

# AI Education Development in Hong Kong Schools 香港學校的AI教育發展

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# AI in Hong Kong classrooms

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Me: How was AI education in your school?

**Teacher A: I used AI in my teaching – adopted technology to collect student data and change how I teach.**

**Teacher B: I taught STEM lessons in my school. My students were able to use some devices for creating smart homes and robot football players, so my students can learn how to apply.**

**Teacher C: In Computer Studies lessons, we taught our students to code AI applications.**

Me: Were your students sensitive to the ethics around the data collected from their work?

**Teachers: ....**



# Different technology-related initiatives

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## IT in Education

(How we learn now)



## STEM education

(what skills the society expects our students to have)



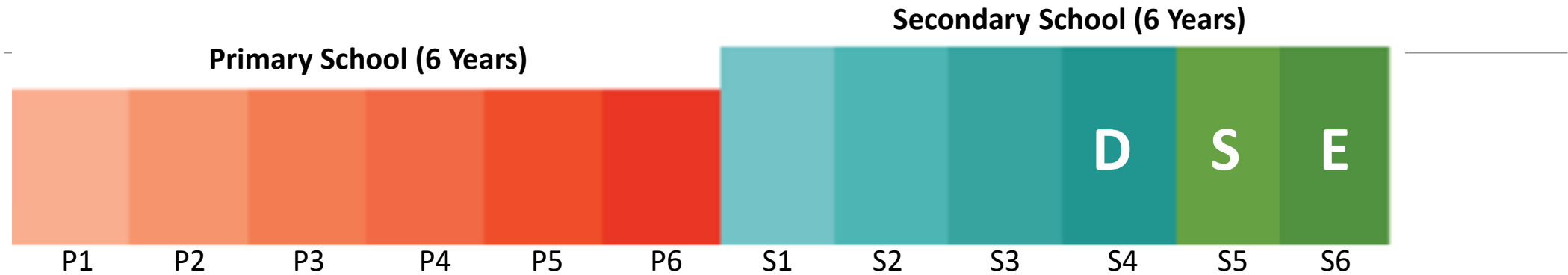
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## AI Education

(where we live)



# Hong Kong Jockey Club Charities Trust's Technology Education Programme Highlights



**Cool/Think** @JC >  
賽馬會運算思維教育

CoolThink@JC

Application process opens now and will end in mid January (168 primary schools)

<https://www.coolthink.hk/>

**CUHK Jockey Club**  
**AI for the Future**  
「智」為未來

Application process will open in late Dec / early Jan (32 secondary schools)

**CLAP-TECH Pathway**

# AI curriculum development

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- New to K12 teaching
- Abstract Terms
- Coding and programming?
- Including Mathematics?
- Ethnics

**AI Curriculum is coming to our junior  
secondary school level.**

**What will it include?**

Identification of key concepts and the impact of AI through eye-catching, illustrative applications, especially usage contexts of local relevance.

Acquisition of the abilities to design, development and integrate component AI technologies into end-to-end systems



Awareness of the history, background and development of various types of AI technologies (corresponding to different subsets of intelligence: machine perception, understanding, reasoning, etc.)

Experimentation of AI technologies in AI Lab

Exploration of AI topics and case studies to promote social good, illustrate transformative effects the future of work, and reflect on ethical use of AI



Modules \ Teaching Units (x)	Awareness	Ethics and Impact	Knowledge	Interactions	Em powerment
1. Introduction	X	X	X	-	-
2. Fundamentals of AI	X	X	X	X	-
3. "See"	X facial recognition	X privacy issues in video surveillance	X image formation, representation and recognition	X demo of facial recognition	X build a simple object / shape recognizer
4. "Hear"	X	X	X	X	X
5. "Speak"	X	X	X	X	X
6. "Read"	X	X	X	X	X
7. "Interact"	X	X	X	X	X
8. "Simulate"	X	X	X	X	X
9. "Think and Create"	X	X	X	X	X
10. AI for Societal Good/Impacts	X	X	X	X	X
11. Ethical Use of AI	X	X	X	-	X
12. AI and Future of Work	X	X	X	-	X

X Beginner Units (BU)    
 X Intermediate Units (IU)    
 X Advanced Units (AU)

55 modules divided into three levels for schools to flexibly adopt:

# Curriculum development cycle

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## Phase 1 (2019-20): Building prototype

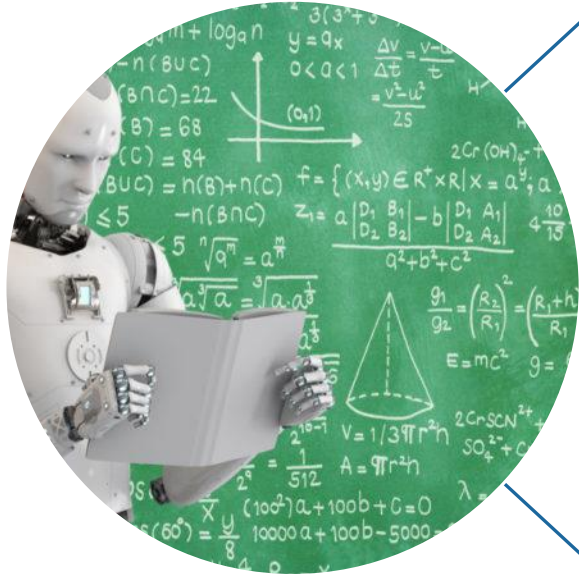
- 6 Pioneer Schools
- Curriculum design
- Pilot run

