



Kissipo Learning for Deep Learning

Topic 17: Automated Optical Inspection (20min)

Hsueh-Ting Chu

KLDL-W6-T17

Course Schedule

- W1 - Course Introduction
- W2 - DL Programming Basics(1)
- W3 - DL Programming Basics(2)
- W4 - DL with TensorFlow
- W5 - Midterm
- W6 - DL with PyTorch
- W7 - AOI hands-on project
- W8 - RSD hands-on project
- W9 - NLP hands-on project
- W10 - Final exam

DL: Deep Learning

AOI: Automated Optical Inspection

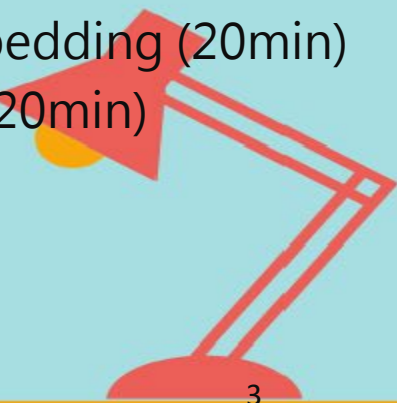
RSD: Road Sign Detection

NLP: Natural Language Processing



Topics

- Topic 01: Introduction to Deep Learning (20min)
- Topic 02: KISSipo Learning for Deep Learning (20min)
- Topic 03: Python quick tutorial (20min)
- Topic 04: Numpy quick tutorial (15min)
- Topic 05: Pandas quick tutorial (15min)
- Topic 06: Scikit-learn quick tutorial (15min)
- Topic 07: OpenCV quick tutorial (15min)
- Topic 08: Image Processing basics (20min)
- Topic 09: Machine Learning basics (20min)
- Topic 10: Deep Learning basics (20min)
- Topic 11: TensorFlow overview (20min)
- Topic 12: CNN with TensorFlow (20min)
- Topic 13: RNN with TensorFlow (20min)
- Topic 14: PyTorch overview (20min)
- Topic 15: CNN with PyTorch (20min)
- Topic 16: RNN with PyTorch (20min)
- **Topic 17: Introduction to AOI (20min)**
- Topic 18: AOI simple Pipeline (A) (20min)
- Topic 19: AOI simple Pipeline (B) (20min)
- Topic 20: Introduction to Object detection (20min)
- Topic 21: YoloV5 Quick Tutorial (20min)
- Topic 22: Using YoloV5 for RSD (20min)
- Topic 23: Introduction to NLP (20min)
- Topic 24: Introduction to Word Embedding (20min)
- Topic 25: Name prediction project (20min)



Week 7 Topics

- Topic 17: Introduction to AOI (20min)
- Topic 18: AOI simple Pipeline (A) (20min)
- Topic 19: AOI simple Pipeline (B) (20min)



AOI machine



Automated optical inspection machine

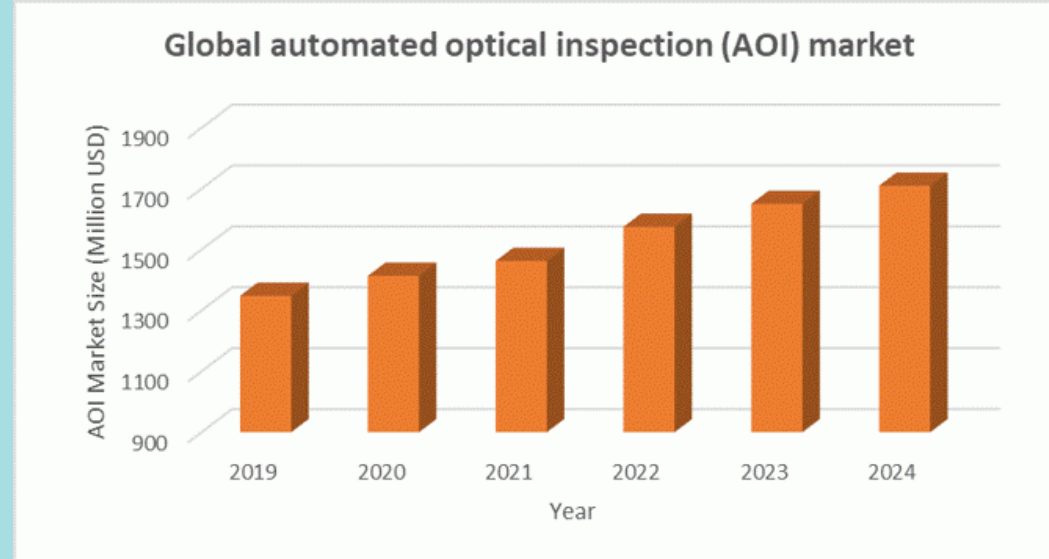
Automated optical inspection (AOI) is an automated visual inspection of printed circuit board (PCB) (or LCD, transistor) manufacture where a camera autonomously scans the device under test for any quality defects.

It is commonly used in the manufacturing process because it is a non-contact test method.

https://en.wikipedia.org/wiki/Automated_optical_inspection



Automated Optical Inspection System Market

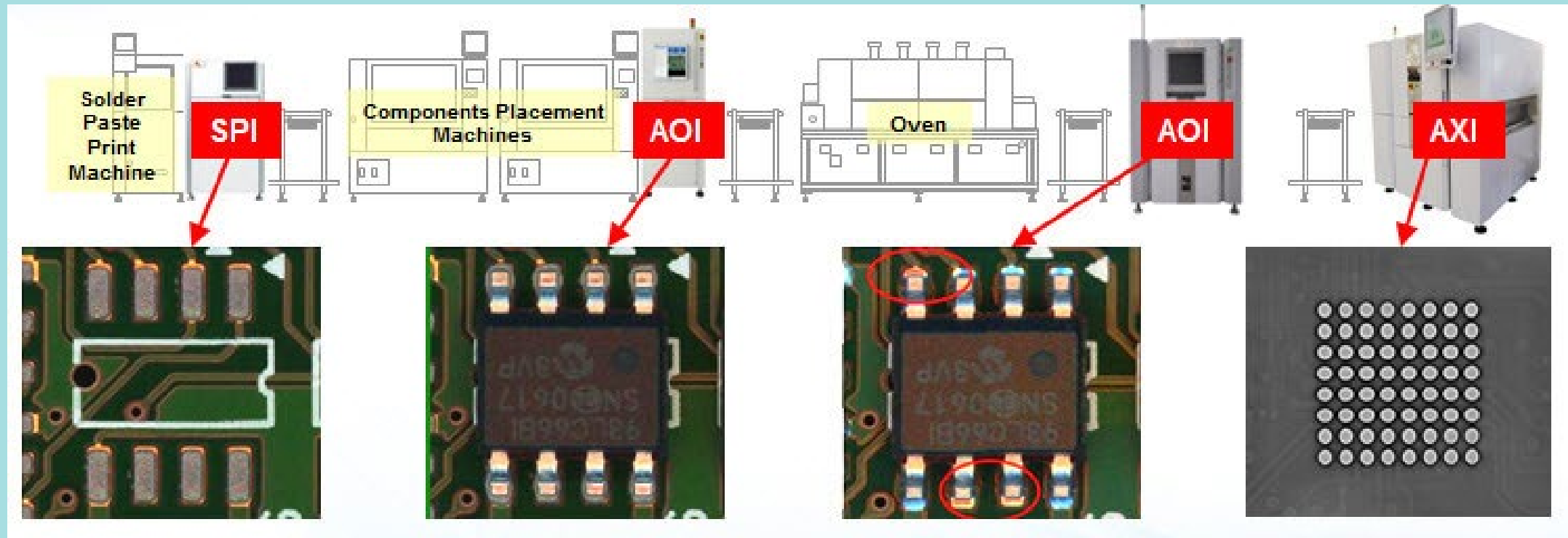


Global automated optical inspection (AOI) market was valued to be **1,348 million USD in 2019**. On the other hand, the automated optical inspection (AOI) market size is anticipated to have a growth with **the CAGR of 4.87%** in the coming years to reach **1,709 million USD in 2024**.

