AI for the Future
CUHK Jockey Club AI for the Future Project
中大賽馬會智為未來計劃

Co-organized by:
The Chinese University of Hong Kong
Faculty of Engineering
Faculty of Education

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Creating Our AI Future
共建人工智能未來

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Outline

Designing an AI Curriculum

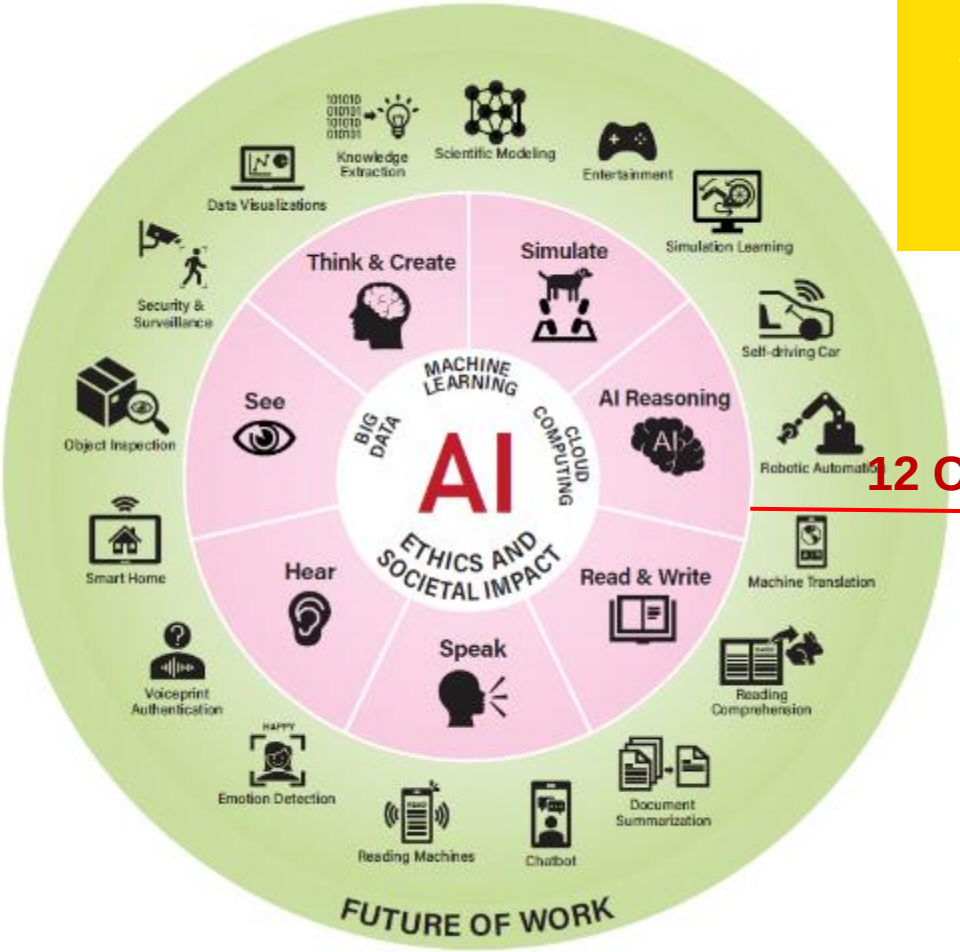
Special Emphases: Ethics and Future of Work

Pedagogy for Teaching AI

Experience Sharing from Pioneering Schools

Designing an AI Curriculum

Curriculum Framework



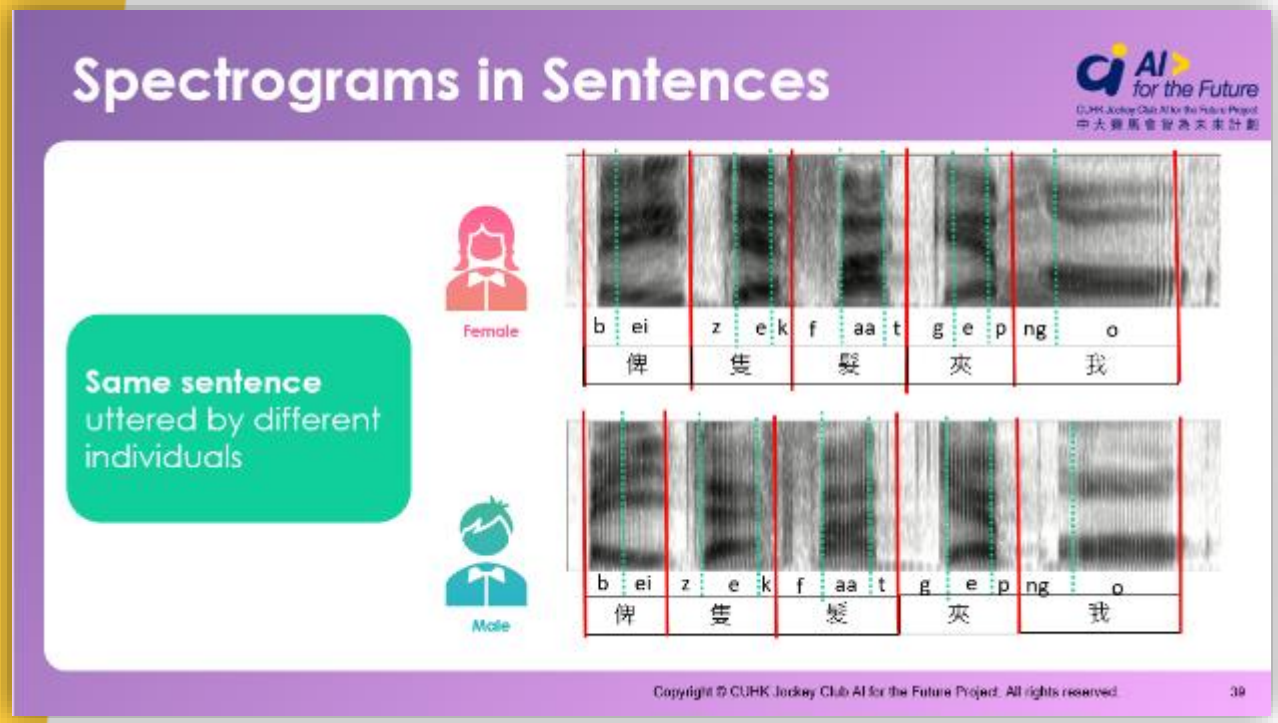
AWARENESS | ETHICS & IMPACT | KNOWLEDGE | INTERACTION | EMPOWERMENT