## Phase 2 (2020-21): Testing and refinement

- 12 Participating Schools
- 4 classes per school
- 120 students per school

## Phase 3 (2021-22): Module launch and Scale up

- 20 Participating Schools
- 8 classes per school
- 240 students per school



CUHK

- Faculty of Engineering
- Faculty of Education

Pioneer Schools

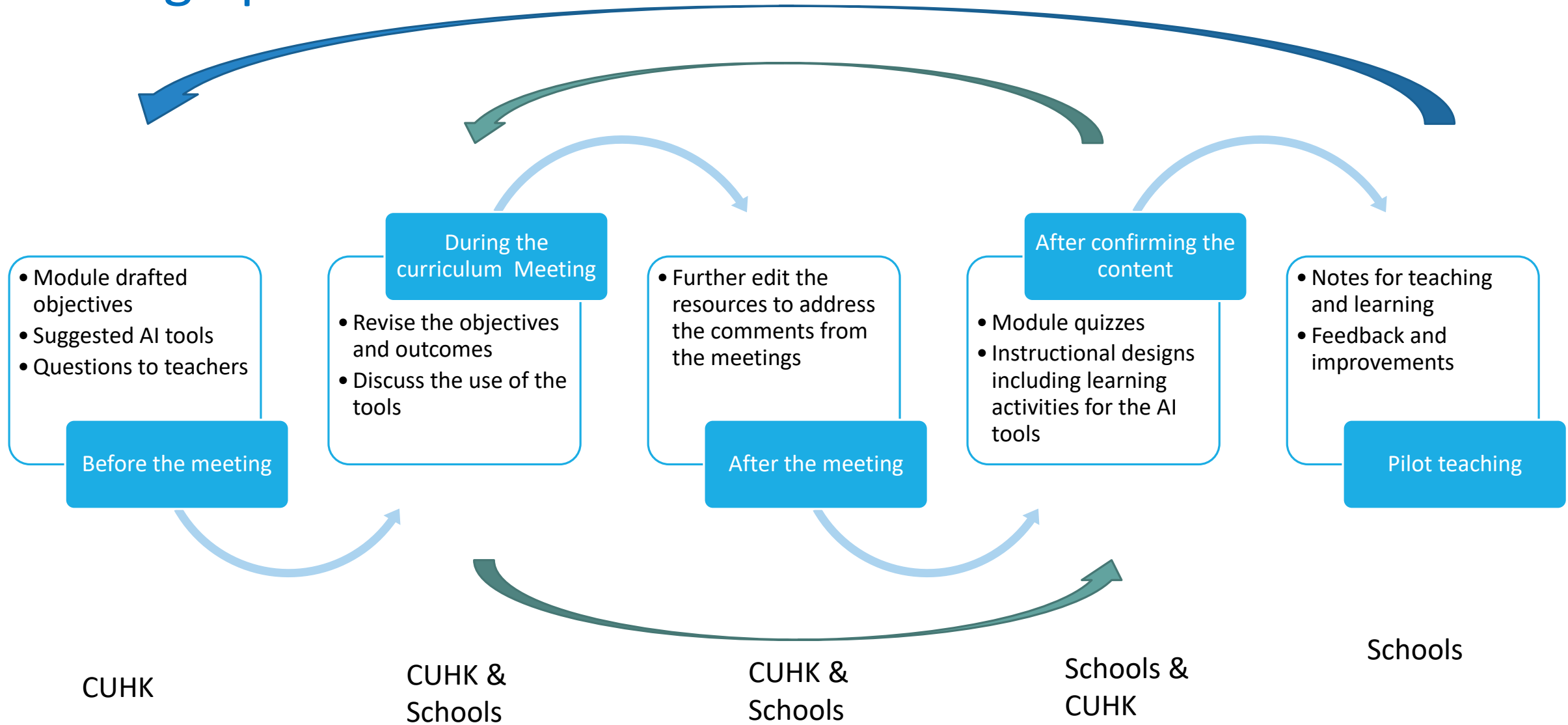
- AI teaching experience
- willing to try AI curriculum

AI industry

- AI hardware
- AI software

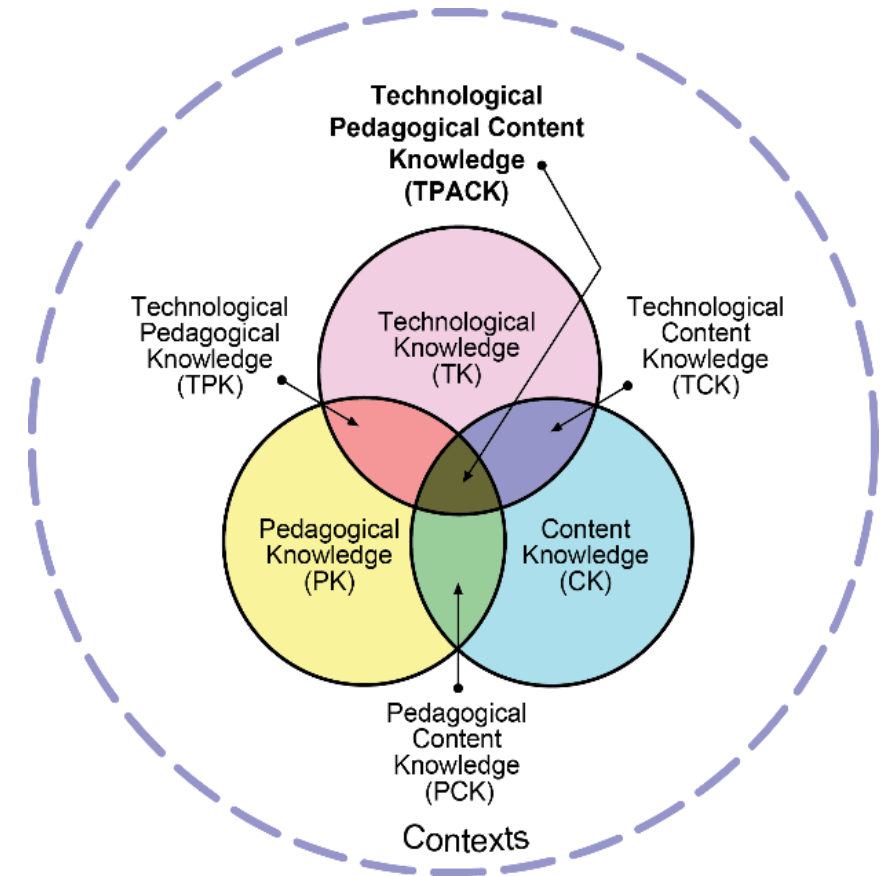
AI Lab.

