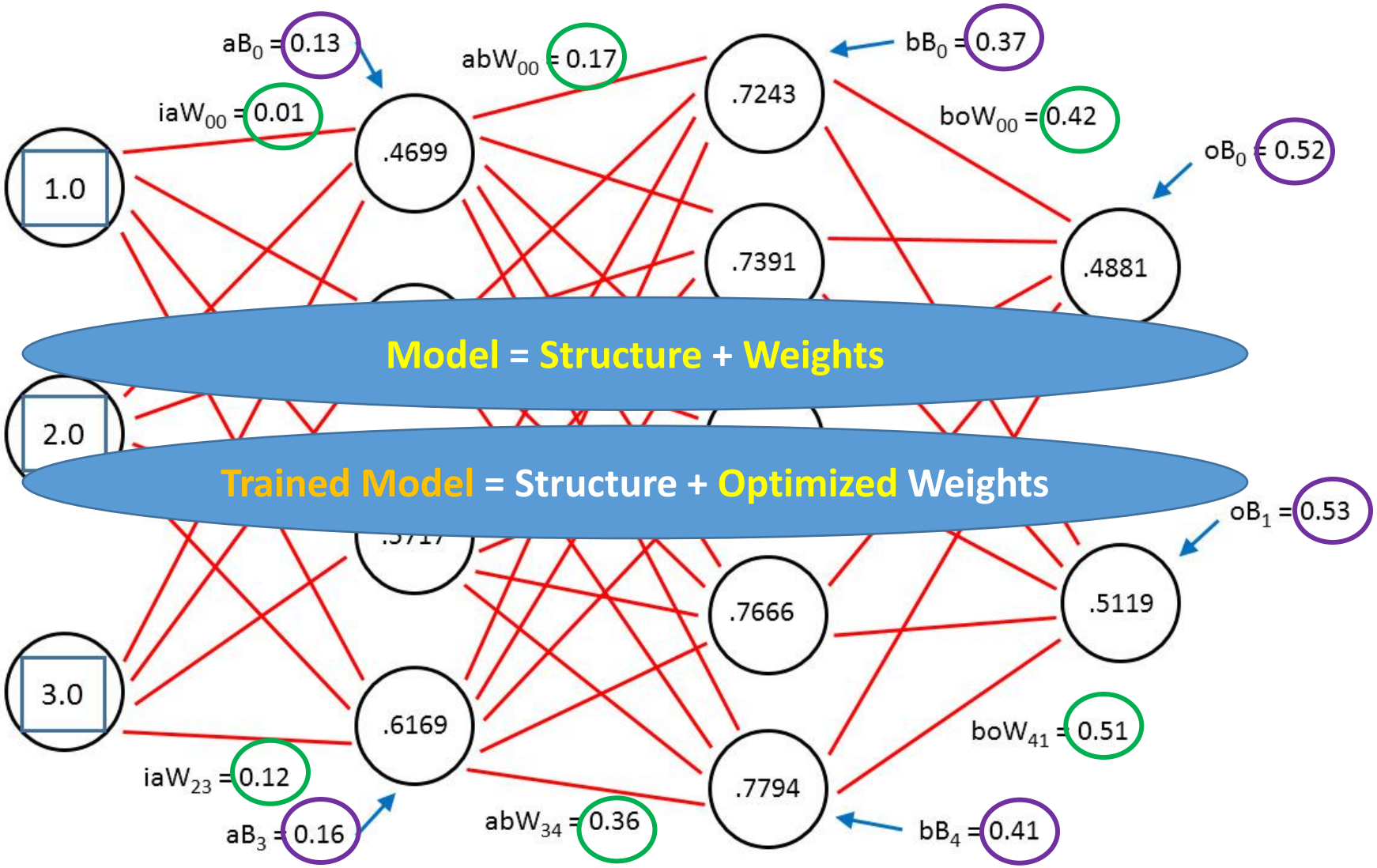
Deep Learning Neural Network Model



Deep Learning Neural Network Model



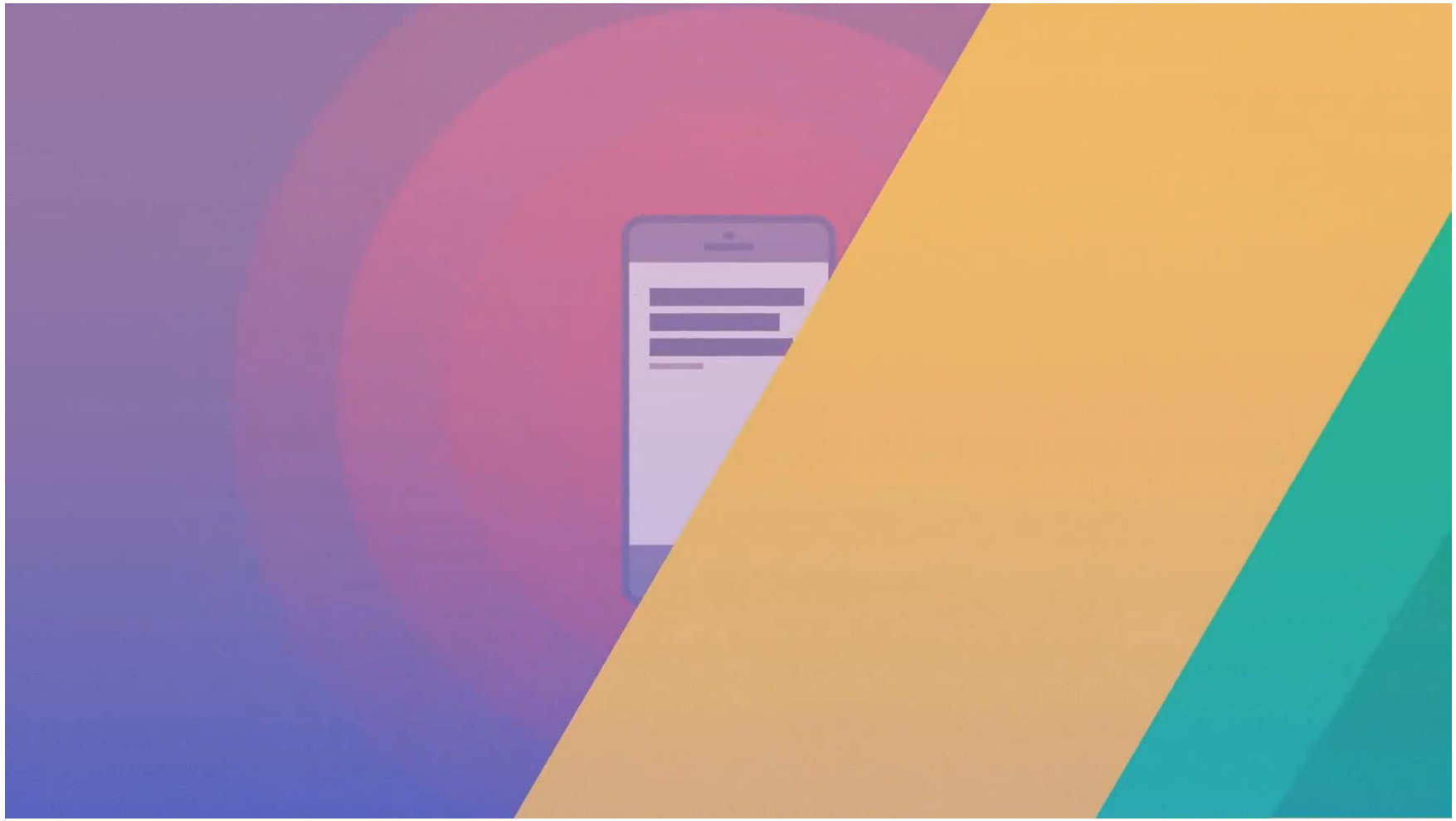
An Example of Deep Learning Neural Network

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

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

Model

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

Prediction: **Evaluate the performance**

Problem: Wrong model, data etc.