55 Modules

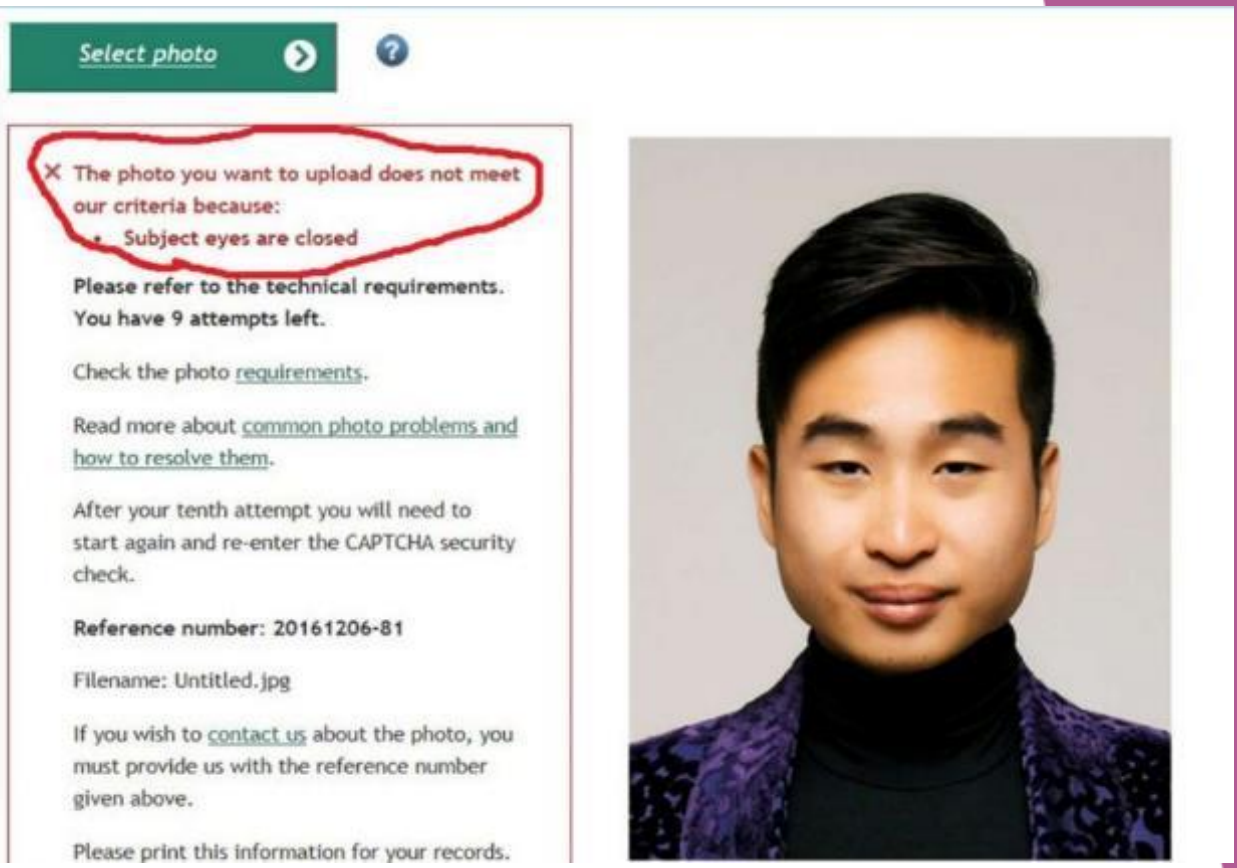
12 Chapters

Chapters	Modules				
	Awareness	Ethics and Impact	Knowledge	Interactions	Empowerment
1. Introduction to AI	✓	✓	✓	-	-
2. Fundamentals of AI	✓	✓	✓	✓	-
3. See	✓	✓	✓	✓	✓
4. Hear	✓	✓	✓	✓	✓
5. Speak	✓	✓	✓	✓	✓
6. Read	✓	✓	✓	✓	✓
7. AI Reasoning	✓	✓	✓	✓	✓
8. Simulate	✓	✓	✓	✓	✓
9. Think and Create	✓	✓	✓	✓	✓
10. Social Good, Social Impacts and Challenges of AI	✓	✓	✓	✓	✓
11. AI and Ethics	✓	✓	✓	-	✓
12. AI and Future of Work	✓	✓	✓	-	✓