<https://aoi-spi.com/automated-optical-inspection-market/>

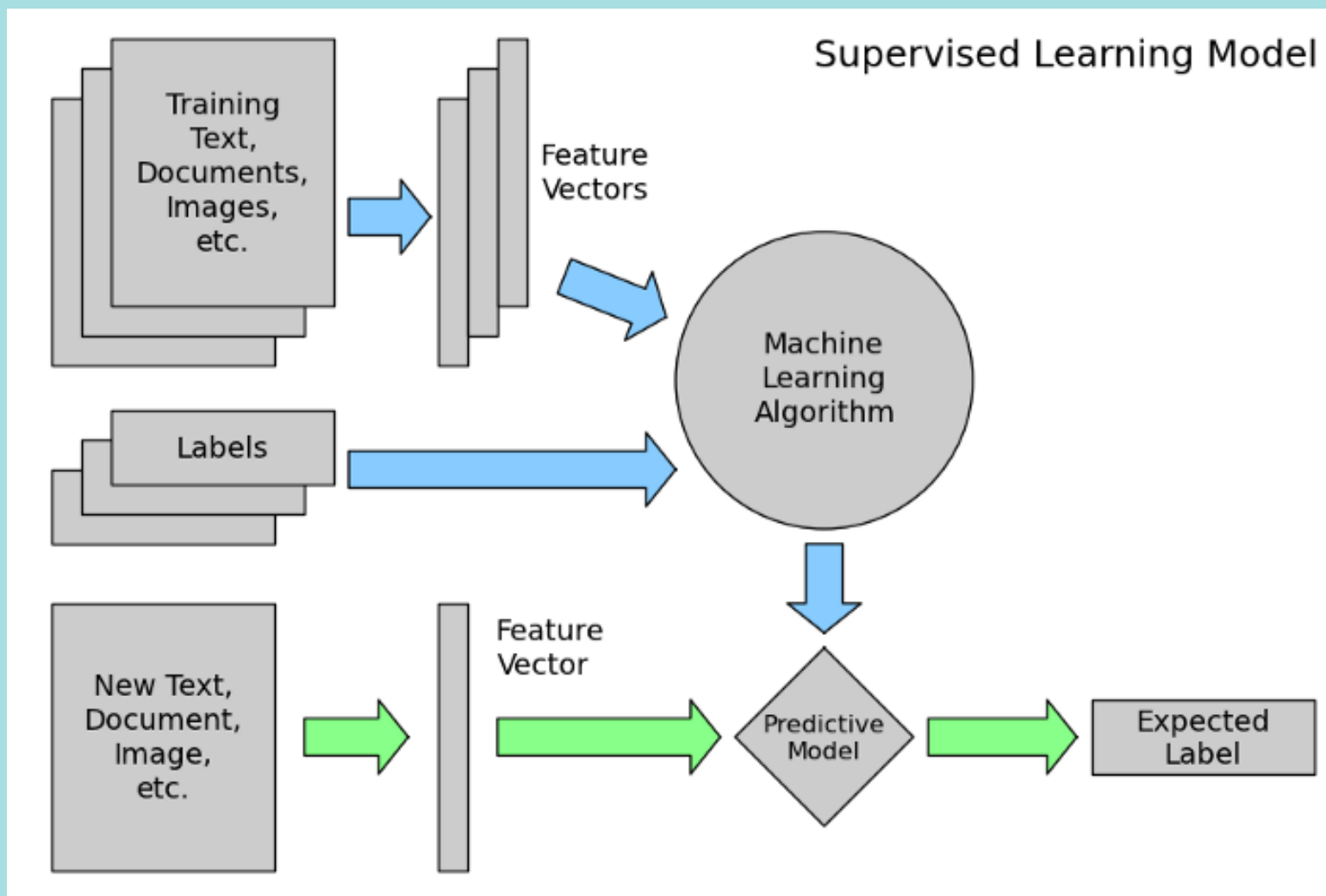


Types of Automated Optical Inspection

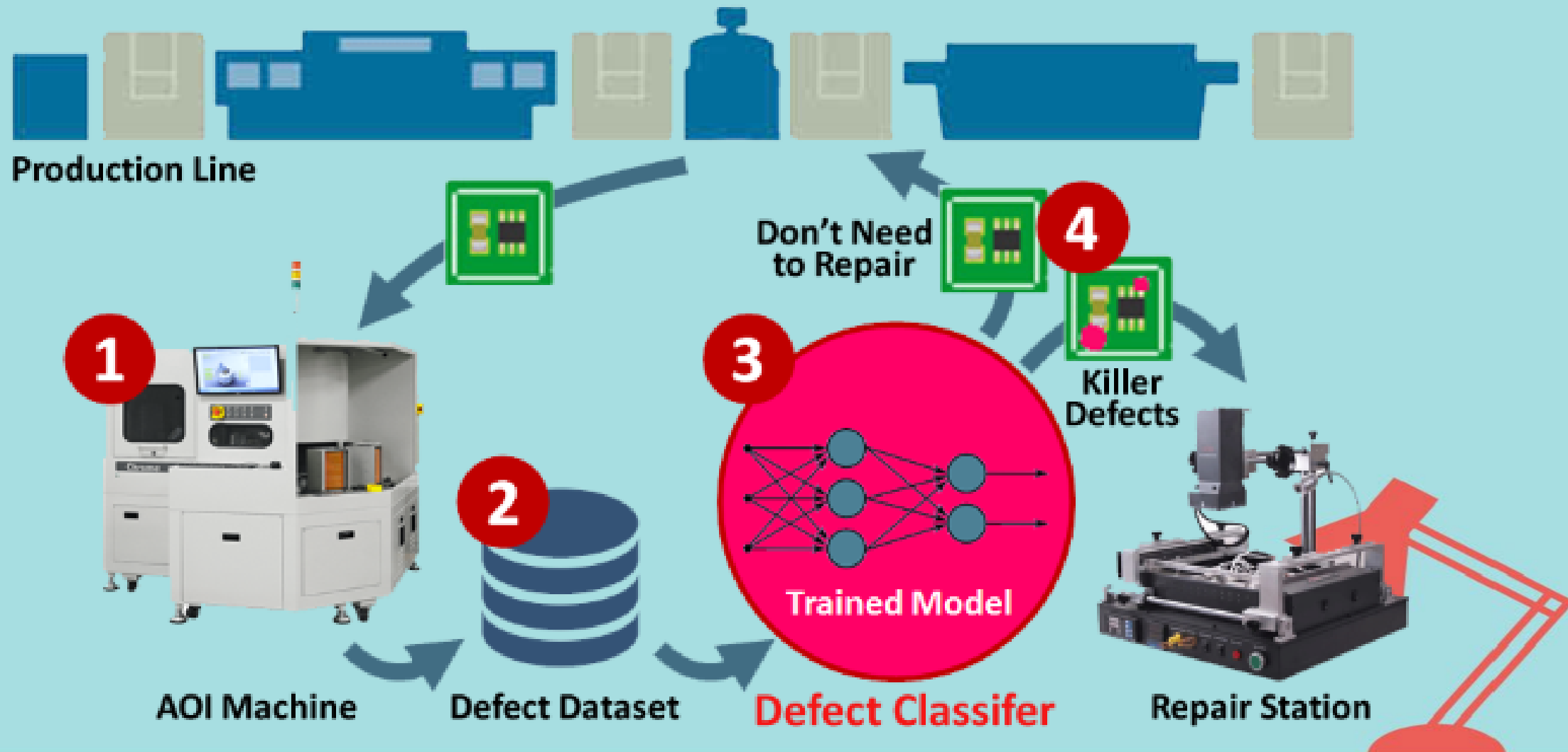


SPI (Solder Paste Inspection)
AOI (Auto Optical Inspection)
AXI (Automatic X-ray Inspection)