An Example of Deep Learning

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**

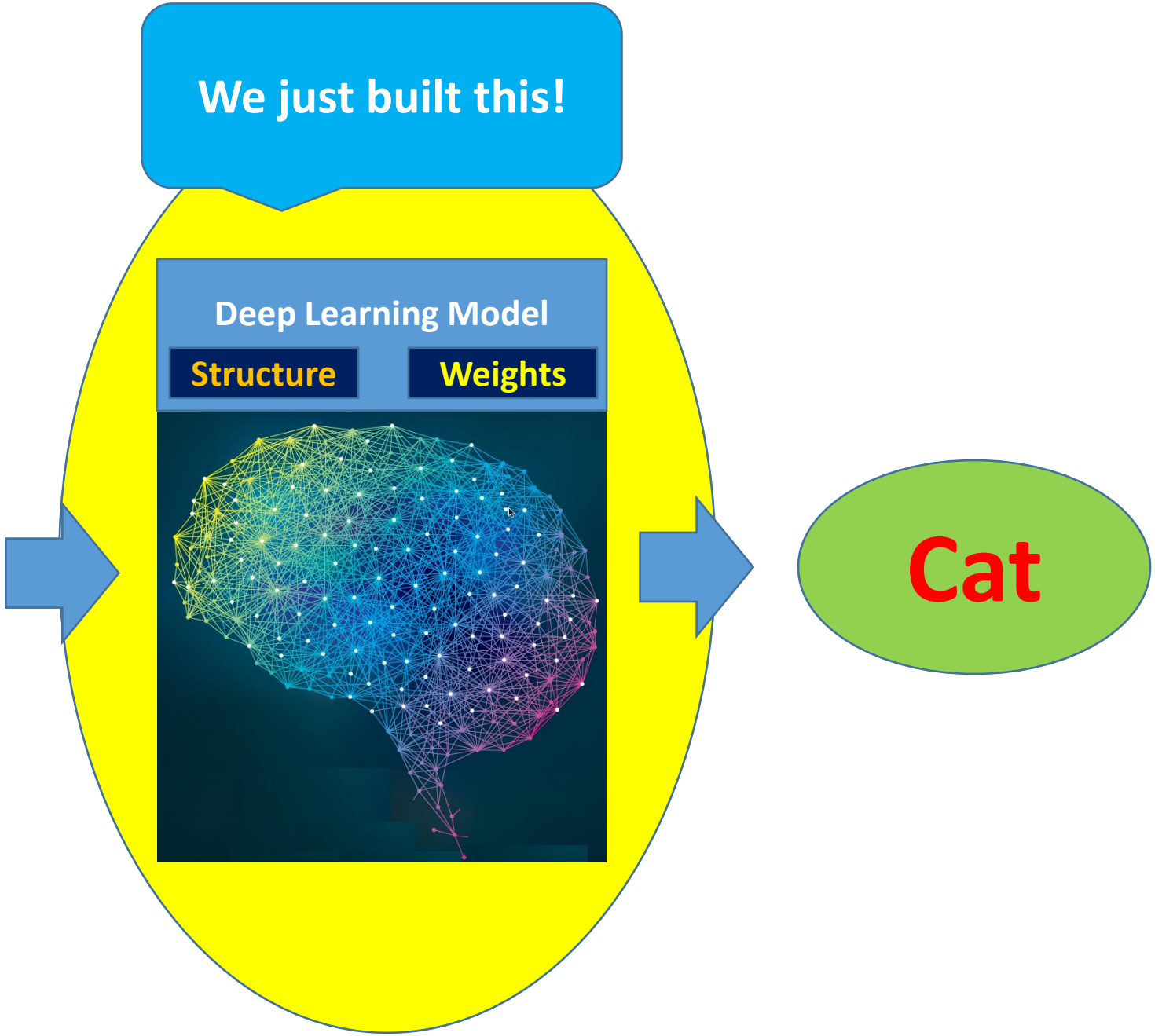
Try to do: Identify it as a **Cat**

Deep Learning Approach

Trained Model

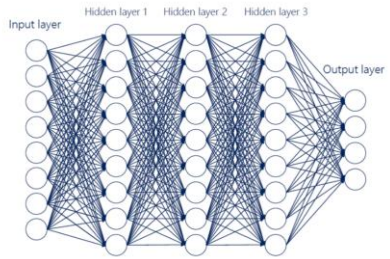
Problem: Wrong model, data etc.