Local & International Examples

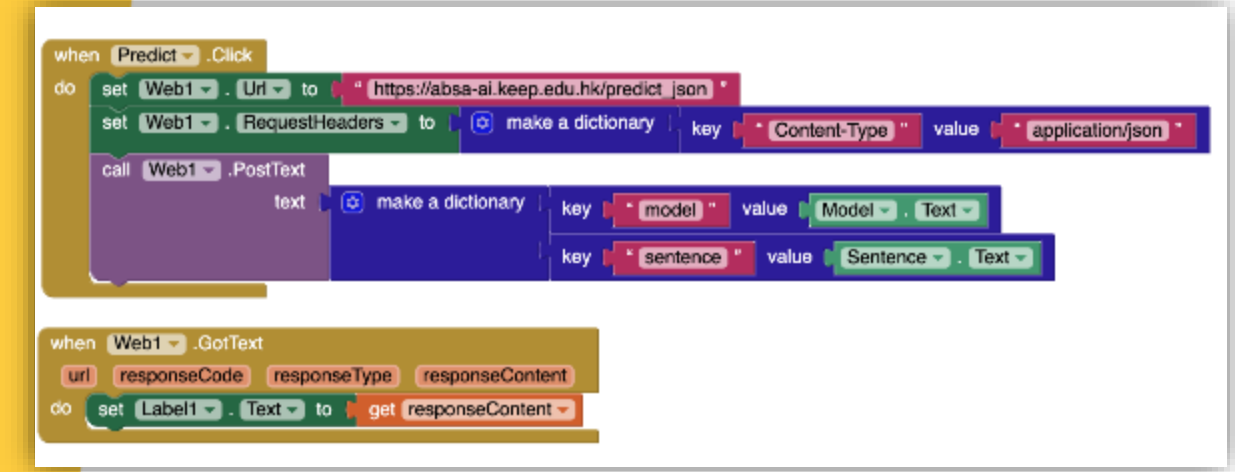


Local: Understand machine analysis of Cantonese speech



International: Passport robot tells Asian applicant to open eyes

Software and Hardware Toolkits

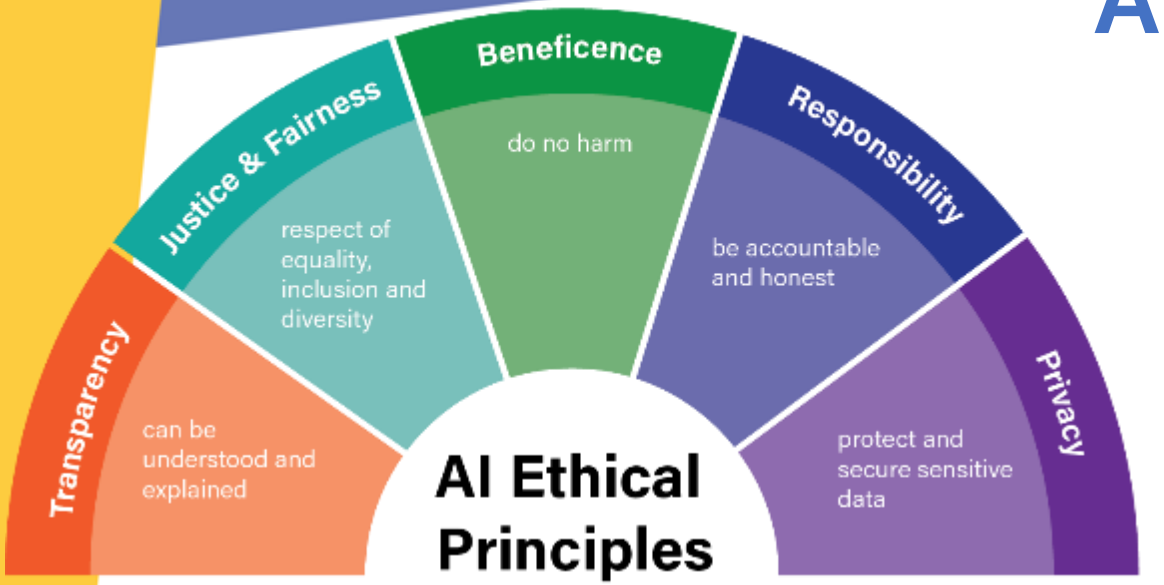


SoftwareToolkits: MIT AppInventor

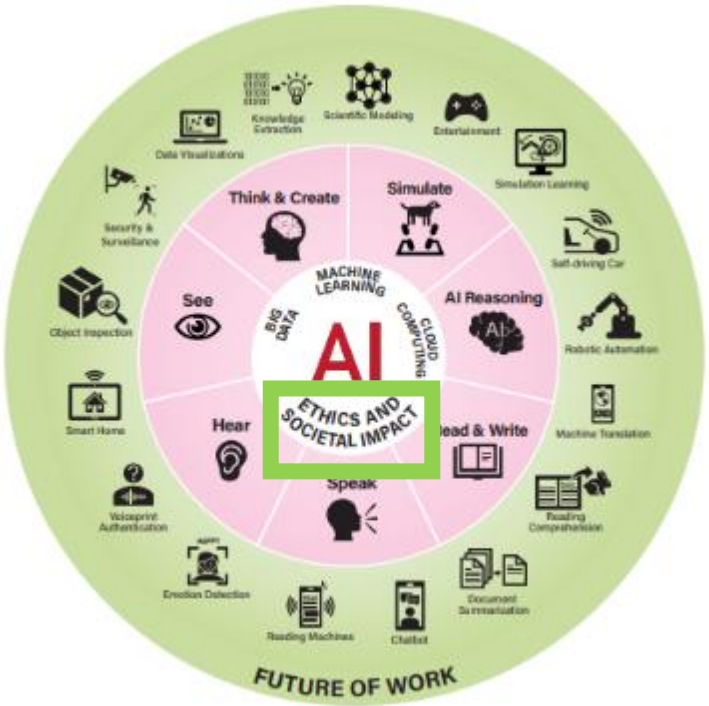
Hardware Toolkits: CUHK-JC iCar

Special Emphases:
Ethics and Future of Work

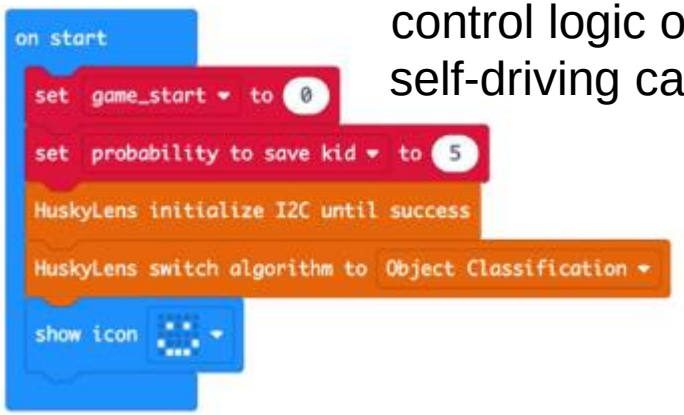
AI Ethics



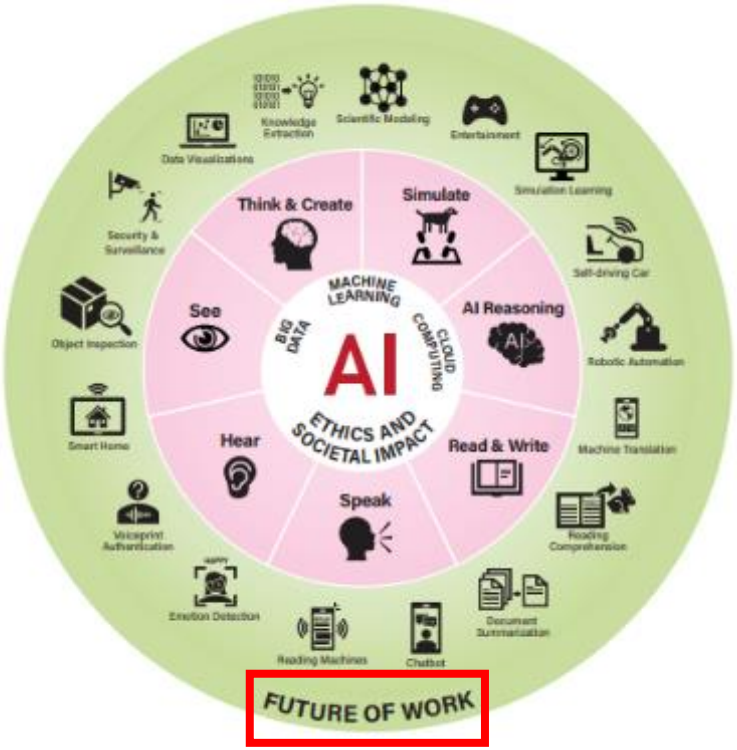
Failure of braking system – self-driving car can ONLY turn left or right! DECISION?