AOI Machine Learning model



AOI with Deep Learning models

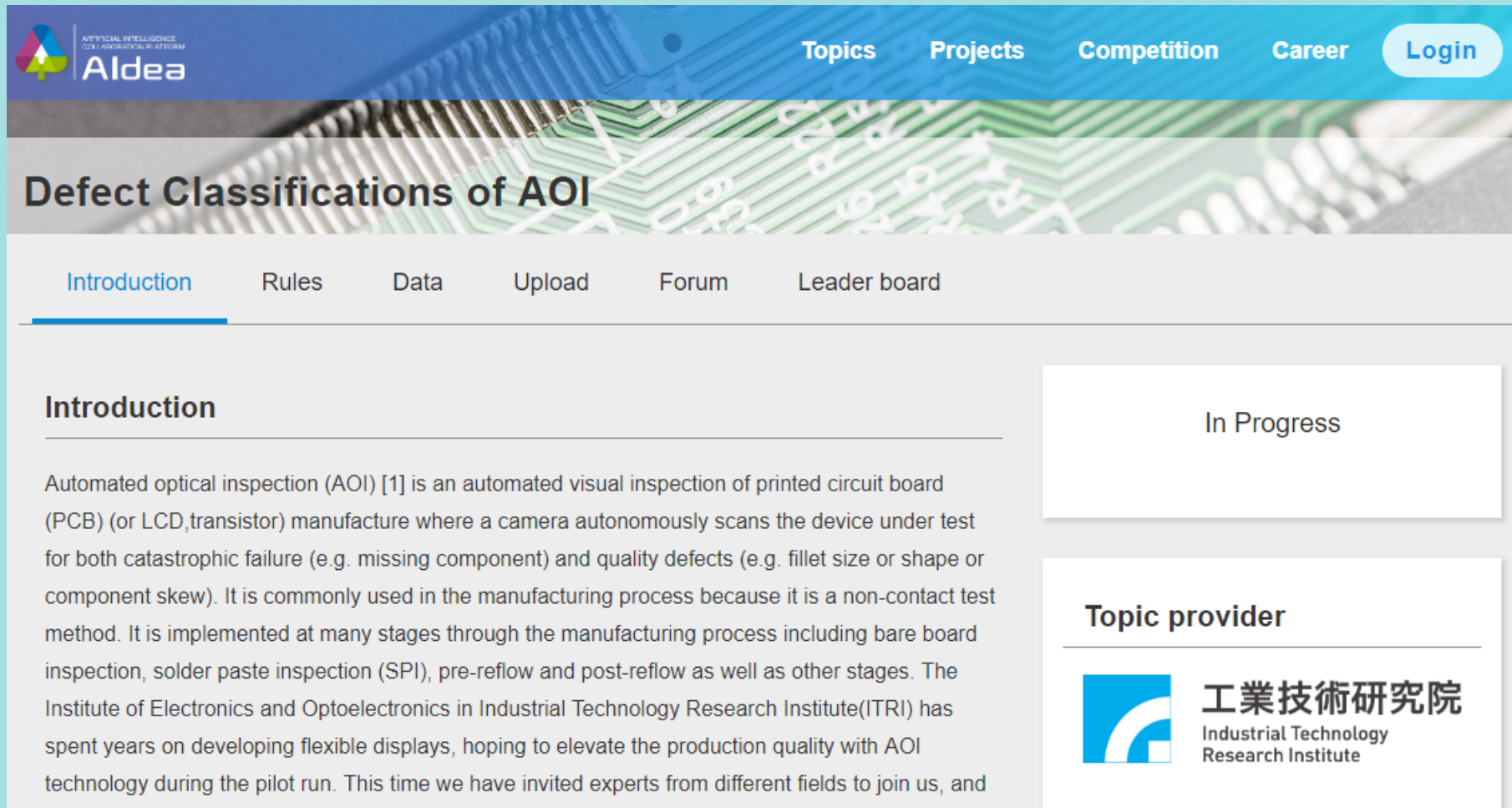


AOI errors

- Underkill rate: Bad- > Good
- Overkill rate: Good- > Bad
- In traditional AOI inspection methods, in order to prevent passing defective objects, parameters are usually set strictly, leading to many overkill situations. Therefore, it is still necessary to have human re-check with traditional methods.



Open Topic: Defect Classifications of AOI



The screenshot shows the Aldea website interface. At the top, there is a navigation bar with the Aldea logo (a stylized 'A' with a green and blue triangle) and the text 'ARTIFICIAL INTELLIGENCE COLLABORATION PLATFORM'. To the right of the logo are links for 'Topics', 'Projects', 'Competition', 'Career', and a 'Login' button. Below the navigation bar is a large banner image of a green circuit board. The main heading 'Defect Classifications of AOI' is displayed in a dark box. Underneath the heading is a sub-navigation bar with links: 'Introduction' (which is underlined), 'Rules', 'Data', 'Upload', 'Forum', and 'Leader board'. The 'Introduction' section contains a paragraph of text about Automated Optical Inspection (AOI). To the right of the text, there is a white box with the text 'In Progress'. Below this, there is a 'Topic provider' section featuring the logo of the Industrial Technology Research Institute (ITRI) and its name in Chinese and English.

Aldea ARTIFICIAL INTELLIGENCE COLLABORATION PLATFORM

Topics Projects Competition Career Login

Defect Classifications of AOI


Introduction Rules Data Upload Forum Leader board

Introduction

Automated optical inspection (AOI) [1] is an automated visual inspection of printed circuit board (PCB) (or LCD, transistor) manufacture where a camera autonomously scans the device under test for both catastrophic failure (e.g. missing component) and quality defects (e.g. fillet size or shape or component skew). It is commonly used in the manufacturing process because it is a non-contact test method. It is implemented at many stages through the manufacturing process including bare board inspection, solder paste inspection (SPI), pre-reflow and post-reflow as well as other stages. The Institute of Electronics and Optoelectronics in Industrial Technology Research Institute (ITRI) has spent years on developing flexible displays, hoping to elevate the production quality with AOI technology during the pilot run. This time we have invited experts from different fields to join us, and

In Progress


Topic provider

 **工業技術研究院**
Industrial Technology Research Institute



Defect Classifications of AOI

Defect Classifications of AOI



[Introduction](#)[Rules](#)[Data](#)[Upload](#)[Forum](#)[Leader board](#)


Introduction

Automated Optical Inspection (AOI for short) [1] is a high-speed and high-precision optical image inspection system, using machine vision as the inspection standard technology, which can improve the shortcomings of traditional manual inspection using optical instruments. The application level includes From research and development of high-tech industries, manufacturing quality control, to national defense, people's livelihood, medical care, environmental protection, electric power...etc. The Institute of Electro-Optics of the Industrial Technology Research Institute has invested in the research and development of flexible electronic displays for many years. During the trial mass production process, it hopes to improve the production quality through AOI technology. This time, data scientists from all walks of life are invited to participate in this grand event to interpret the classification of defects based on the provided AOI image data, so as to improve the efficiency of AOI interpretation through data science.

1011
participants

Register

Topic provider



工業技術研究院
Industrial Technology
Research Institute



Aidea platform



ARTIFICIAL INTELLIGENCE
COLLABORATION PLATFORM

Aidea

- Artificial Intelligence Collaboration Platform by ITRI(Industrial Technology Research Institute)
- Solving real AI industrial issues in Taiwan
- Building AI industrial datasets in Taiwan