# Co-design process



# Teacher training

- Knowledge about **how AI can be applied to solve real-world problems** constitute the technological knowledge and the authentic problem that students will be engaged to solve.
- Knowledge about the **teaching and learning strategies** to engender creative and critical thinking, as well as develop good communicative and collaborative skills, constitute the pedagogical knowledge.
- Knowledge about **subject matter (esp. different facets of AI)** involves constitute the content knowledge to be applied.
- How these three forms of knowledge are synthesized to produce the AI-specific curriculum unit constitute the AI-PCK design process.



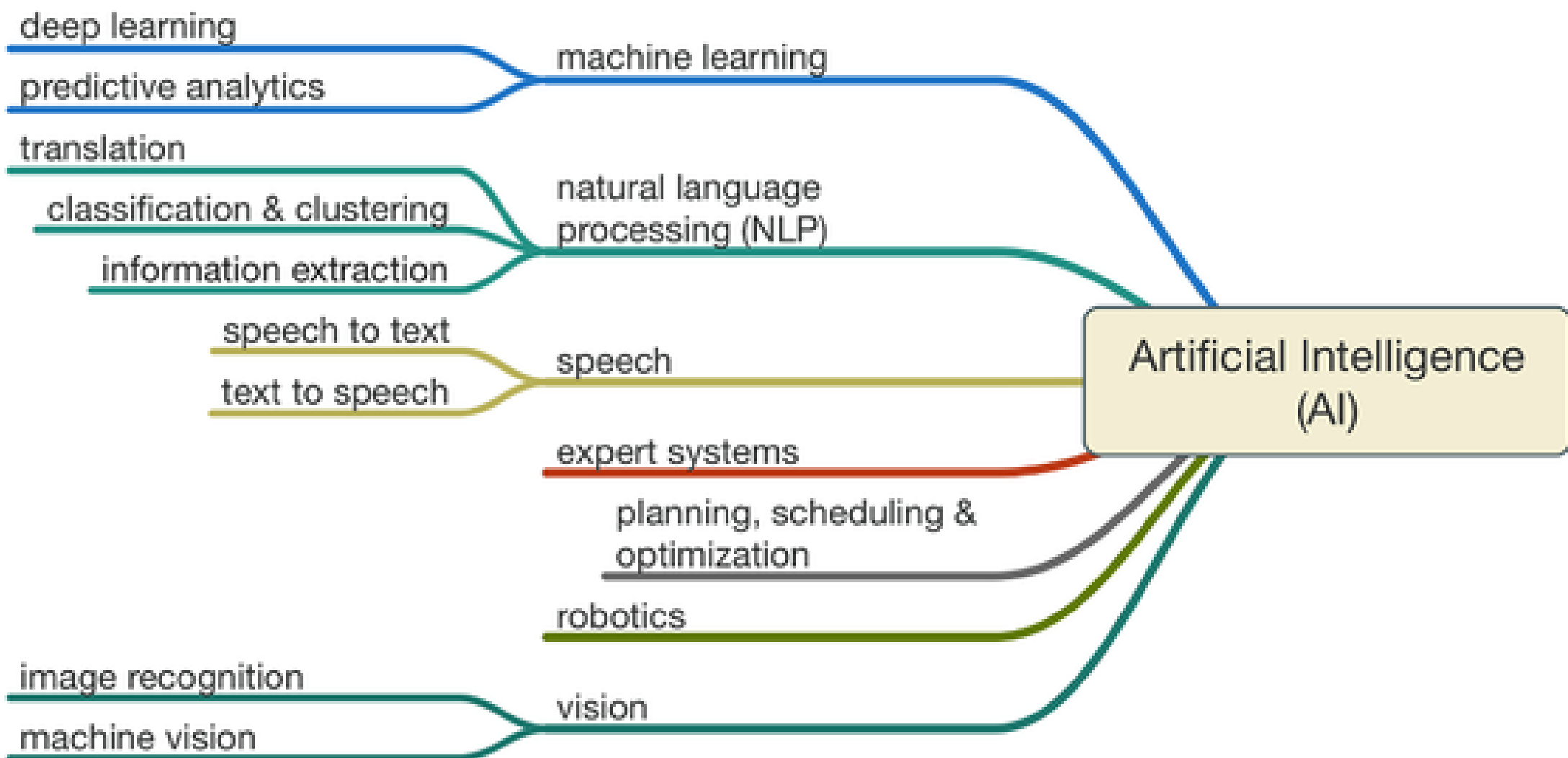
# An example of co-design process: Definitions of AI