Students program control logic of self-driving car



AI and Future of Work



By 2025…

AI Will Create 97 million New Jobs

	Technologies to be Adopted	Skills in Demand
1	Cloud Computing	Data Analysts and Scientists
2	Big data analytics	AI & Machine Learning Specialists
3	IoT & connected devices	Big Data Specialists
4	Encryption & cybersecurity	Digital Marketing Specialists
5	Artificial Intelligence	Process Automation Specialists

Source: Future of Jobs Report 2020, World Economic Forum

Pedagogy for Teaching AI

Source: WebMD

Source: Ecmetric.com

Source: Iphone, Mi, and Samsung

Source: KKBOX and Spotify

Skills \ Task	Psychological counselling	Advertisement creation	Calculation on 987654321 x 123456789	Activity planning	AI technology development	Goods delivery from one place to another place for 100 times
Communication Skills						
Mathematical Skills						
Information Technology Skills						
Critical Thinking Skills						
Creativity						
Problem Solving Skills						
Self-management Skills						
Self-learning Skills						
Collaboration Skills						

DESIGN THINKING

Empathize
Understanding people

Ideate
Generating your ideas

Define
Figuring out the problem

Test
Refining the product

Prototype
Creation and experimentation

Source: MAQE

- AI programmer
  (who built in the decision)
- Self-driving car manufacturer
- Driver / other parties
- Policy makers

- Human > pets
- Women > men
- Young > old
- Fit > sickly
- More lives > fewer lives
- Passengers > pedestrians
- High > low social status

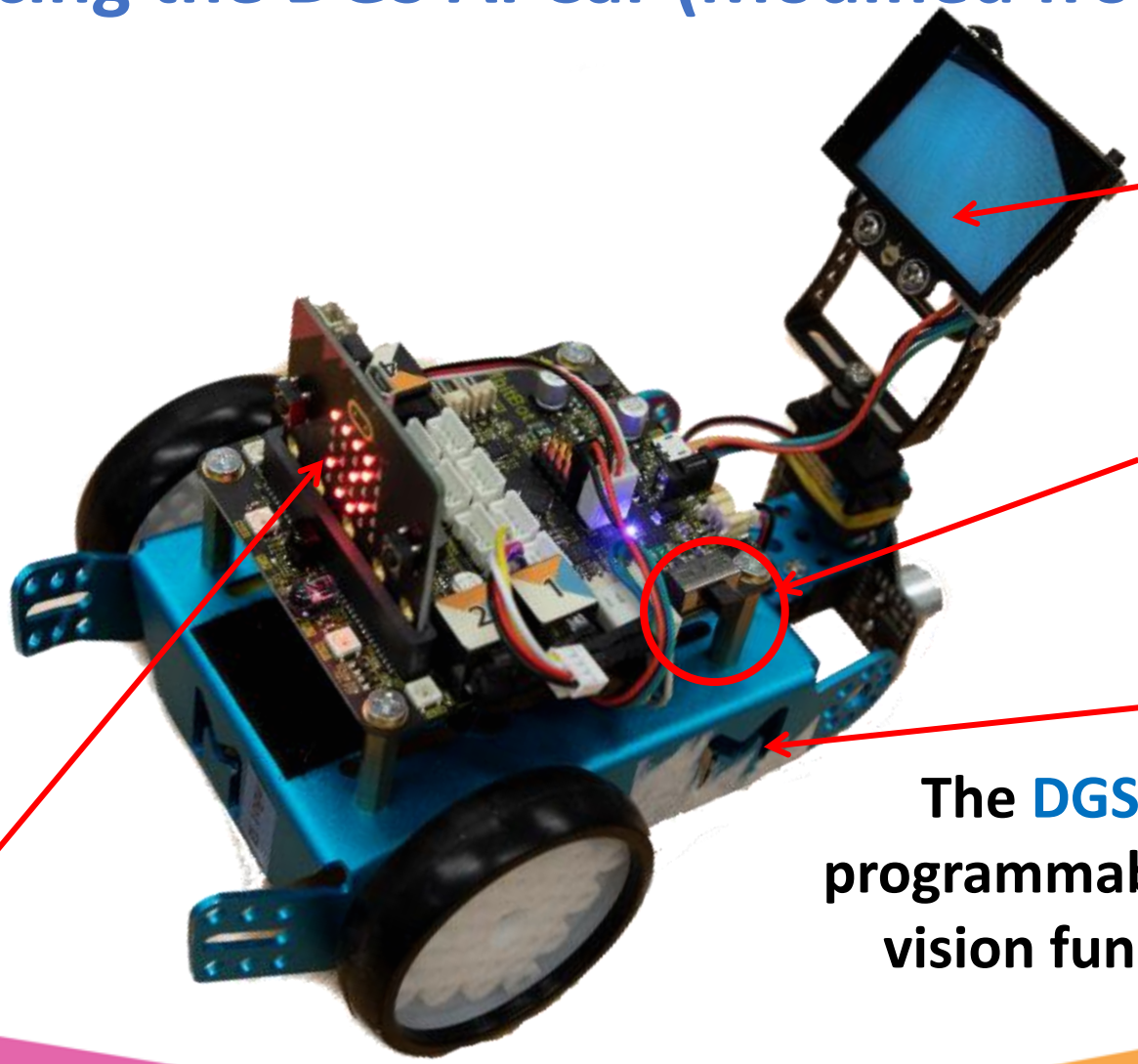
Source: The Guardian

Size?
Shape?
Color?
…

Experience Sharing from Pioneering Schools

Hardware Toolkit - One Student One Toolkit (Chapter 3 – See)

Introducing the DGS AI Car (Modified from CUHK-JC iCar)



HuskeyLens
(A camera with AI vision functionalities)