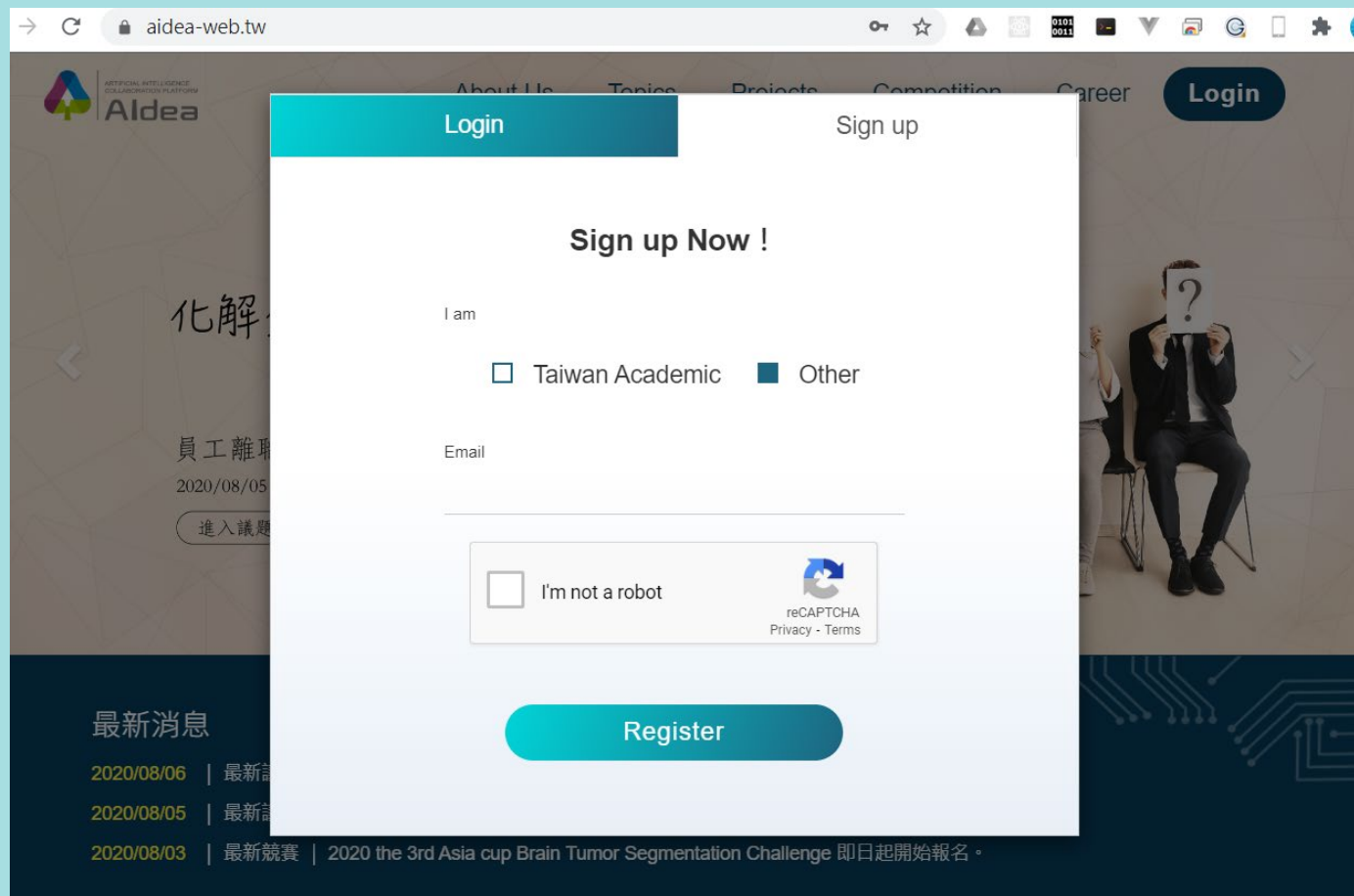
AOI data description

There are 6 categories included in image data that the issue offers (1 normal category + 5 defect categories)

The download data file (aoi_data.zip) includes:

- train_images: image data for training (PNG format), 2,528 images in total.
- train.csv: includes 2 columns, ID and Label.
 - ID: the image filename
 - Label: defect classification category
(0: normal, 1: void, 2: horizontal defect, 3: vertical defect, 4: edge defect, 5: particle)
- test_images: image data for testing (PNG format), 10,142 images in total.
- test.csv: includes 2 columns, ID and Label.
 - ID: the image filename
 - Label: Nan

Prepare to register Aldea projects



The screenshot shows the Aldea website with a registration modal open. The modal has a teal header with 'Login' and 'Sign up' tabs. The main heading is 'Sign up Now !'. Below it, there is a section 'I am' with two radio buttons: 'Taiwan Academic' (unchecked) and 'Other' (checked). An 'Email' input field is present. At the bottom of the form, there is a checkbox labeled 'I'm not a robot' next to a reCAPTCHA logo and the text 'reCAPTCHA Privacy - Terms'. A large teal 'Register' button is at the bottom of the modal. The background of the website shows the Aldea logo, navigation links, and a person holding a sign with a question mark.

→ ↻ aidea-web.tw

About Us Topics Projects Competition Career Login

Login **Sign up**

Sign up Now !

I am

☐ Taiwan Academic ☒ Other

Email

☐ I'm not a robot reCAPTCHA Privacy - Terms

Register

化解

員工離職

2020/08/05

進入議題

最新消息

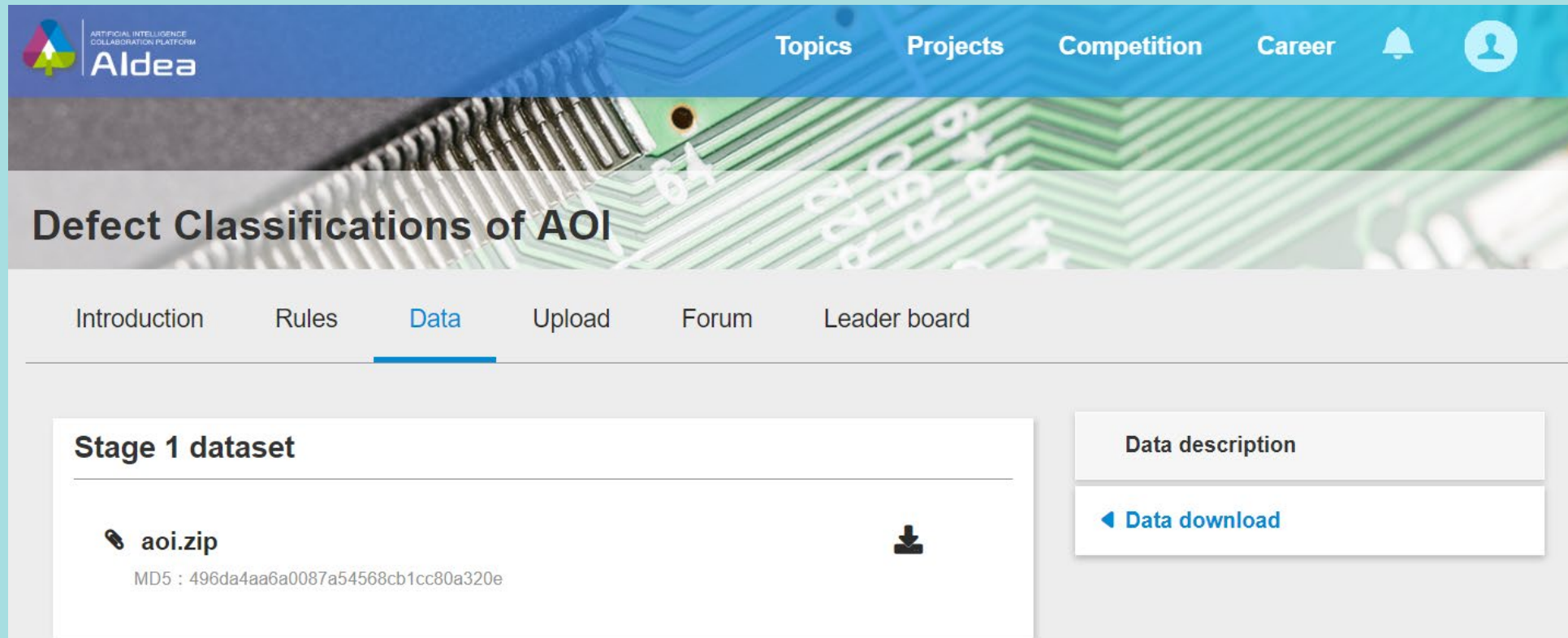
2020/08/06 | 最新

2020/08/05 | 最新

2020/08/03 | 最新競賽 | 2020 the 3rd Asia cup Brain Tumor Segmentation Challenge 即日起開始報名。



Download the AOI Dataset



The screenshot shows the Aldea Artificial Intelligence Collaboration Platform interface. The top navigation bar includes links for Topics, Projects, Competition, and Career, along with a notification bell and a user profile icon. The main header features the Aldea logo and the title "Defect Classifications of AOI". Below this, a sub-navigation bar highlights the "Data" tab among other options like Introduction, Rules, Upload, Forum, and Leader board. The "Stage 1 dataset" section displays a file named "aoi.zip" with its MD5 hash and a download icon. A "Data description" box on the right contains a "Data download" link. A red desk lamp is positioned in the bottom right corner of the slide.

