



# **Syllabus of Machine Learning**

**Prof. Chia-Yu Lin**  
**Yuan Ze University**

**2022 Spring**

# Goal

---



- Learn the basic knowledge and implementation techniques of machine learning.
  - Supervised Learning
  - Unsupervised Learning
  - Reinforcement Learning
- Create a wonderful final project so you can tell your son(s)/daughter(s), this is your project.
  - Make contributions on what you care

# Prerequisite

---

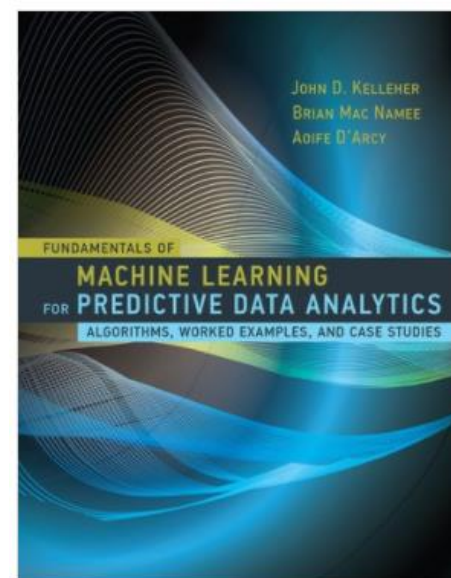
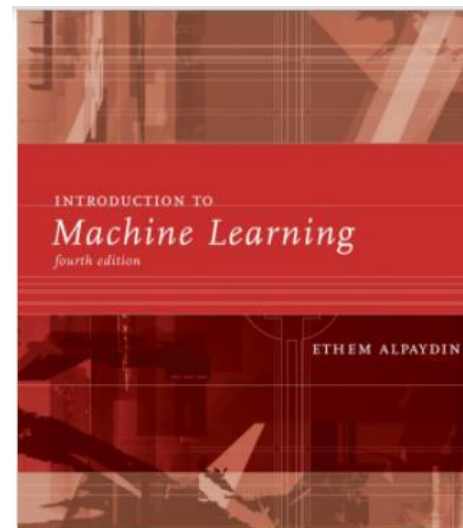


- Basic python programming ability
- Data structure
- Algorithms

# Books



- Introduction to Machine Learning, Fourth Edition
  - [Ethem Alpaydin](#)
- Fundamentals of Machine Learning for Predictive Data Analytics
  - [John D. Kelleher](#), [Brian Mac Namee](#), [Aoife D'Arcy](#)



# Slides

---



- Portal system

# Syllabus



週次	日期	課程主題	內容	作業
1	2月16日	說明課程		
2	2月23日	機器學習與資料前處理介紹	機器學習課程與競賽內容簡介 資料前處理技術(資料分析常用的函式庫介紹、Numpy的基礎、Pandas的基礎、資料前處理)	資料前處理作業
3	3月2日	機器學習模型	迴歸、分類模型、分群模型介紹	分類模型作業
4	3月9日	深度學習模型-DNN	DNN模型概念介紹	<ul style="list-style-type: none"> <li>個人Proposal提案</li> <li>個人提案介紹投影片</li> <li>個人錄影</li> </ul>
5	3月16日	DNN模型實作	DNN模型實作	
6	3月23日	深度學習模型-CNN	CNN模型概念介紹	DNN模型作業完成
7	3月30日	CNN與物件辨識模型實作	CNN與YOLO模型實作教學	<ul style="list-style-type: none"> <li>CNN模型作業完成</li> <li>YOLO模型作業完成</li> </ul>
8	4月6日	民族掃墓連假		
9	4月13日	期中考		
10	4月20日	口頭報告提案投影片 競賽能力介紹	提案申請書撰寫介紹、投影片製作邏輯介紹、口頭報告技巧介紹	
11	4月27日	聯邦式學習	聯邦式模型介紹	<ul style="list-style-type: none"> <li>Fed SVM實作</li> </ul>
12	5月4日	Edge AI	Edge AI教學與實作	
13	5月11日	Edge AI	Edge AI教學與實作	<ul style="list-style-type: none"> <li>Edge AI成果報告</li> </ul>
14	5月18日	深度學習模型-RNN	RNN模型概念介紹	
15	5月25日	強化式學習	Reinforcement Learning概念介紹	<ul style="list-style-type: none"> <li>閱讀Paper以及撰寫報告</li> </ul>
16	6月1日	元學習	Meta Learning概念介紹	
17	6月8日	期末專題報告 (1)	由學生報告期末專題，可以以競賽的作品內容為主題進行報告	團體Proposal提案
18	6月15日	期末專題報告 (2)		團體提案投影片

# Join Competition

---



- To improve your skill of data analytics, you have to choose one of the competitions to join:
- Practice your data analytics skill :  
Kaggle/Aidea/TBrain
- Using data to create a service: 資料創新競賽
- If there are new competitions, I will announce.
- Additional Competition:
  - 水資料應用競賽: Write a proposal to propose a solution for water issue.
  - Help Industry solve the problem: ALGO (The end date of competition is in October)
- Of course, you can join all competitions.