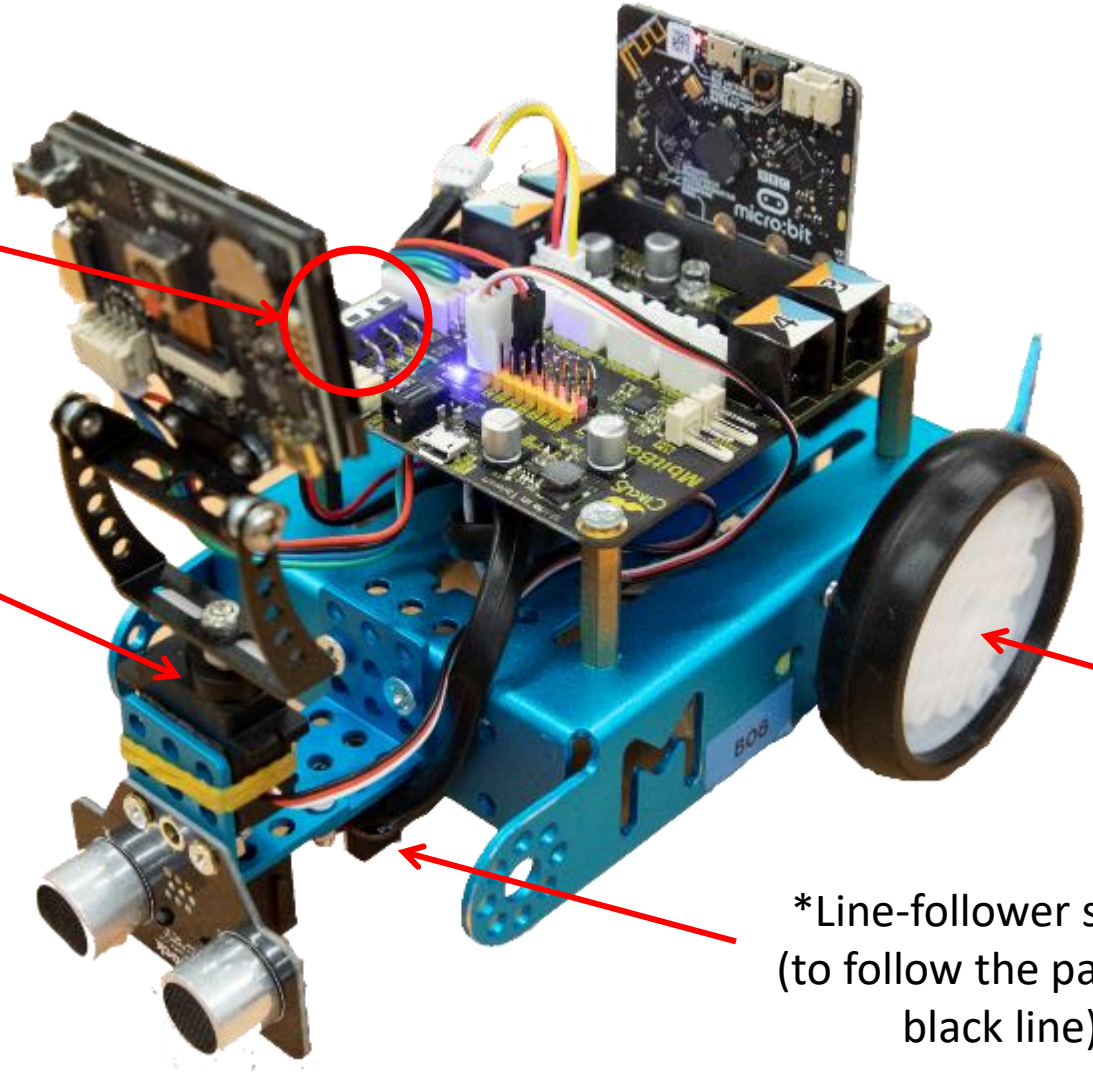
Power On switch

mBot
(A robot car)

Micro:bit
(A micro-computer)

The DGS AI car is a programmable car with AI vision functionalities.

Introducing the DGS AI Car



Power On switch

Servo-motor (rotate the lens from 0 to 180 degree)

*Ultra-sonic sensor (to detect obstacles)

DC motor (driving the car)

*Line-follower sensor (to follow the path of a black line)

* The functions of these sensors are not considered as AI. However, it does have limited capabilities to “see” the world.

Consolidating Knowledge Using the Hardware Toolkit

Face Detection vs Face Recognition

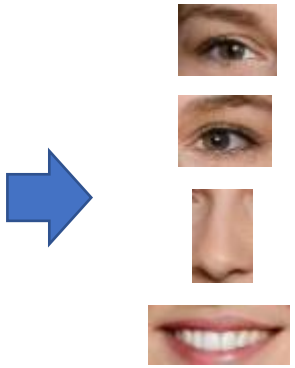
Face Detection

- Can confirm that there is a human face present in an image by identifying the features extracted.

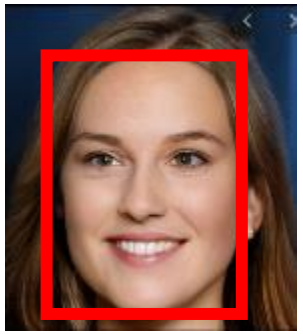
Face Recognition

- Can confirm the identity of the face detected by comparing data below with known (tagged or learnt) faces.

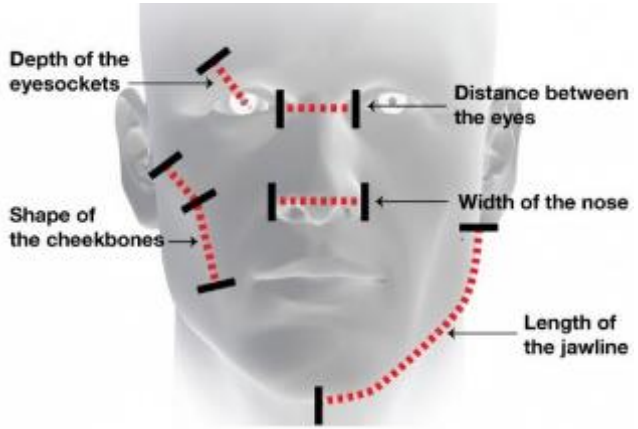
Input image



Feature Extraction

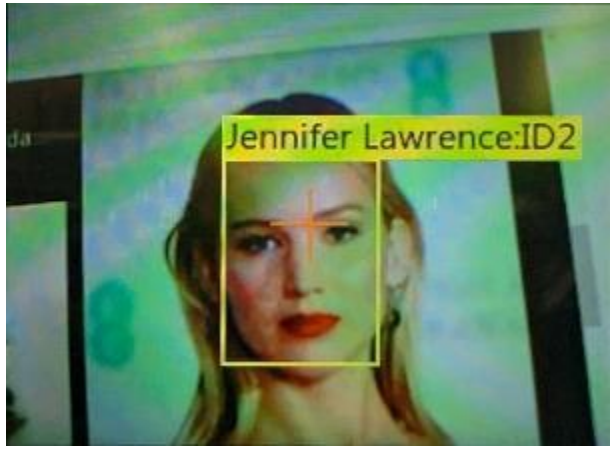


Face detected



Steps for Face Recognition in HuskyLens

1. Face detection (program already built in the hardware)
2. Learn faces by taking photos. The learnt faces will be marked as ID1, ID2, ID3, ….
3. Tag the IDs with real identities (e.g. names) of the faces



Developing Computational Thinking Using the Hardware Toolkit

Can We Build These Using Our AI Cars?