Aldea
ARTIFICIAL INTELLIGENCE
COLLABORATION PLATFORM

Topics Projects Competition Career

Defect Classifications of AOI

Introduction Rules **Data** Upload Forum Leader board

Stage 1 dataset


aoi.zip
MD5 : 496da4aa6a0087a54568cb1cc80a320e

Data description

◀ Data download

Check the dataset

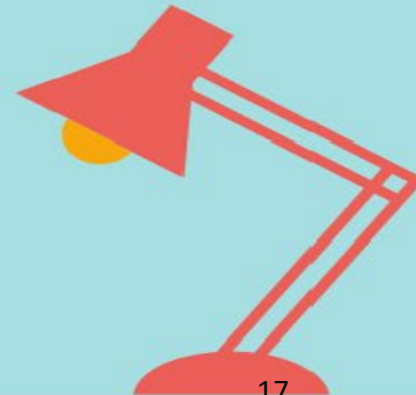
- aoi.zip → unzip
 - test.csv
 - test_images.zip → unzip
 - train.csv
 - train_images.zip → unzip



7-Zip is a file archiver with a high compression ratio.

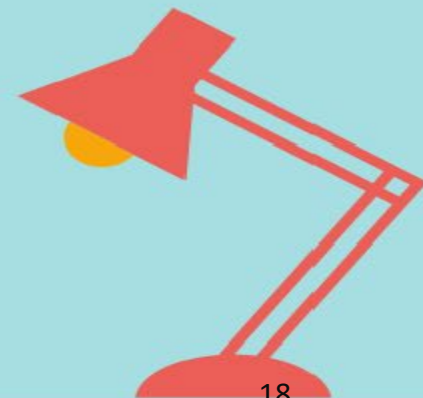
Download 7-Zip (2019-02-21) for Windows:

Link	Type	Windows	Size
Download	.exe	32-bit x86	1 MB
Download	.exe	64-bit x64	1 MB



The folders and files

aoi			
名稱	修改日期	類型	大小
test_images	2019/7/25 上午 0...	檔案資料夾	
train_images	2019/7/25 上午 0...	檔案資料夾	
test.csv	2018/5/18 下午 0...	Microsoft Excel 逗...	169 KB
train.csv	2018/5/18 下午 0...	Microsoft Excel 逗...	47 KB



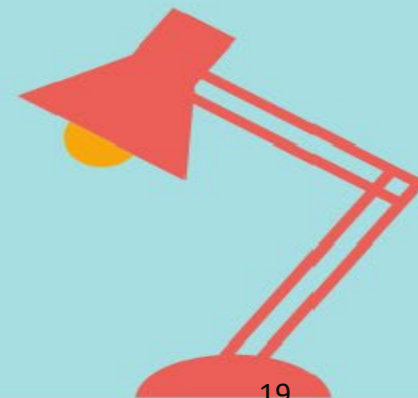
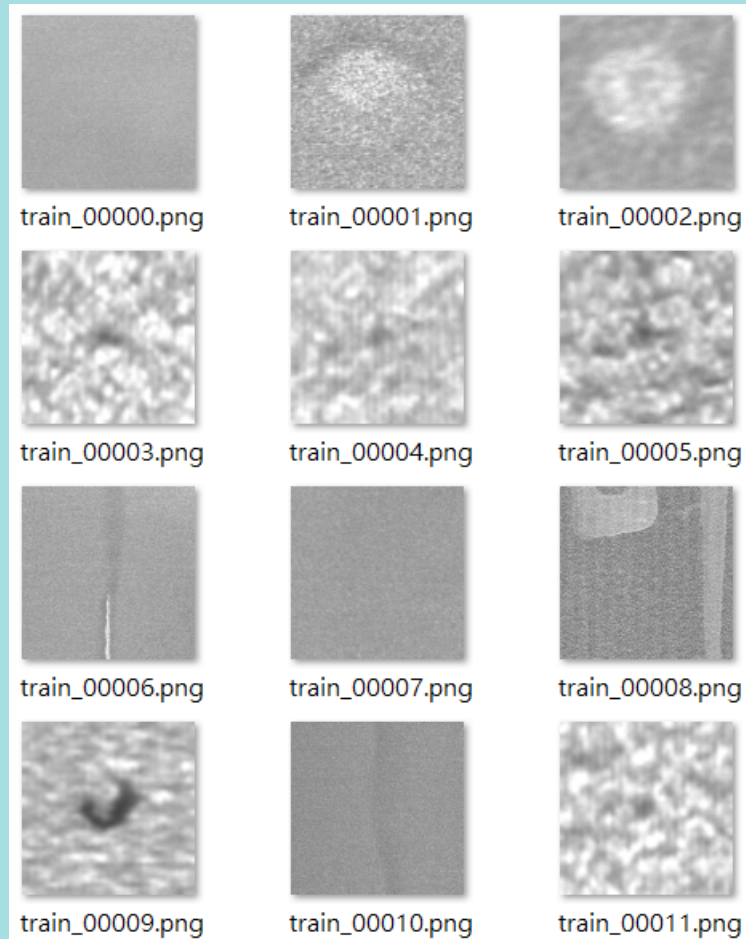
The training dataset - train.csv

train.csv - Excel

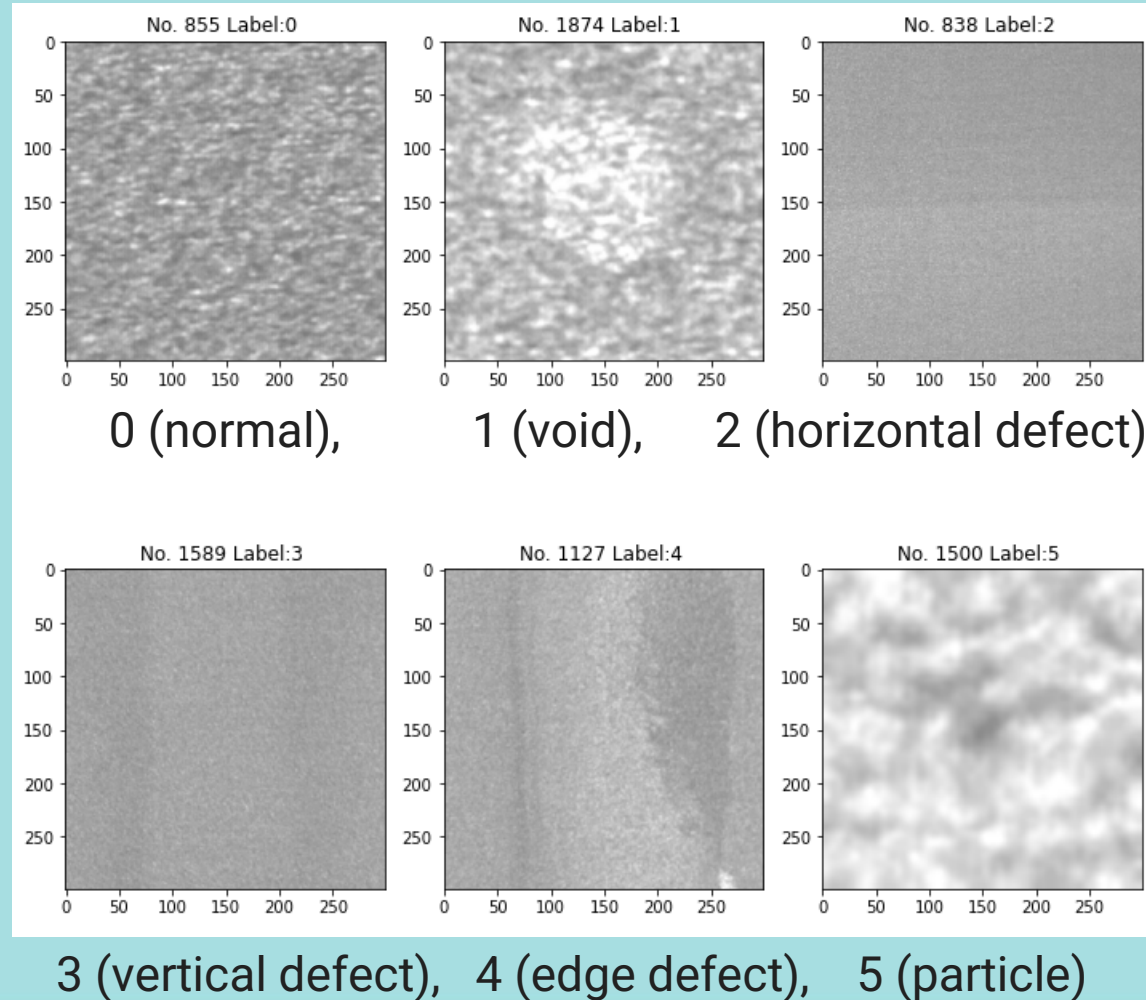
檔案 常用 插入 版面配置 公式 資料 校閱 檢視 ACROBAT 小

M15

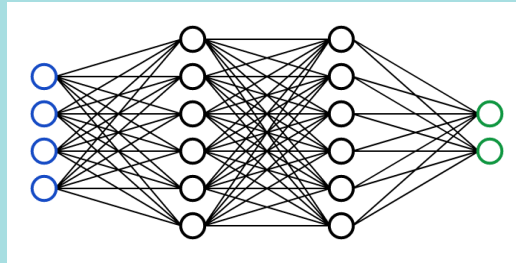
	A	B	C	D	E
1	ID	Label			
2	train_00000.png	0			
3	train_00001.png	1			
4	train_00002.png	1			
5	train_00003.png	5			
6	train_00004.png	5			
7	train_00005.png	5			
8	train_00006.png	3			
9	train_00007.png	0			
10	train_00008.png	3			
11	train_00009.png	5			