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# Definition of AI

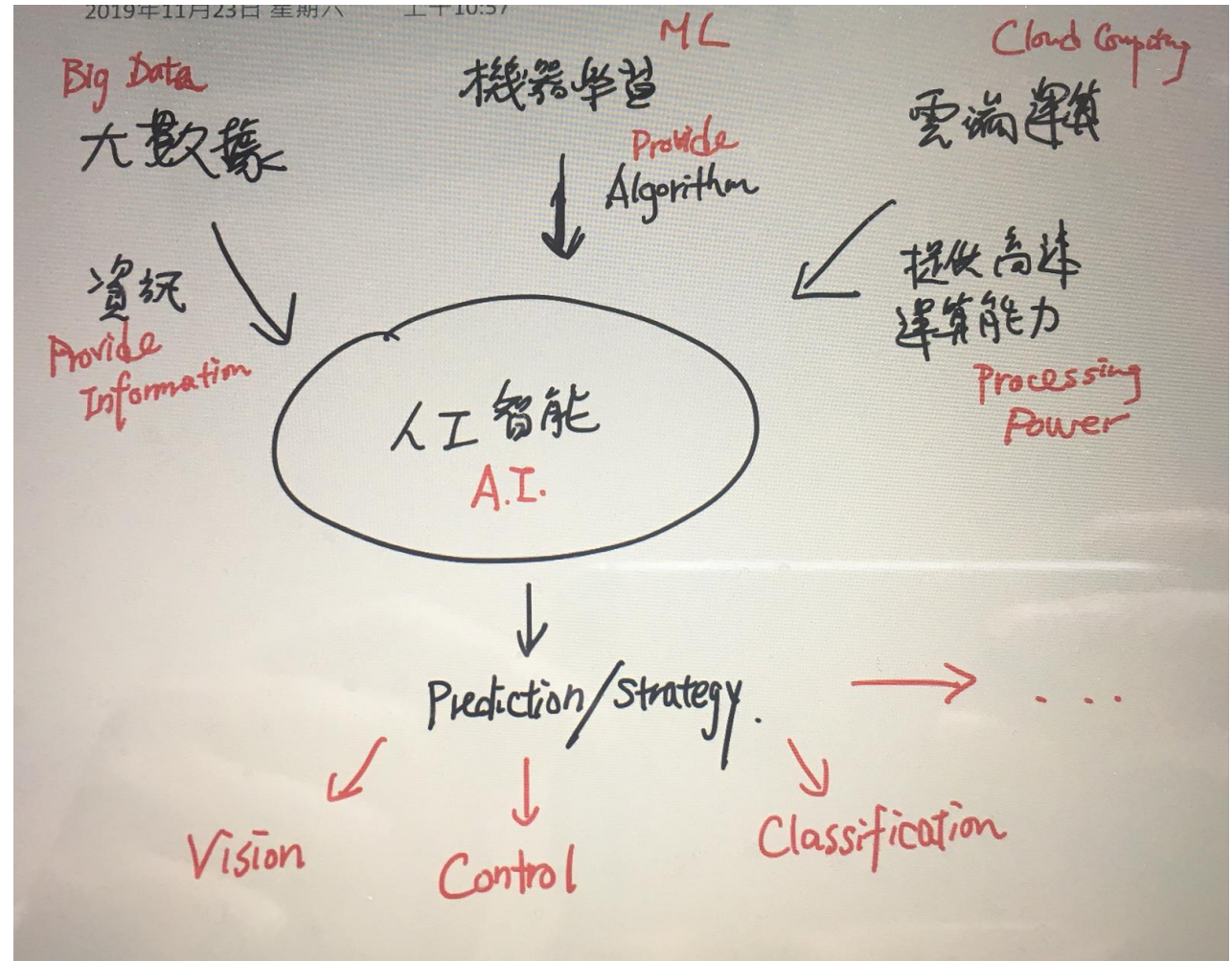
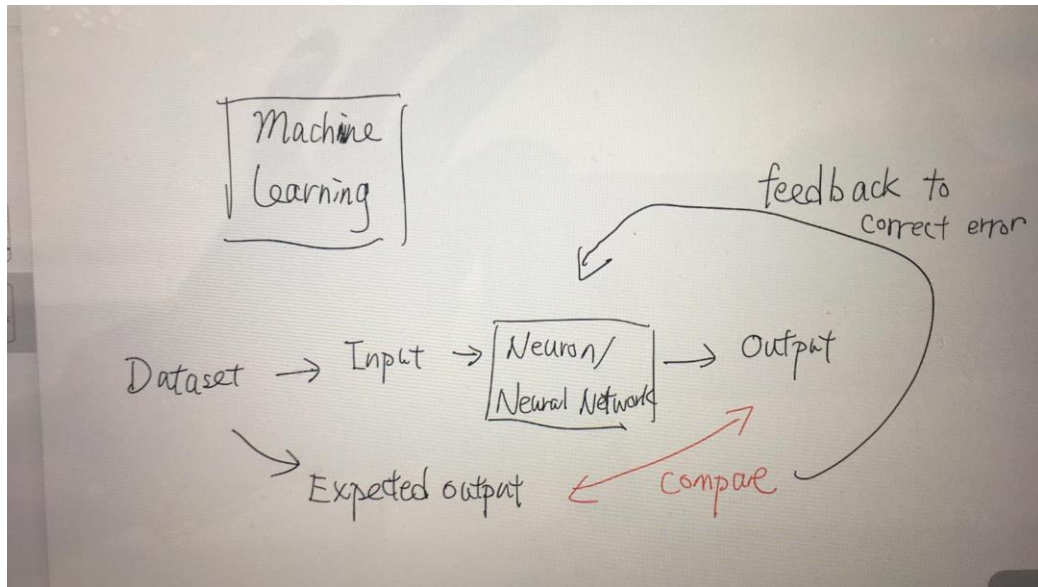
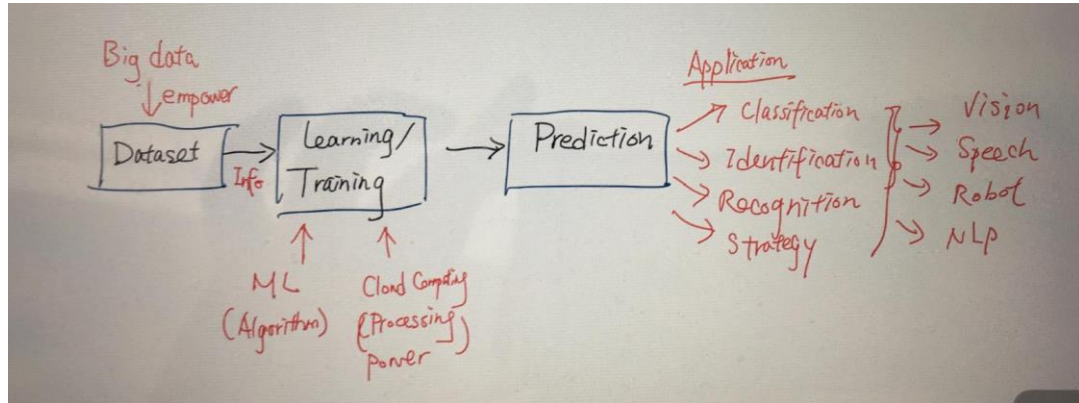
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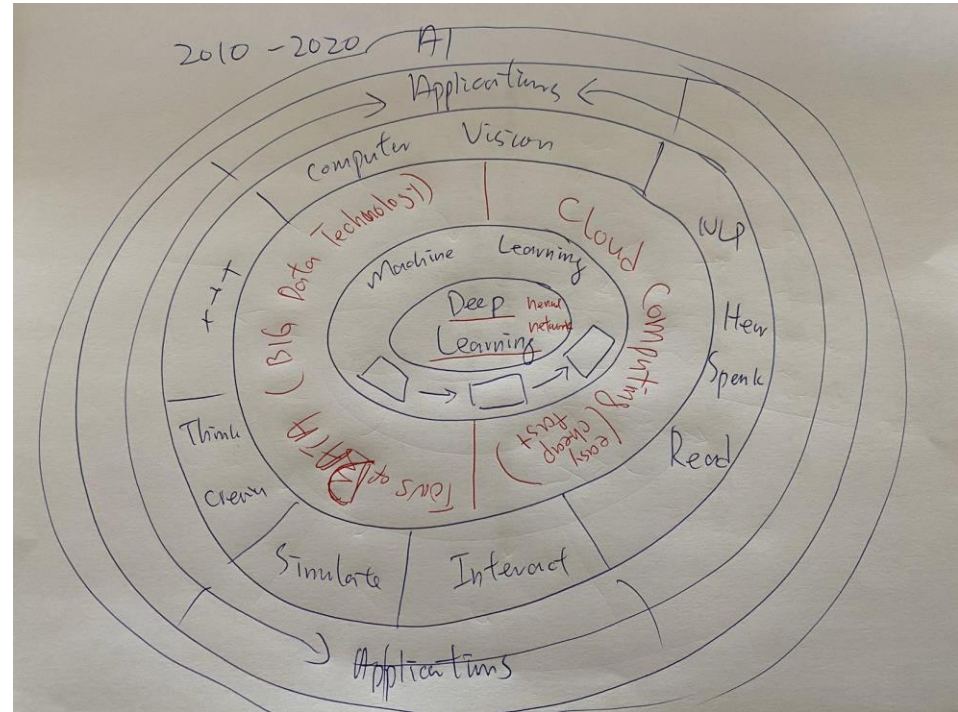
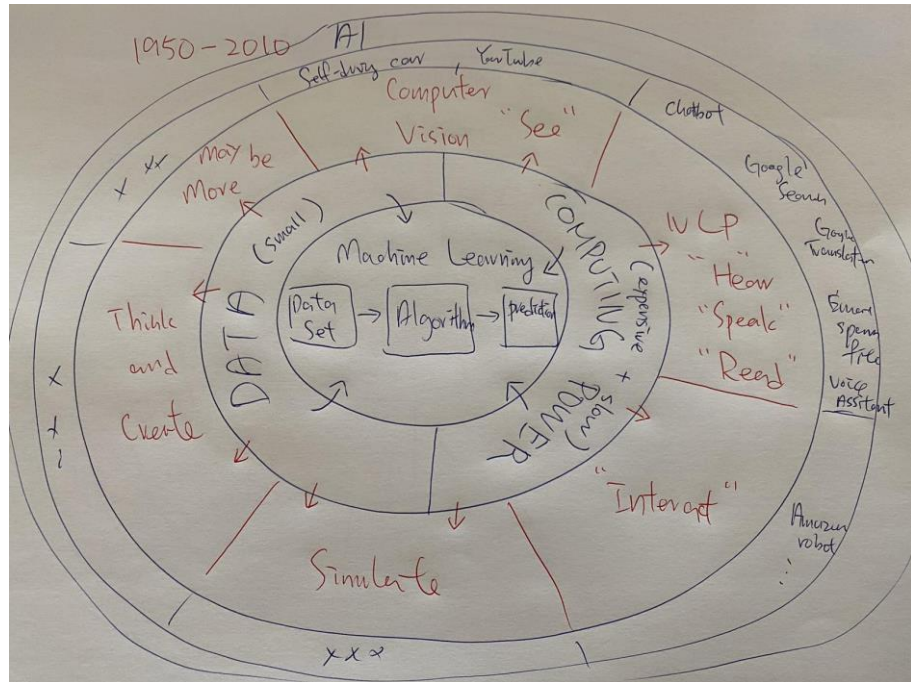
- *“An attempt to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.” [McCarthy, 1955]*
- *“The science of making machines do things that would require intelligence if done by men” [Minsky, 1968]*
- *“The theory and development of computer systems able to perform tasks normally requiring human intelligence.” [The English Oxford Living Dictionary]*
- *“the science and engineering of making intelligent machines” John McCarthy, first coined the term Artificial Intelligence in 1950*
- *“AI is whatever hasn’t been done yet.” Douglas Hofstadter quoting Tesler’s Theorem*
- AI = programming?
- Data is the new code
- AI=Big Data + Machine Learning + Cloud Computing