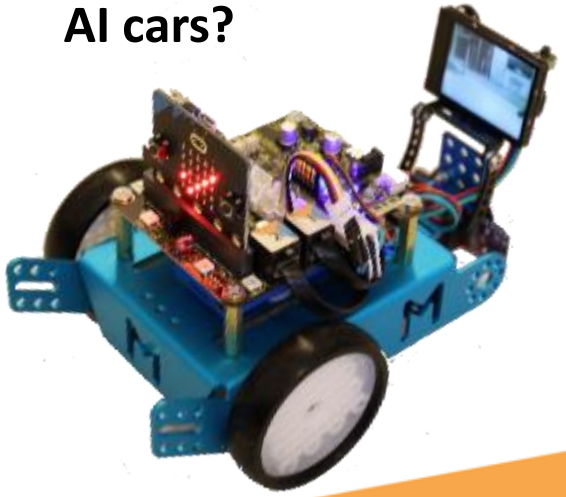
Camera that follows you

Link: https://www.youtube.com/watch?v=CDW-3lCM5QM

Automatic Camera in Sports

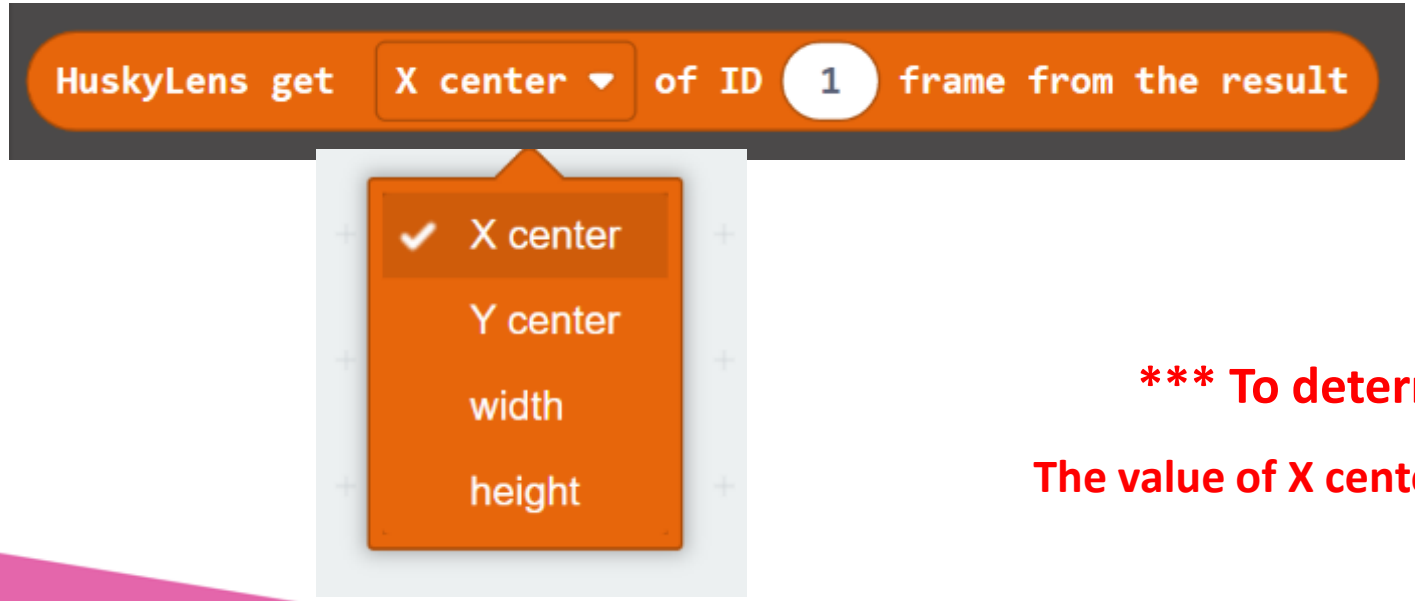
Link: https://www.youtube.com/watch?v=fHeZwiWMfXo

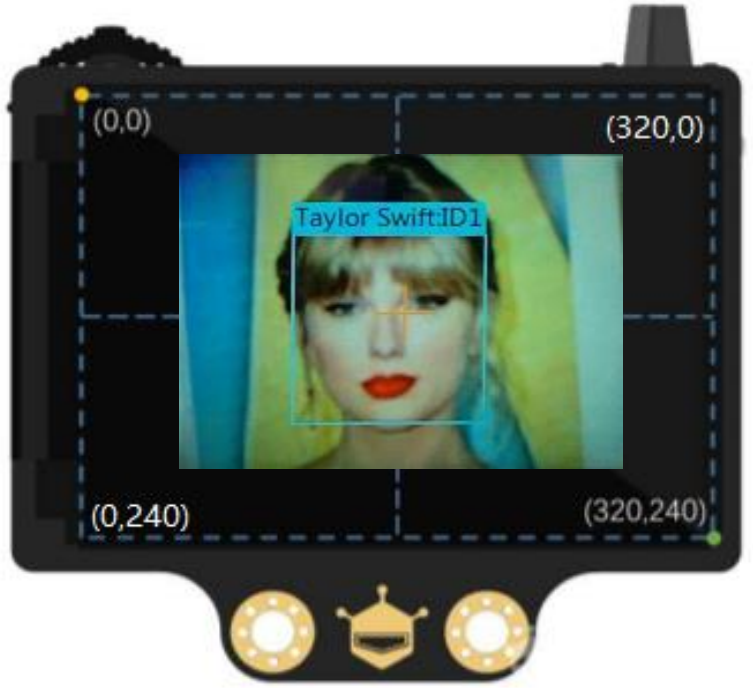
- What do we need?
  - AI?
  - Robotics?
- Are these provided in the AI cars?



Coordinate System of Huskylens

When HuskyLens is detecting an object, the target will be automatically selected by a color frame on the screen. Then, we can use the following program block to get its coordinate.





***** To determine if the face ID is present *****

The value of X center will be equal to -1 if the face ID is NOT present in the screen

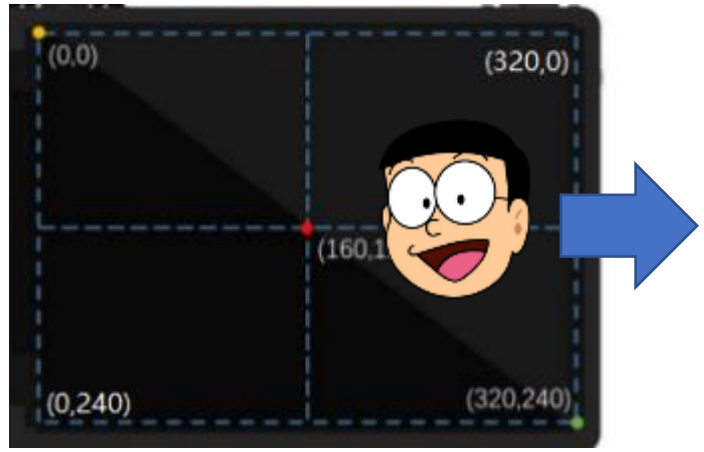
Algorithm of Face Following

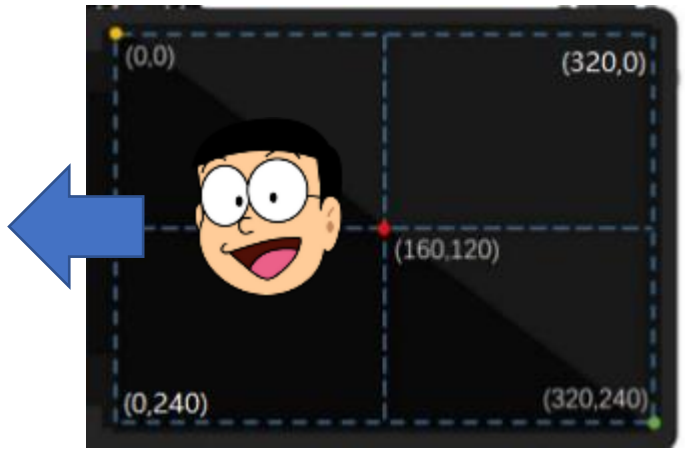
```
forever
{
        x = x coordinate of the face detected

        if x > 190 and x < 320 then
              turn the camera to the right

        else if x > 0 and x < 130 then
              turn the camera to the left

        else
                stop rotating the camera
}
```