Classes of images



Aldea Workflow



(A) Input training data

(B) Model training and inference

(C) Output test result

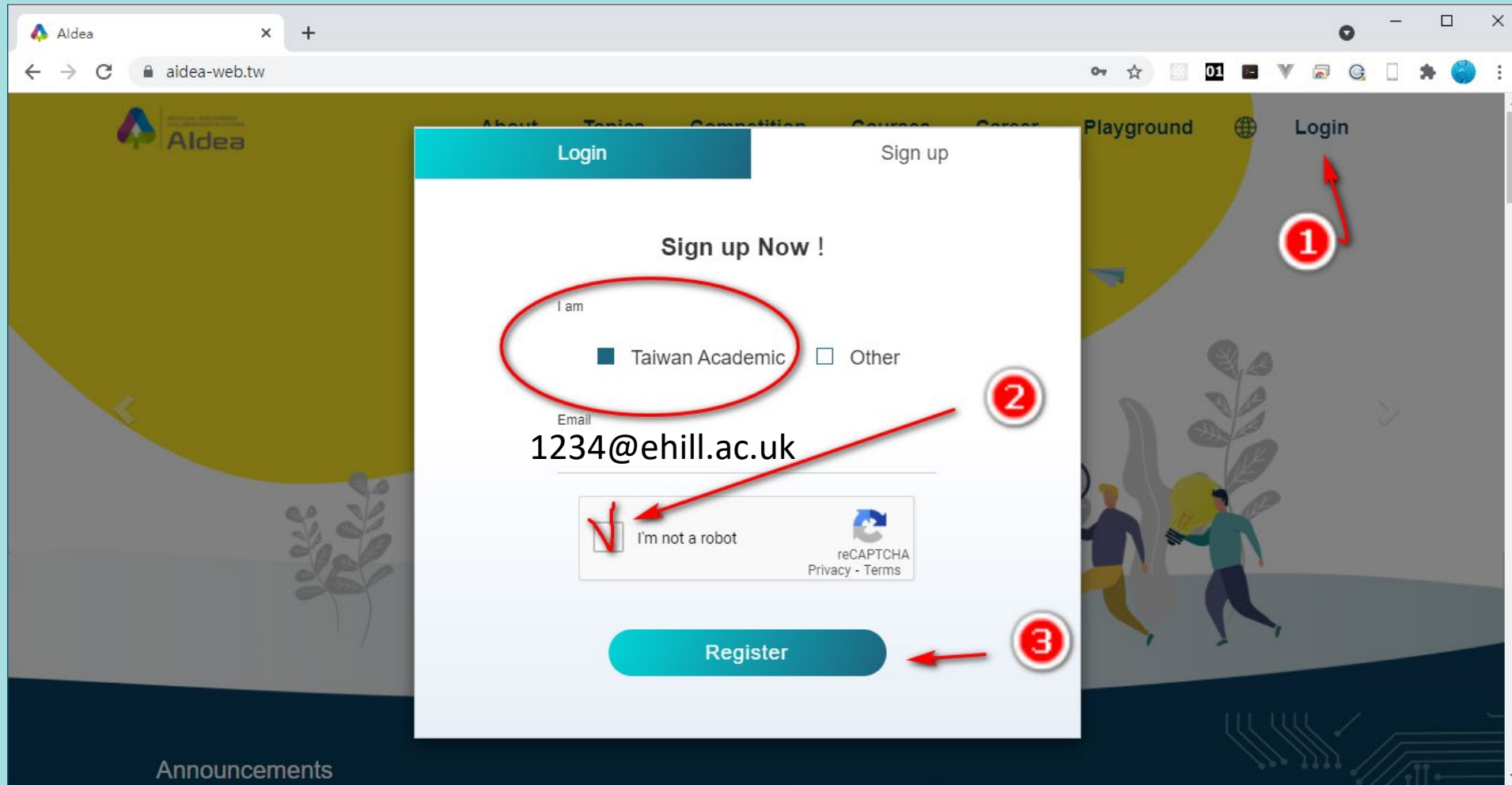




Register your Aldea account



Step 1: Type your email account, and press the Register button



The screenshot shows a web browser window with the URL 'aidea-web.tw'. A modal window titled 'Sign up Now !' is displayed. The modal has two tabs: 'Login' and 'Sign up'. The 'Sign up' tab is active. Inside the modal, there is a section 'I am' with two radio buttons: 'Taiwan Academic' (selected) and 'Other'. Below this is an 'Email' field containing '1234@ehill.ac.uk'. There is a reCAPTCHA widget with a checkbox labeled 'I'm not a robot' and a 'reCAPTCHA Privacy - Terms' link. At the bottom of the modal is a blue 'Register' button. Three red numbered arrows indicate the steps: Arrow 1 points to the 'Login' tab, Arrow 2 points to the 'Taiwan Academic' radio button, and Arrow 3 points to the 'Register' button.

Aldea

aidea-web.tw

About Terms Competition Courses Career Playground Login

Login Sign up

Sign up Now !