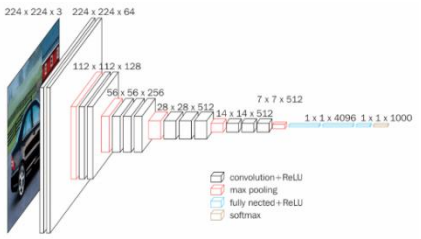
Summary

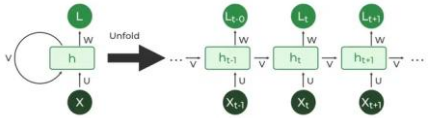

We just built this!
Deep Learning Model
Structure
Weights
Cat

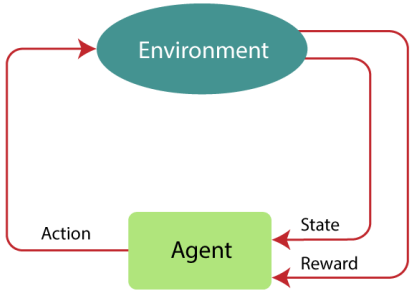
3. Different Deep Neural Networks

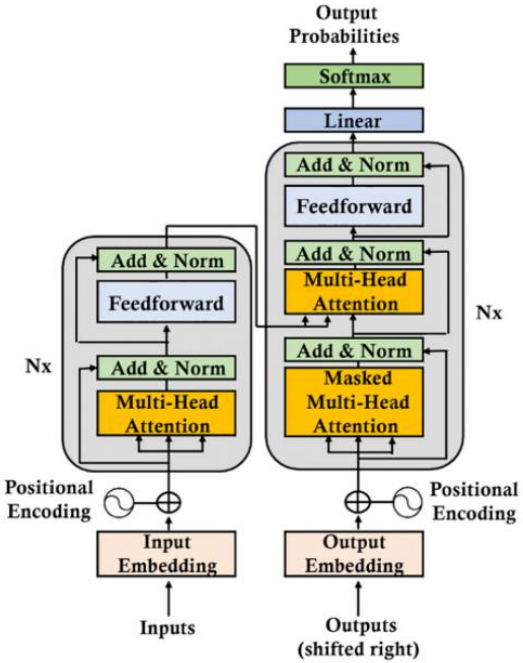
Different Deep Neural Networks











Deep Neural Network (DNN)

Convolutional Neural Network (CNN)

Recurrent Neural Network (RNN)

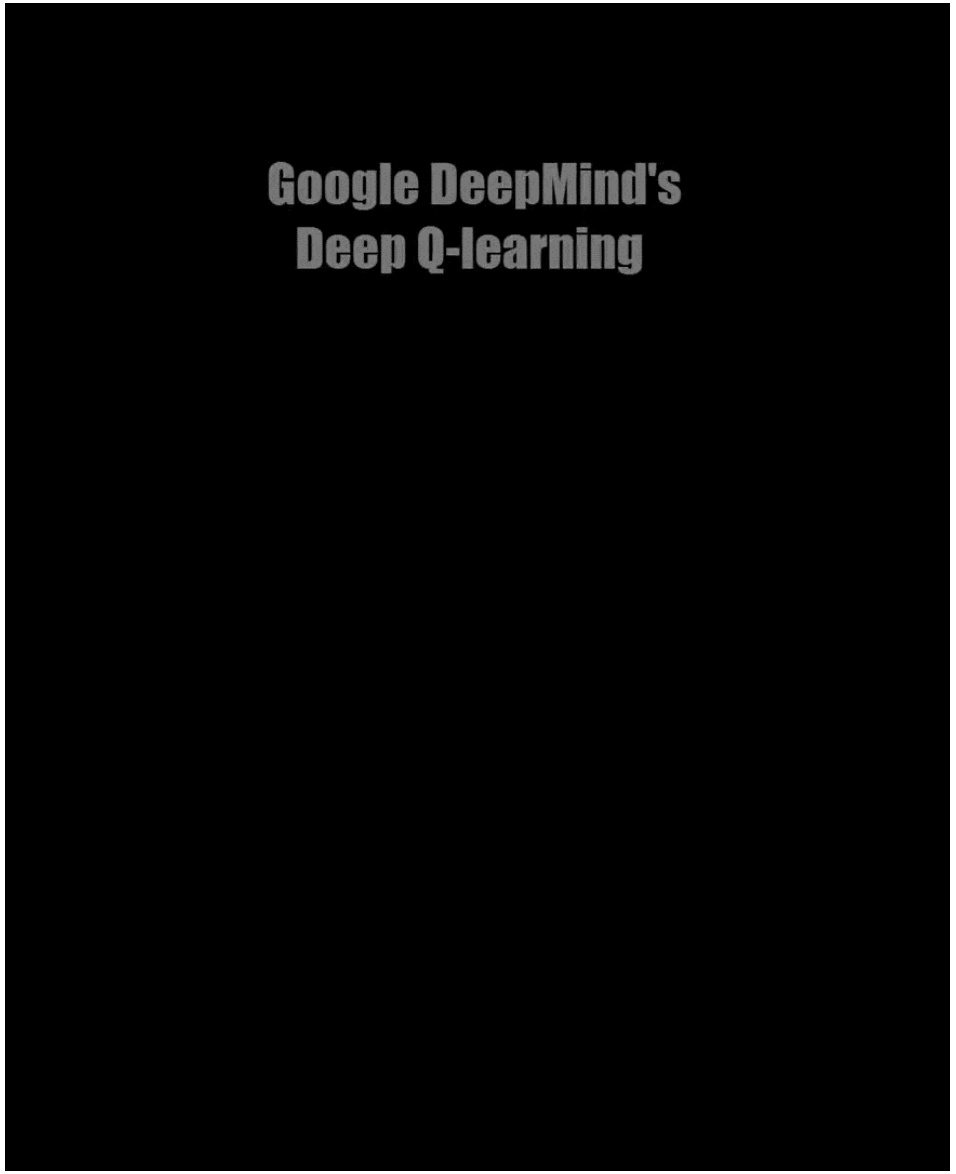
Long Short Term Memory (LSTM)