Extended Activity

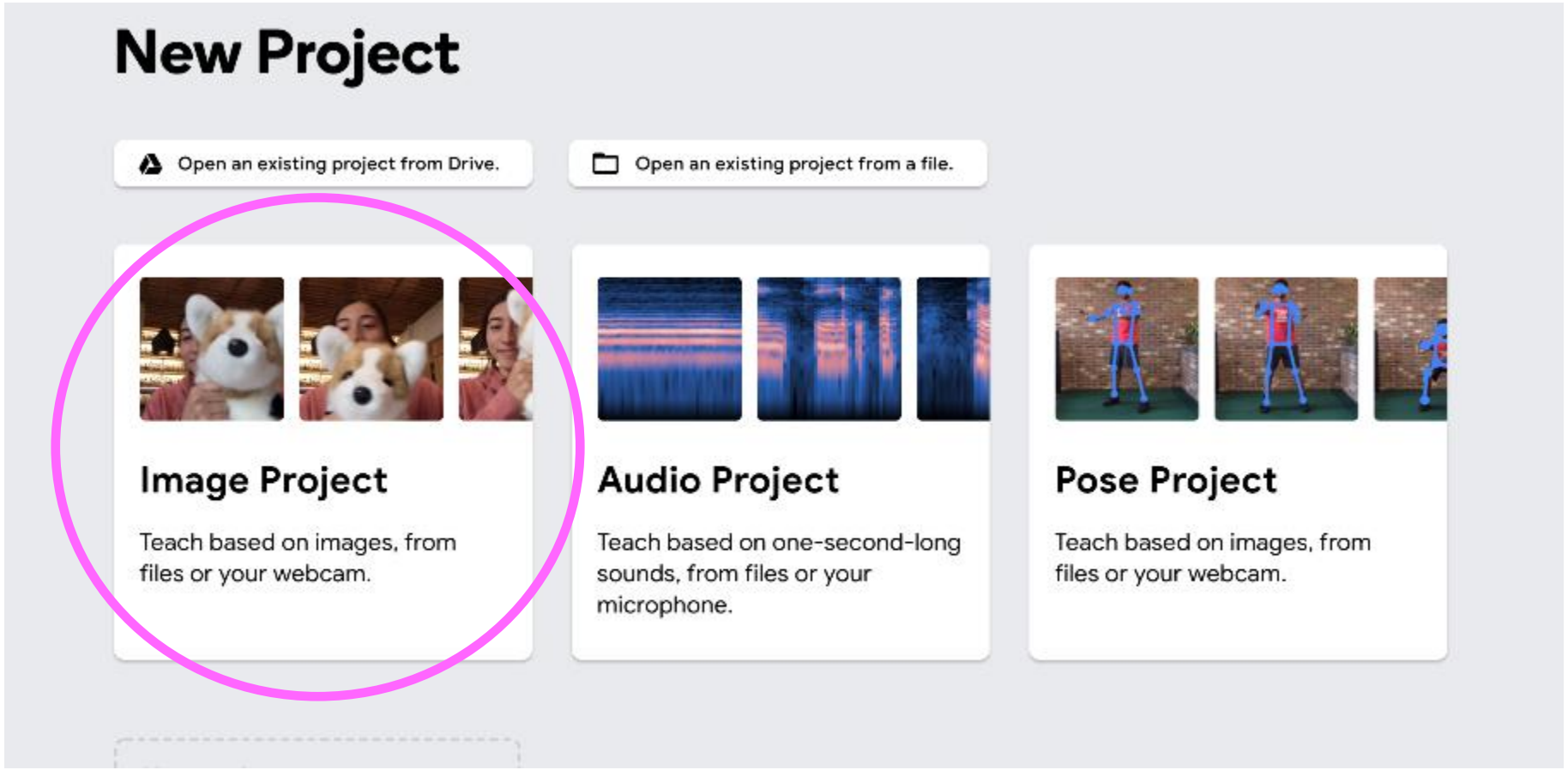
1. Learn one more face ID and modify the program so that the camera can follow face ID 1 or face ID 2 (Hint: it is a simple task of copy and paste)

2. What will happen if both face IDs are present on the screen?
   How to determine if both face IDs are present? (slide 6)
   Can we follow both faces together?

   (Hint: What is the value of x that we can use for reference? Can we create two variables x1, x2 and calculate the value of x based on these variables?)

Software Toolkit
(Chapter 2 – Fundamentals of AI)