I am

☒ Taiwan Academic ☐ Other

Email

1234@ehill.ac.uk

☒ I'm not a robot reCAPTCHA Privacy - Terms

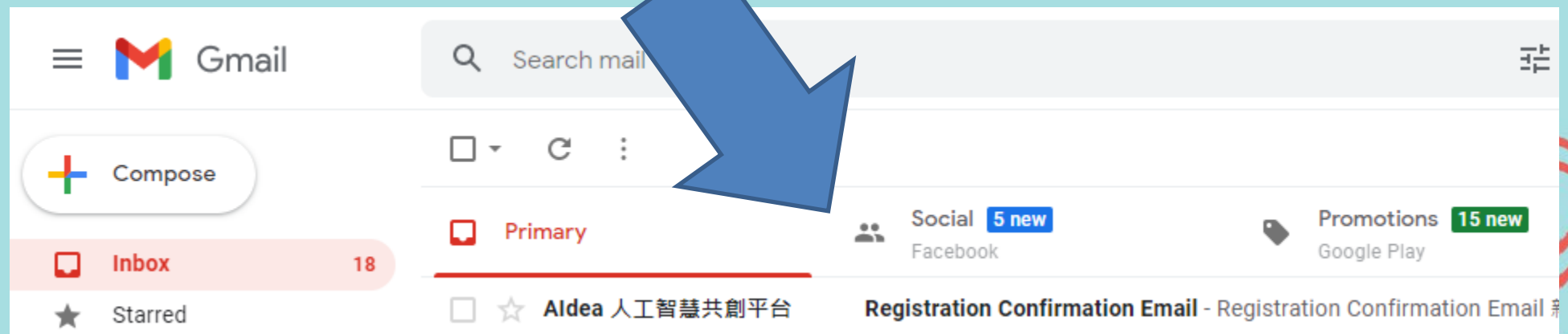
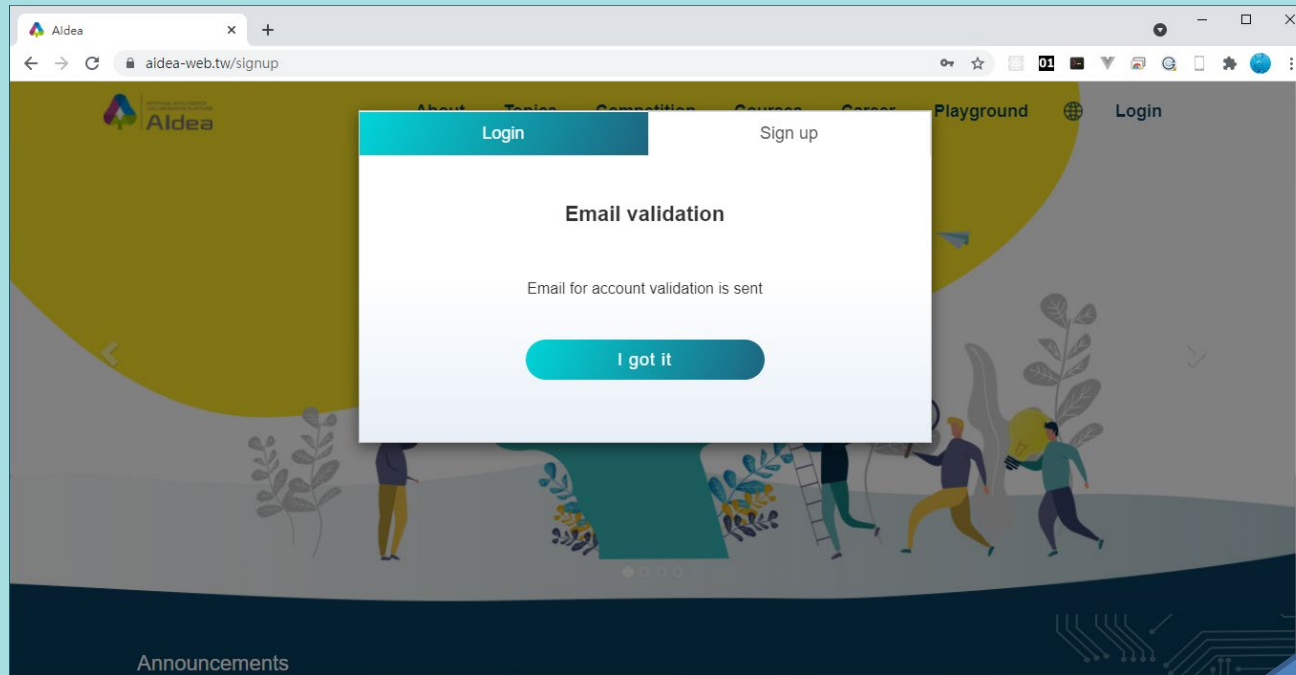
Register

Announcements

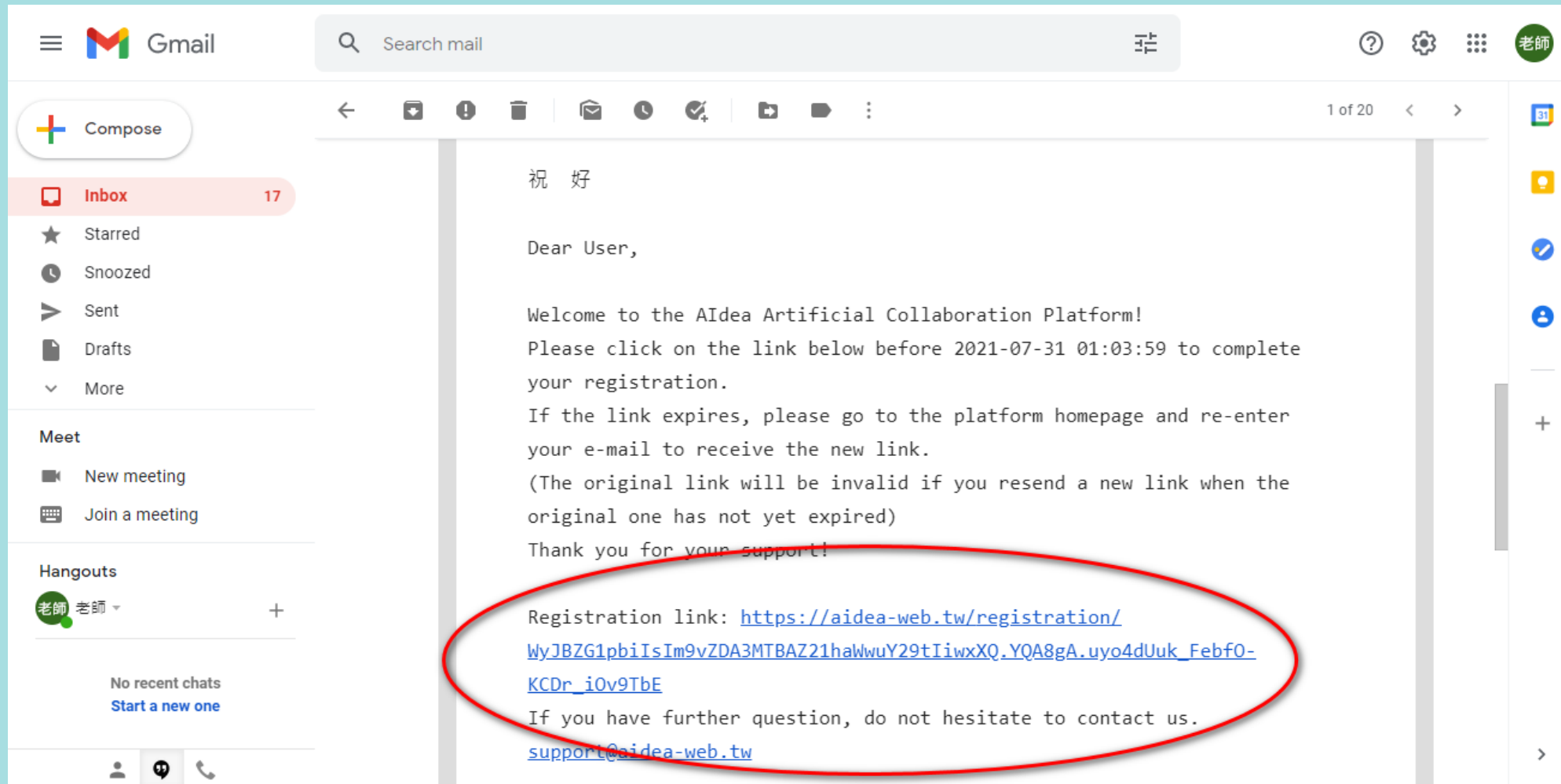
We treat you as foreign students at Asian universities,
so they are also Taiwan's academic.



Step 2: The system will send you an email



Step 3: Click the Registration link in the email



Step 4: Fill the registration form (Chinese)