# AI = Big data + Machine learning + Cloud computing





## More examples

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Prerequisite knowledge or not?



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55 modules divided into three levels for schools to flexibly adopt:



腾讯扣叮 (Tencent Ke Ding) AI Lab interface showing a drag-and-drop workflow for training a neural network model.

**Workflow Steps:**

- 设置 dataX 为 1
- 将 dataX 增加 1
- 设置 dataY 为 1
- 添加 5 \* x + 1 到数据 dataY 尾部
- 设置 dataX 为一维张量 (向量) dataX
- 设置 dataY 为一维张量 (向量) dataY
- 设置 model 为 新建序贯模型
- 模型 model 添加层: 全连接层 units: 1 activation: ? inputShape: 建立数组 [1] useBias: 否
- 编译模型 model 优化器: rmsprop 学习速率: 0.1 损失函数: meanSquaredError
- 训练模型 (fit) model \* dataX \* y dataY \* batchSize: 10 epochs: 20 可观察
- 输出 学习后的权重: 代码 model.layers[0].kernel.val.dataSync()
- 输出 学习后的偏置: 代码 model.layers[0].bias.val.dataSync()
- 设置 inputX 为 从 1 到 30 范围内的随机整数
- 输出 计算输入为 inputX 的结果
- 输出 预测 model 一维张量 (向量) 建立数组 inputX

**Code Output:**

```

Tensor
[[[98.0556335],

```

```

[ ] from tensorflow import keras # 匯入KERAS框架
import numpy as np
(x_train, y_train), (x_test, y_test) = keras.datasets.mnist.load_data() # 匯入KERAS中MNIST數據 (60000張28 x 28的黑白數字圖像及標記)

x_train = x_train.reshape((x_train.shape[0], 784)) / 255 # 將圖像變換為10數據
x_test = x_test.reshape((x_test.shape[0], 784)) / 255
y_train = keras.utils.to_categorical(y_train, 10) # 利用One Hot Encoding 處理標記
y_test = keras.utils.to_categorical(y_test, 10)

# 定義神經網絡
model = keras.Sequential()
model.add(keras.layers.Dense(100, activation='relu', input_shape=(784,))) # 定義輸入層為100個神經元及以RELU為激活函數
model.add(keras.layers.Dense(80, activation='relu')) # 第二層為50個神經元
model.add(keras.layers.Dense(30, activation='relu')) # 第三層為30個神經元
model.add(keras.layers.Dense(40, activation='relu')) # 第三層為30個神經元
model.add(keras.layers.Dense(10, activation='softmax')) # 輸出層分別以10個神經元計算各個數字的概率

# 製作神經網絡 [學習效率=0.25]
model.compile(loss=keras.losses.categorical_crossentropy,
              optimizer=keras.optimizers.SGD(lr=0.25),
              metrics=['accuracy'])
model.summary()

model.fit(x_train, y_train, validation_data=(x_test, y_test), batch_size=100, epochs=10, verbose=1) # 將數據輸入進行訓練及測試
loss, acc = model.evaluate(x_test, y_test, verbose=1)
print('Final loss=%4f, Final Accuracy=%4f' % (loss, acc)) # 顯示模型最終準確度

# 嘗試抽取數據中的第一個圖像進行辨識
prob = model.predict(np.array([x_test[0]]))

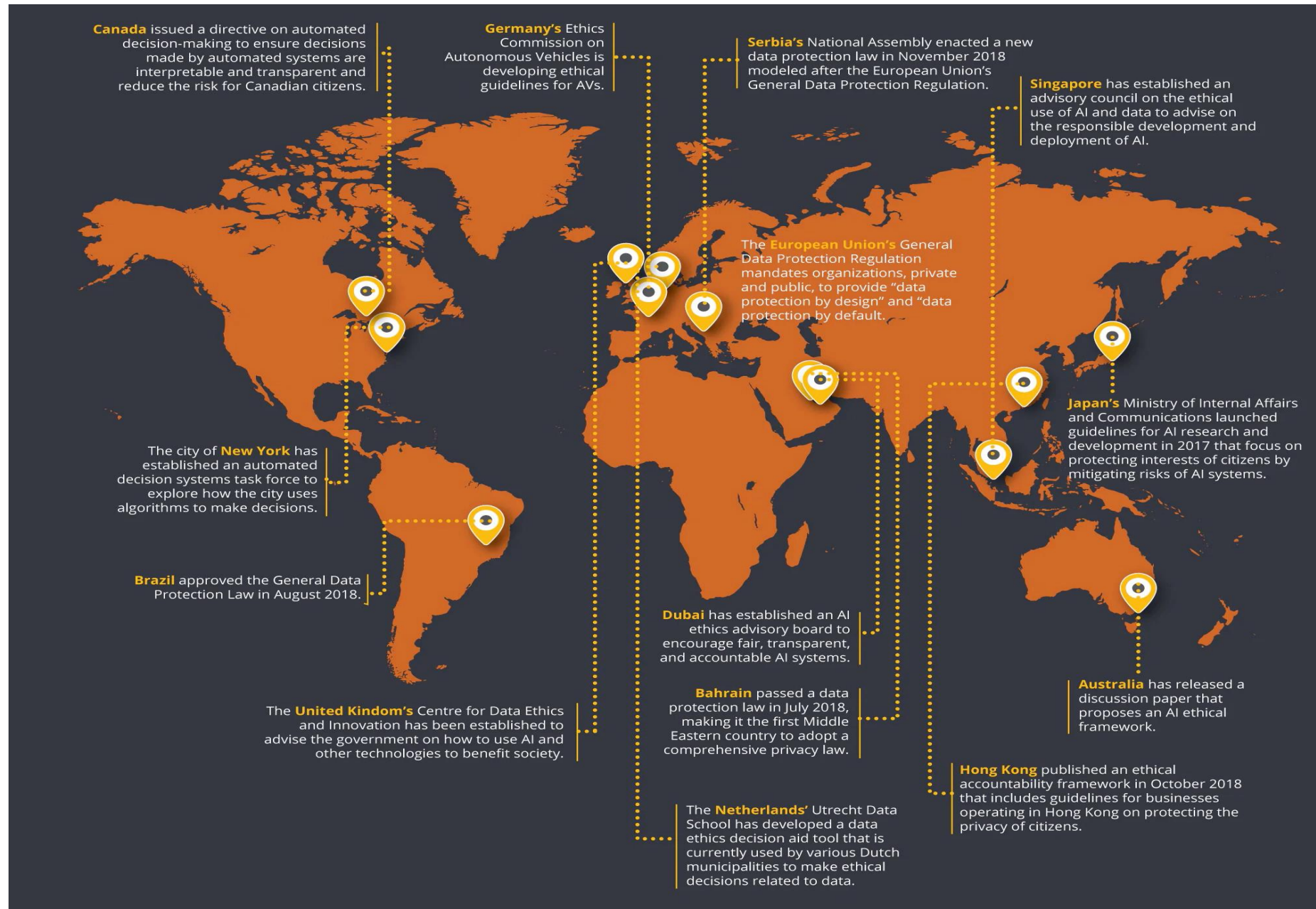
print('第一個圖像的辨識結果:')
import matplotlib.pyplot as plt