# Kaggle



- <https://www.kaggle.com/competitions>

## All Competitions

Active

Completed

InClass

All Categories ▼

Default Sort ▼



### HuBMAP - Hacking the Kidney

Identify glomeruli in human kidney tissue images

Research • a month to go • Code Competition • 1106 Teams

\$60,000



### RANZCR CLIP - Catheter and Line Position Challenge

Classify the presence and correct placement of tubes on chest x-rays to save lives

Featured • 17 days to go • Code Competition • 1161 Teams

\$50,000



### VinBigData Chest X-ray Abnormalities Detection

Automatically localize and classify thoracic abnormalities from chest radiographs

Featured • a month to go • 777 Teams

\$50,000



### Human Protein Atlas - Single Cell Classification

Find individual human cell differences in microscope images

Featured • 3 months to go • Code Competition • 222 Teams

\$25,000



# Aldea



- <https://aidea-web.tw/about>



2021-Intracranial Tum...

2021/01/18 ~ 2021/03/31

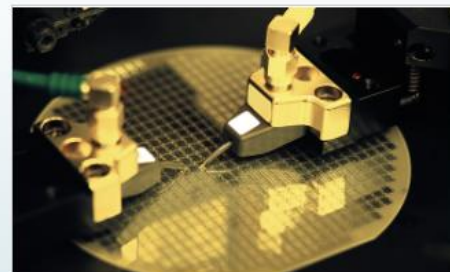
267



水稻無人機全彩影像植...

2021/01/04 ~ 2021/06/01

313



2021-自動光學瑕疵檢測

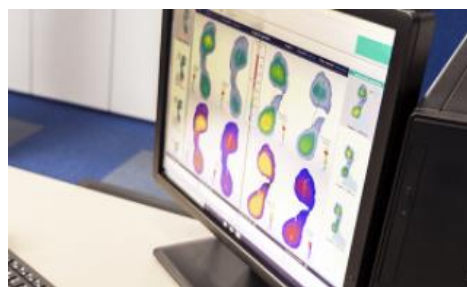
2020/12/22 ~ 2021/04/28

322



香水百合價量預測

2020/11/25 ~ 2021/03/03



動態足壓影像辨識

2020/11/25 ~ 2021/03/03

348

# TBrain



- [T-Brain Machine Learning Competition \(trendmicro.com.tw\)](https://trendmicro.com.tw)

TBrain AI 實戰吧

HomeCompetitionsDiscussionDatasetsSuccess StorySign In

已結束

A circular logo showing a busy street scene with various signs and buildings.

繁體中文場景文字辨識競賽－高階賽：複雜街景之文字定位與辨識 >

11/3/202112/23/2021

開始結束

42 萬元(NTD)  
TOTAL REWARD

128  
TEAMS

市區內處處可見的招牌、路牌、看板、標語與廣告等，包含了大量的文字，傳遞豐富的訊息。這些提供影像拍攝地點相關資訊的街景文字，若能被自動地由畫面中定位並加以辨識，相信對於包括場景理...

(More)

已結束

A circular logo with the letters 'AI' in white on a blue background.

玉山人工智慧公開挑戰賽2021冬季賽 - 信用卡消費類別推薦 >

10/27/20211/6/2022

開始結束

23 萬元(NTD)  
TOTAL REWARD

859  
TEAMS

【聰明消費來預3－信用卡消費類別推薦】

...

(More)

已結束

A logo with the text '中鋼人工智慧挑戰賽 字元辨識' on a dark background with a stylized 'Z'.

中鋼人工智慧挑戰賽-字元辨識 >

10/4/202111/9/2021

開始結束

32 萬元(NTD)  
TOTAL REWARD

321  
TEAMS

中鋼50年來致力於鋼鐵產業，有舉足輕重的地位，為世界知名鋼鐵廠。隨著人工智慧科技在許多領域已超越人類智能，中鋼放眼下一個50年的發展，已定調「精緻鋼鐵」、「綠能產業」是我們經營發...

(More)

# 資料創新競賽



- <https://opendata-contest.tca.org.tw/>



# 水資料應用競賽



<https://iot.wra.gov.tw/IOTCompetition/>

- 報名至**3/1**

## (一) 競賽主題

競賽主題規劃以「穩定供水」、「水災防汛」、「河川安全」、「智慧決策」四大主題發想，參賽隊伍可以四大主題做延伸與發想，盼結合各界想法及各領域專長，激發如何運用水利相關資料發揮創意構想，以解決水利相關問題。

### 1. 穩定供水

水資源調度、水質監測、農業用水或民生用水等。

### 2. 水災防汛

淹水預警、防汛整合等。

### 3. 河川安全

堤防結構物安全、閘門安全等。

### 4. 智慧決策

水資源智慧調控、水利防災決策支援等。



# AIGO



- <https://aigo.org.tw/zh-tw/competitions>



中揚光電

## 多樣性物料設備AI 取料分析優化

由我司自製開發物管設備，進行AI分析取料並加速取料流程，將內部放置物依據MES特殊需求，以AI提示推薦該次應使用的刀具或製具，並透過圖號及刀號這些資料訓練演算法，提高人員倉庫加工製程上的效率，與自我判斷排序整理模