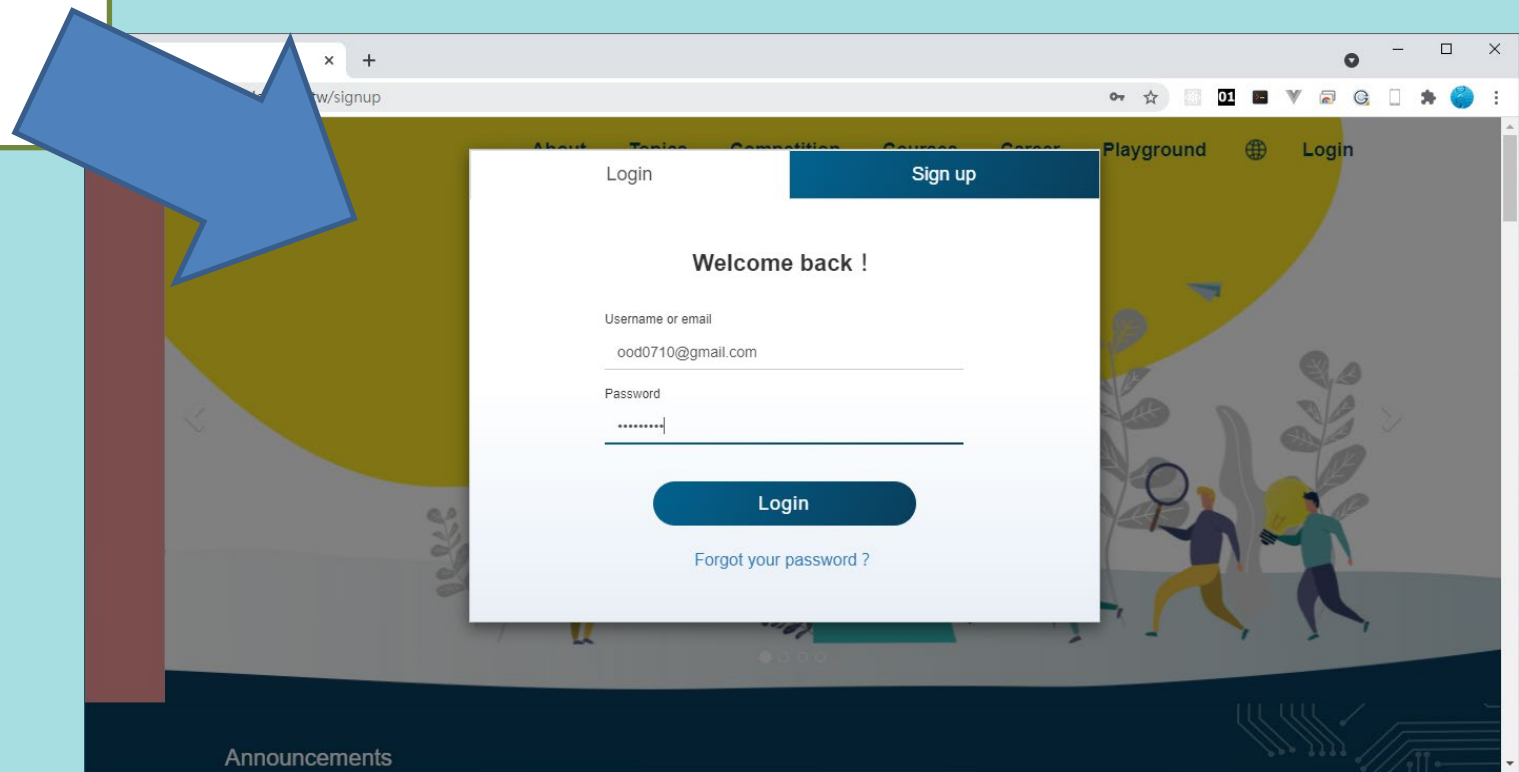
The screenshot shows the 'Member registration form' (會員註冊) on the Aldea website. The form includes the following fields and annotations:

- 使用者名稱 (Username):** A text input field containing 'userDxxx', marked with a red circle and the number 1. Below it, a green checkmark indicates '可以使用此帳號' (Can use this account).
- 電子郵件 (Email):** A text input field containing 'ood0710@gmail.com'.
- 姓名 (Name):** Two text input fields for '姓 (Last Name)' and '名 (First Name)', marked with a red circle and the number 2.
- 學校 (School):** A dropdown menu with '臺中市' (Taichung City) selected, marked with a red circle and the number 3.
- 系所 (Department):** A dropdown menu with '亞洲大學' (Asia University) selected, marked with a red circle and the number 4.
- 手機號碼 (Phone Number):** A text input field containing 'India(+91)' and '91900001', marked with a red circle and the number 5.
- 密碼 (Password):** A text input field with a strength indicator '密碼強度: 中' (Password strength: Medium) and a red circle with the number 6.
- 確認密碼 (Confirm Password):** A text input field for password confirmation.
- 同意條款 (Agree to terms):** A checkbox labeled '我同意服務條款及隱私權政策' (I agree to the terms of service and privacy policy), marked with a red circle and the number 7.
- 註冊 (Register):** A blue button at the bottom of the form.

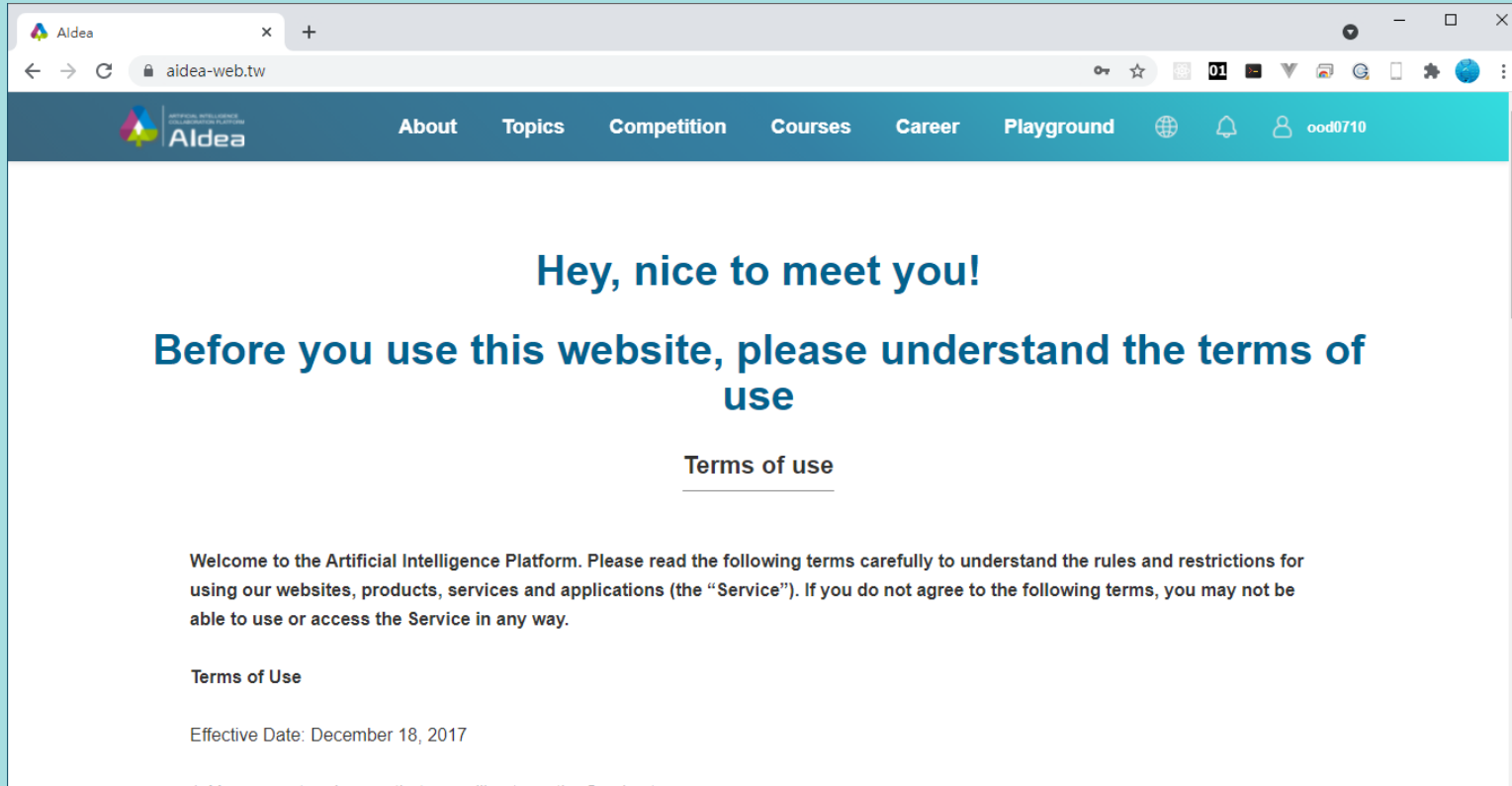
- (1) Choose a unique user id
- (2) Your name (Last name/First name)
- (3) City/School 臺中市/亞洲大學
- (4) Department
- (5) Phone number
- (6) Password
- (7) Agree the terms of service and privacy policy
- (8) Press the registration(註冊) button



Step 5: Finish the registration and return to login with your email



Step 6: Welcome message for Aldea platform



Scroll to the bottom

- We will manage and maintain your personal information in accordance with relevant law and regulation.

☒ Agree

Submit



Step 7: Send your Aldea account to me via Google Form

<https://shorturl.at/drHVW>

Your Aldea account

This form is for the students in the summer program of Asia University to attend the Aldea projects (<https://aidea-web.tw/>). PLEASE fill the email address for registering your Aldea account

*必填

電子郵件 *

你的電子郵件

! 這是必填問題

Your name *

您的回答

Your birthday *

日期

年 / 月 / 日

Comment or Suggestion

您的回答



<https://docs.google.com/forms/d/e/1FAIpQLSdVyabgsd29bR8ULRIneyFXthCfJkRiu1rpHtp6JOsiIXjEhA/viewform>



Thanks!

Q&A