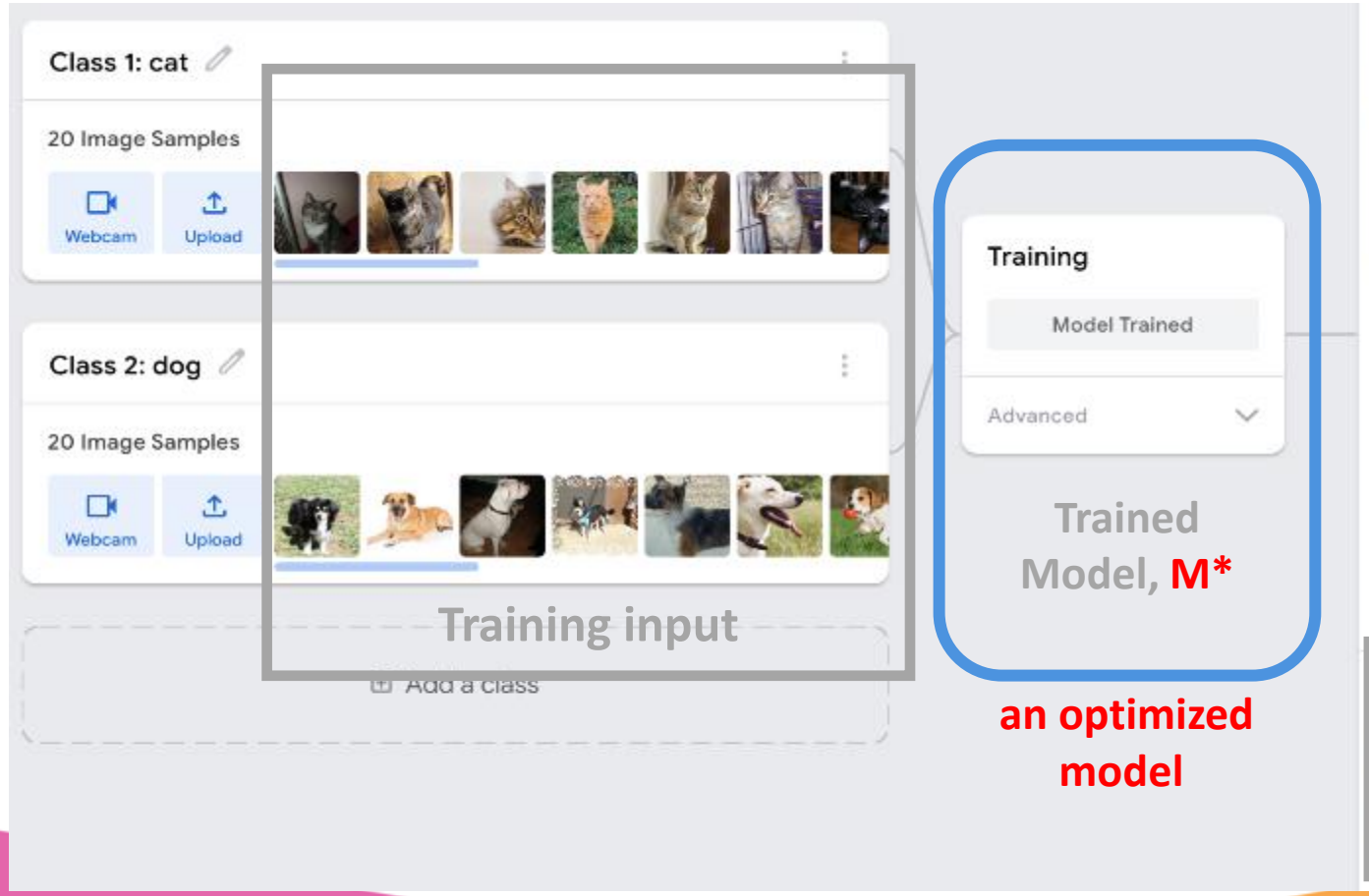
Google's Teachable Machine: Image Classifier



Let's try image classification

Google Teachable Machine: Example

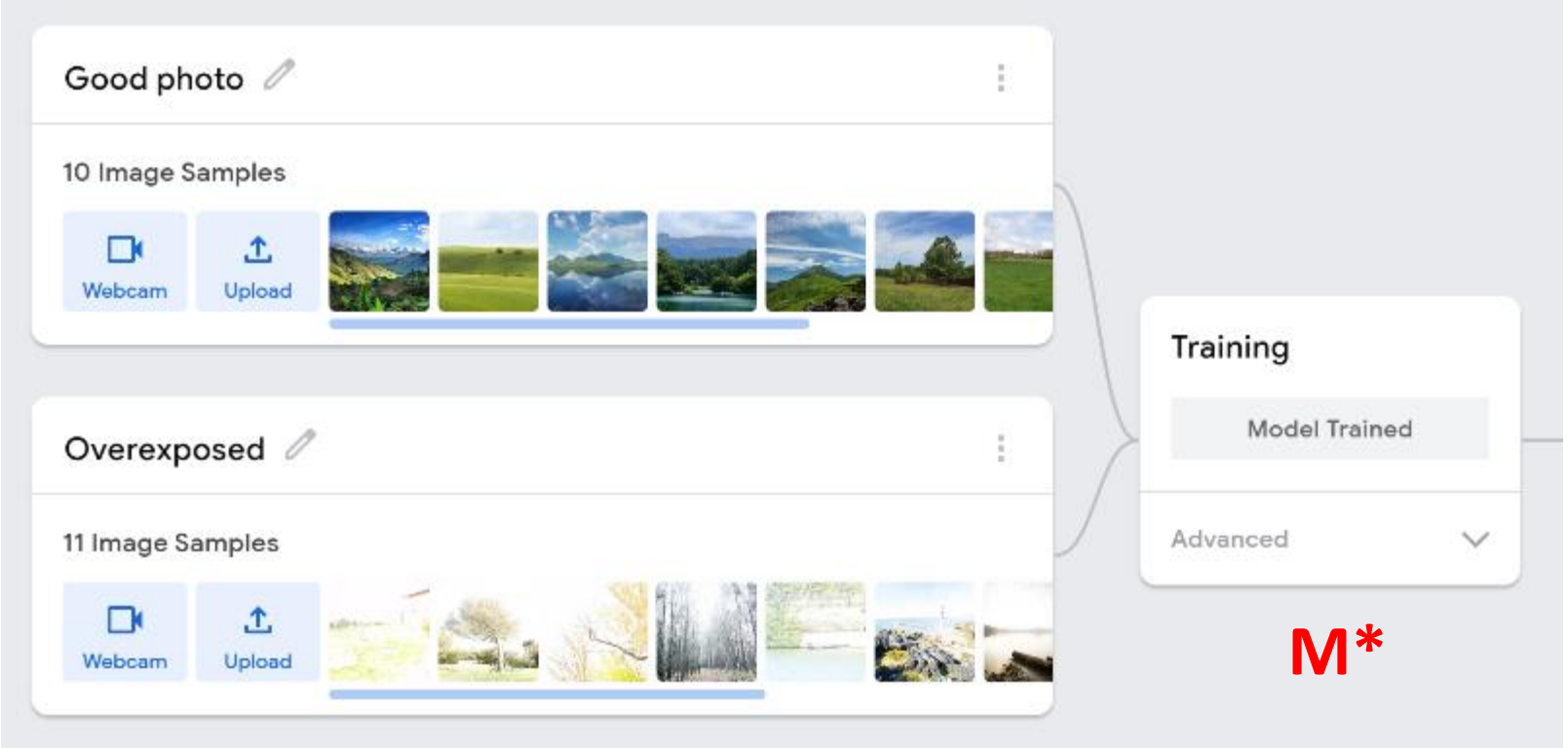
- ❑ Training input is used to train a model
- ❑ Given a testing input, the trained model M outputs its label (either a cat or a dog)



Explaining Concepts Using the Software Toolkit (Learning by doing)

Activity One:
Building an AI Model to Predict if a Photo is Overexposed

- Create and train an AI model in the Google Teachable Machine using the photos in the folder 01a and 01b, we call the trained model M*



Activity One:
Building an AI Model to Predict if a Photo is Overexposed

- ❑ Test the AI model, M*, using the snow photos in the folder 03
- ❑ Does the AI model treat snow photos as overexposed?



- ❑ Train the AI model, M*, again by adding snow photos in the folder 02, to get an updated M*
- ❑ Test the updated AI model (updated M*) using the snow photos in the folder 03 again
- ❑ Does the updated AI model work better for snow photos now?

Q&A