👁 593 🧑 隊伍申請：0-3 歡迎投件



台塑旭

## 彈性纖維橫斷面外觀AI品質辨識

目前彈性纖維橫斷面品質檢測是以顯微鏡放大顯像於螢幕上，以人工目視計算纖維條數後，再以尺規量測螢幕上之纖維直徑是否於管制範圍，整廠平均每天約有300張橫斷面影像需藉由上述方法以人工判讀，非常耗費人力及時間。本案

👁 779 🧑 隊伍申請：0-3 歡迎投件

# Lab and HW

---



- Please hand in Lab and HW on time.
- If you submit your homework late **within 7 days**, you will only get **85%** of your score.
- If you submit your homework late **within 14 days**, you will only get **70%** of your score.
- If you submit your homework late **more than 14 days**, you will get **0**.



# Grades

---

- Lab and HW (28%): 4% each for Labs
- Proposal and First presentation (10%)
- Midterm (20%)
- Quiz (2%): randomly happens, 1 pts each
- Machine Test (10%)
- Final project (30%)
- Bonus : Off-campus competition (Up to 10 points.)
  - When you join **more than one competitions** and you don' t win the prize, you can get registration point and final contest point.
    - +1: Registration (Except Aidea.)
    - +2: Final Contest
  - +10: Award (1<sup>st</sup> prize)
  - +8: Award (2<sup>st</sup> prize)
  - +6: Award (3<sup>rd</sup> prize)
  - +4: Other prize



# Final Project



# Important Information

---



- Group member: 1-4
- Abstract (After midterm)
- Presentation (Slides and 2-min video)
- Report (English/Chinese)

# Final Project Grade

---



- Abstract & Report (25%)
- Presentation score (20%-ranked by peers)
- Originality (15%)
- Performance (20%)
- 2-min video (20%)
- 10, 7, and 3 extra pts for the 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> place of Most Popular Award (MPA), respectively
- Notice that the average scores BEFORE adding bonus for each project will be adjusted to approximately the same value.

# Final Project Report

---



- A 5-page document describing your:
  - Motivation
  - Goal
  - State-of-the-art
  - Proposed Architecture and Methods
    - Uniqueness and Novelty
  - Dataset
  - Experiment Results/Interface
  - Conclusion
  - The job assignments between members
- Not include cover.
- Show that your ideas are worth efforts.

# About the 2-min video

---



- Let viewers understand the **novelty and contribution** easily
- Target audience: **non-ECE bachelor students**
  - Please **DO NOT** stuff the video with **technical terms**
- An example: Please refer to the videos
- [https://www.youtube.com/watch?time\\_continue=97&v=G-omu\\_ki7YM](https://www.youtube.com/watch?time_continue=97&v=G-omu_ki7YM)
- <https://www.youtube.com/watch?v=hUnRCxnydCc>

# Spotlight Video List (1/2)

---



[1] RL for dodging game: <https://youtu.be/4oz-mUb4Dgk>

[2] Arrhythmia detection using 12 lead ECG based on Deep Learning: [https://youtu.be/ZNf5X\\_f1CBo](https://youtu.be/ZNf5X_f1CBo)

[3] DeepFont: Identify Your Font from An Image: <https://youtu.be/WRzvHUN6aMQ>

[4] Intelligent Fault Detection of Rolling-Element Bearing with Deep

Learning: <https://youtu.be/WzKL3XS6pkQ>

[5] Short Text Understanding Through Lexical Semantic Analysis for Keyword

Search: <https://youtu.be/c0e4luqp3rE>

# Spotlight Video List (2/2)

---



- [6] Dope Learning: A Computational Approach to Rap Lyrics Generation: <https://youtu.be/ghvE6JLVi08>
- [7] How FER makes money?: [https://youtu.be/grT\\_-0Yc\\_mE](https://youtu.be/grT_-0Yc_mE)
- [8] Deep Recurrent Q-Learning for Partially Observable MDPs: <https://youtu.be/zhrFWtADUo0>
- [9] Product recommendation with face recognition: <https://youtu.be/bf0609NDQYM>
- [10] Deep Learning for Event-Driven Stock Prediction: <https://youtu.be/cgyurMRSBuA>
- [11] Self-driving cars Simulation with EANN: <https://youtu.be/1tUFju-aoj8>
- [12] Hate Speech Writer Mapper based on Political Views Motive: <https://youtu.be/I87G5USDJg4>
- [13] Beautification: <https://youtu.be/p78Y5tC2rUg>



**Should I take?**



---

Pros

Cons

---

Familiar with Machine Learning Heavy?

Your Own Final Projects Exhausted?

Participation

Pop Quiz

Lab

Programing



# Quiz, homework, project, please...

---



- Do not copy the others' homework
- Write your own code, please
- In project, please:
  - Work as a team
  - Contribute your ideas
  - Implement your part
  - Do join the discussions
- You can always come knock my door
  - I would be glad to help you

---

# Questions



# Let Me Know You

---



## 問卷1