```

# Global and local issues

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# Data and AI Ethics Initiatives



# Global and Hong Kong AI ethic

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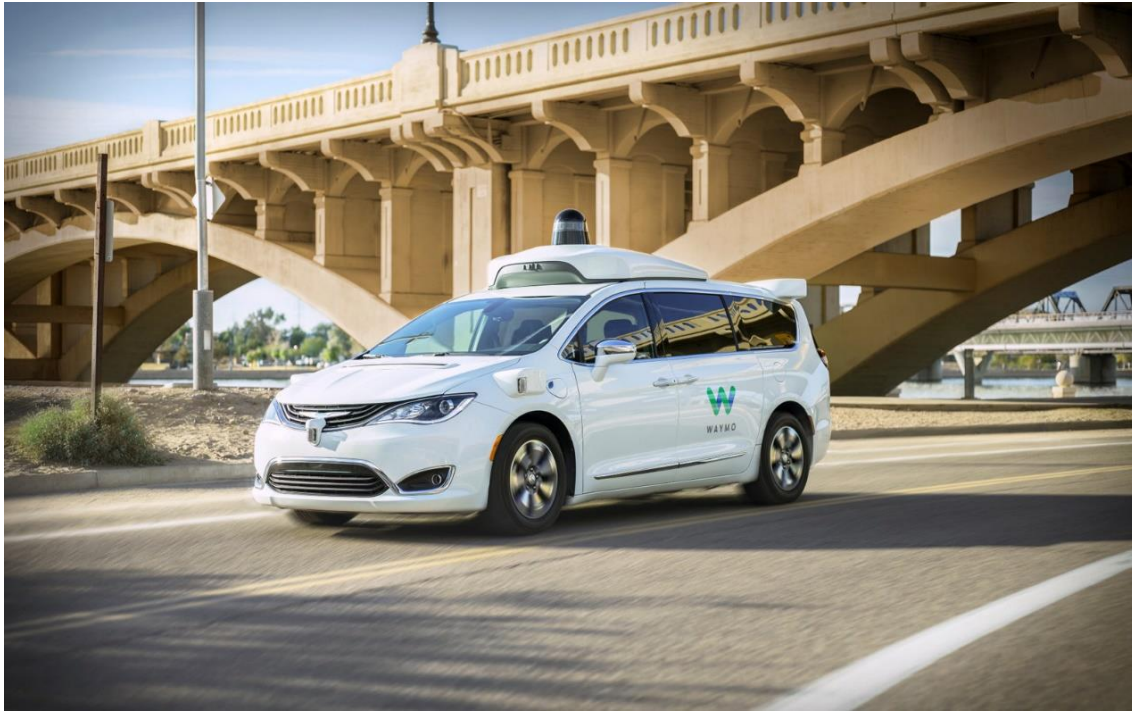
- Other than other countries, we use Ethical Accountability Framework from The Privacy Commissioner for Personal Data (PCPD), Hong Kong
- Three Hong Kong Values – Respectful, Beneficial and Fair – were proposed.





# Global and local issues

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# Everyday learning



Home icon, MTR logo, Accessibility icons (A A A), Profile icon of Kee Gor, and text: "Part of the information is provided by third parties"

Hello! I am Kee Gor. 😊

I can provide a suggested route to your destination.

For example, you can ask me "Where is Telford Plaza?"

Hong Kong City Hall

You mentioned "hong kong city hall". I've found the following for you 😊. Get the suggested MTR route by pressing "Travel by MTR" 🚆.

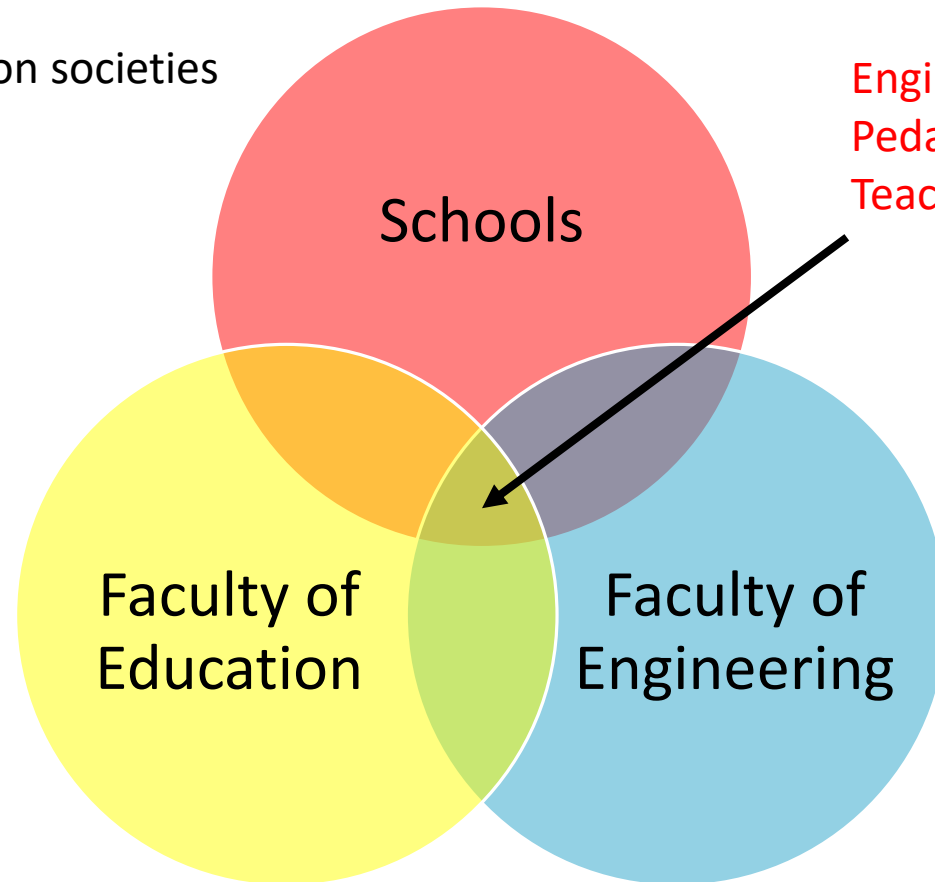
### Hong Kong City Hall

Address: 5 Edinburgh PI, Central, Hong Kong  
Distance from exit: 393m (~ 6 mins)