Reinforcement Learning (RL)

Transformer

Transformer

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



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

4. Implementing Deep Learning in Business

Implementing Deep Learning in Business

Building Your Own Model (BYOM)

Create and train a model with your own data.

Concern
Time-consuming training process.

Concern
Requires large datasets.

Using a Trained Model (TM)

Utilize a model developed by others.

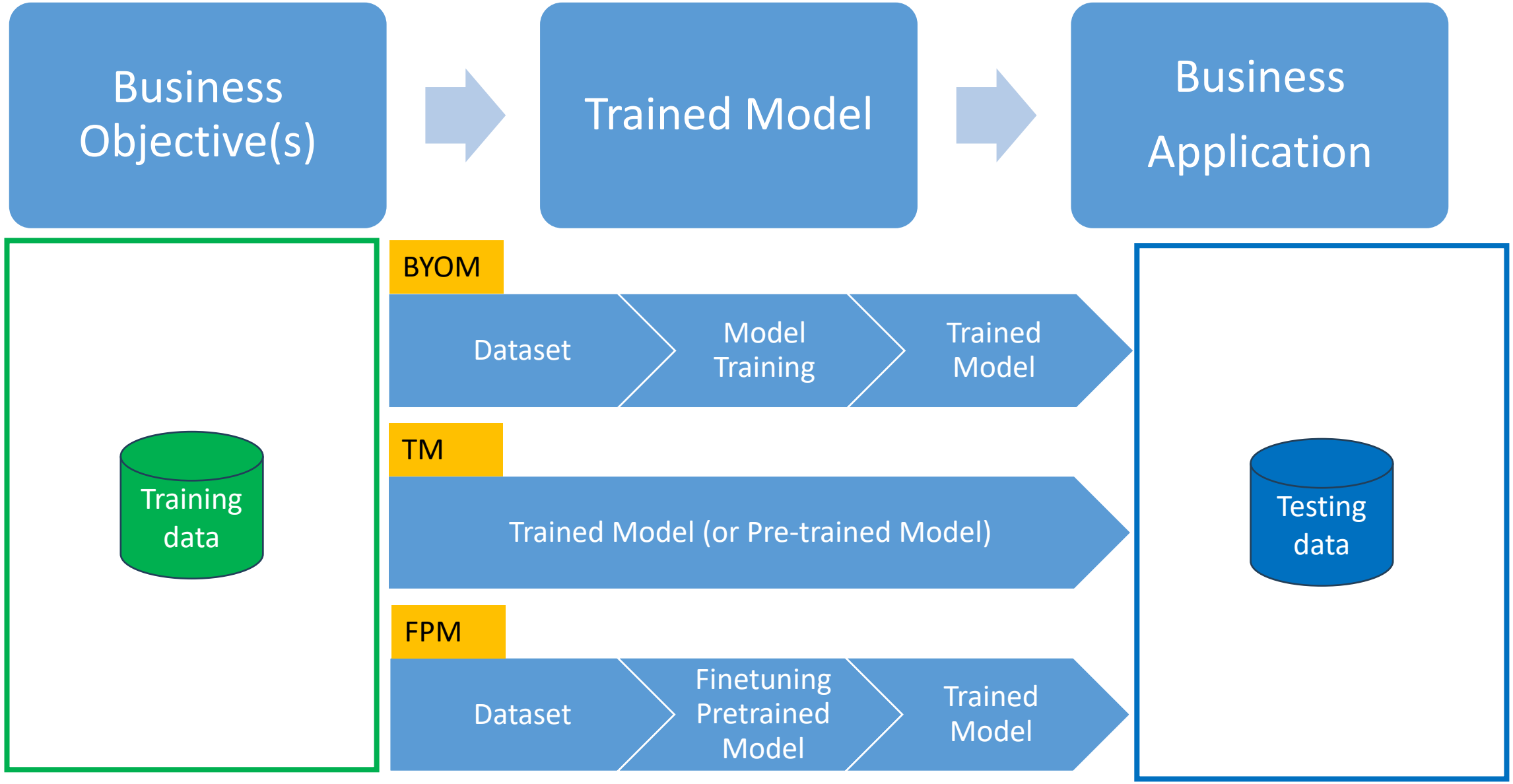
Concern
May not fit your specific business needs.