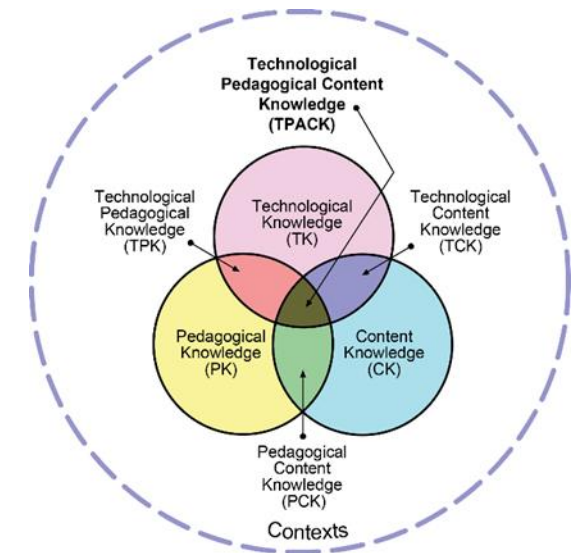
Travel by MTR >

# Co-design process

AI industries  
Computer Education societies

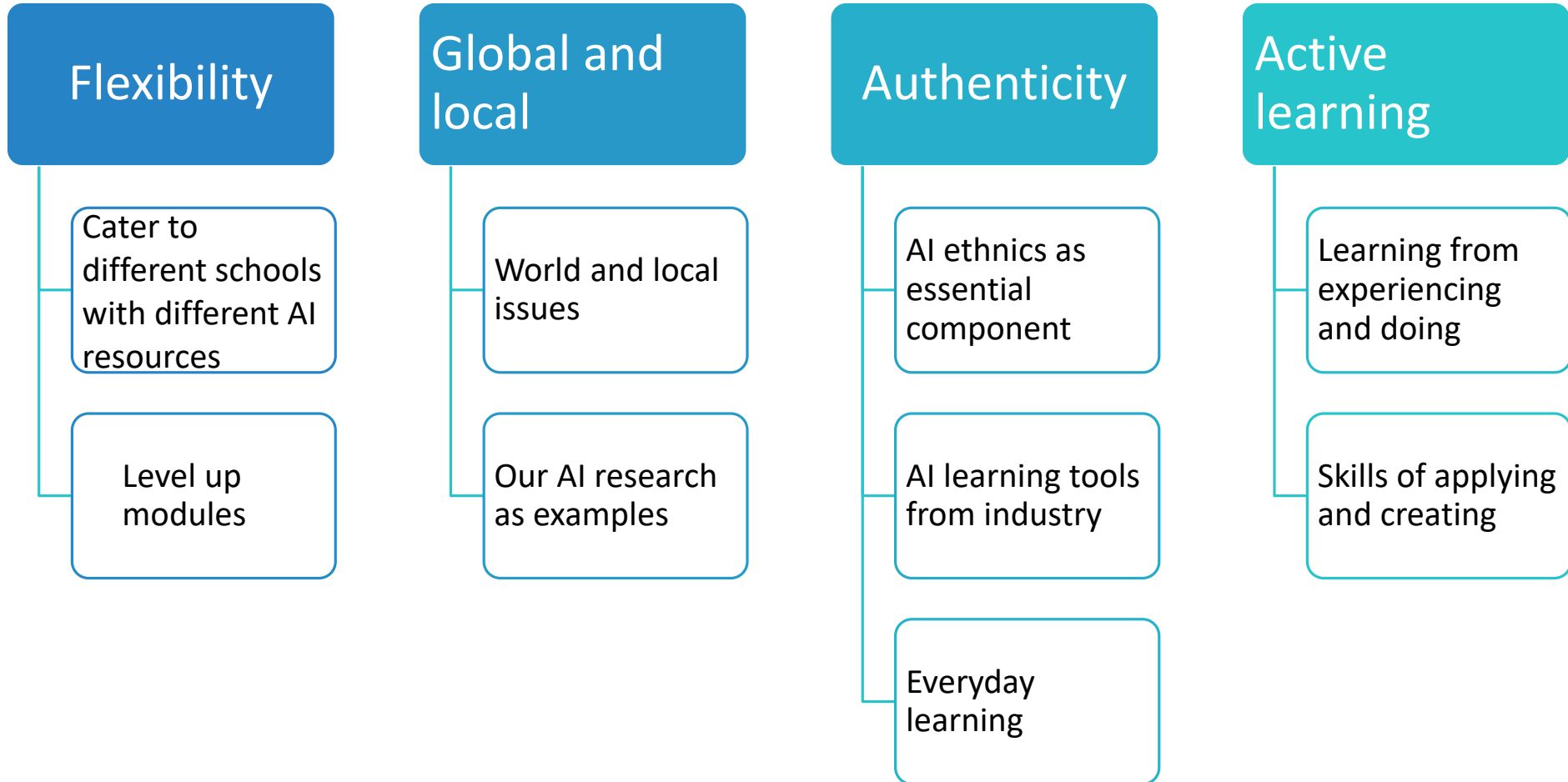


Engineering components  
Pedagogy for junior secondary skill  
Teachers training



# Our proposed AI-specific curriculum

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Thank  
you!