Fine-tuning a Pretrained Model (FPM)

Customize a pretrained model with your data

Concern
Performance depends on the pretrained model.

Deep Learning Business Application



Deep Learning Business Application: Example

Key takeaways:
- Business Obj
- Testing acc

Business Objective(s) → Trained Model → Business Application

Objective: Assist medical professionals in predicting whether **a patient in your hospital** has **cancer or not**.

Training data

Dataset: Utilize chest X-ray images of the **patients in your hospital**.

BYOM

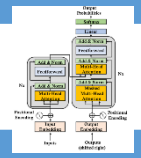
Dataset → Model Training → Trained Model

TM

Trained Model (or Pre-trained Model)

FPM

Hugging Face



Dataset → Finetuning Pretrained Model → Trained Model

Testing data

Testing dataset: Capture a chest X-ray image from a **new patient**, apply the trained model to the new image, and examine the model's output – **cancer or not**.

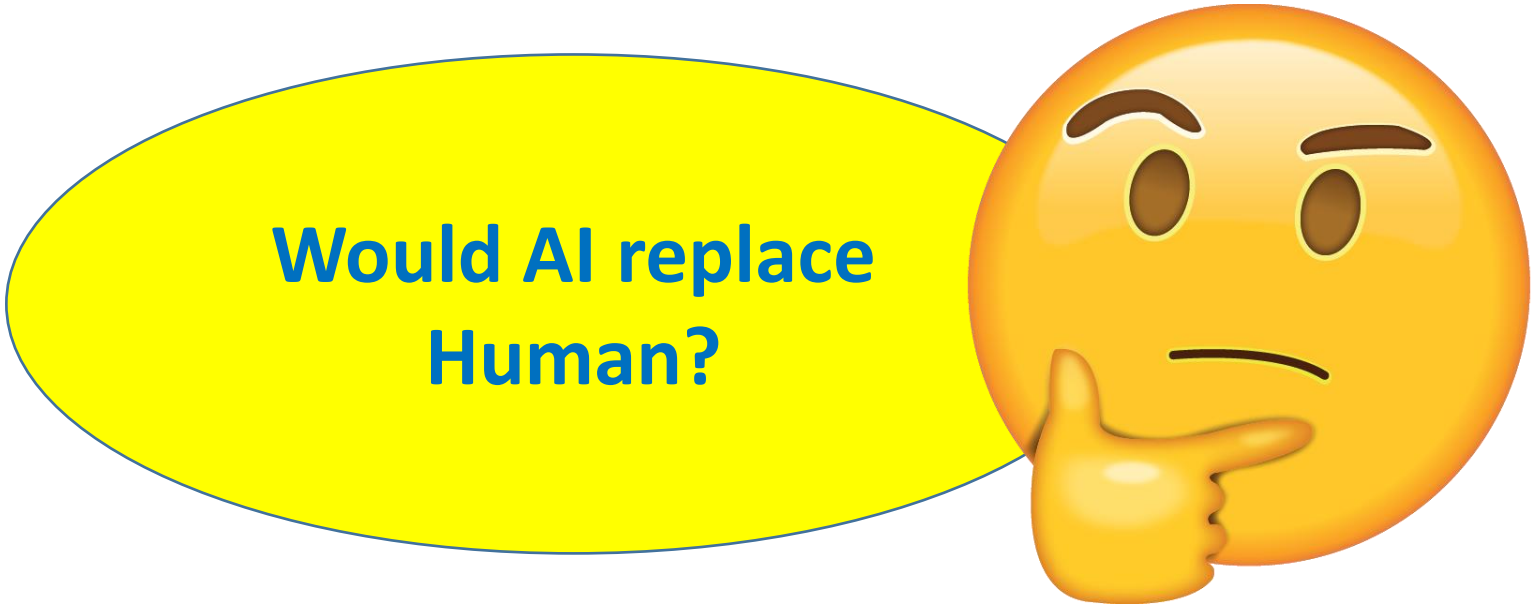
In-class Activity

5. Your First Deep Learning Business Application

6. Final Remarks

Final Remarks

- Deep learning is the future



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

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

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