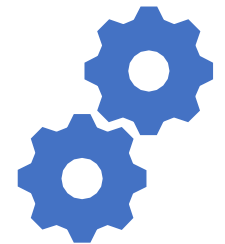You can listen to the **English version**
of this course at
Multi-purpose Classroom Building R202.

本教室禁止飲食、在無法保持社交距離的情況下請戴口罩

# Machine Learning (ML) 2021

李宏毅

Hung-yi Lee

# About this course

- You can complete this course <mark>online</mark>.
  - Record all the lectures, submit homework online, no exam.
- No prerequisite test, no upper limit for the number of students.

## Everyone can take this course!

Special thanks to

國立台灣大學教務處

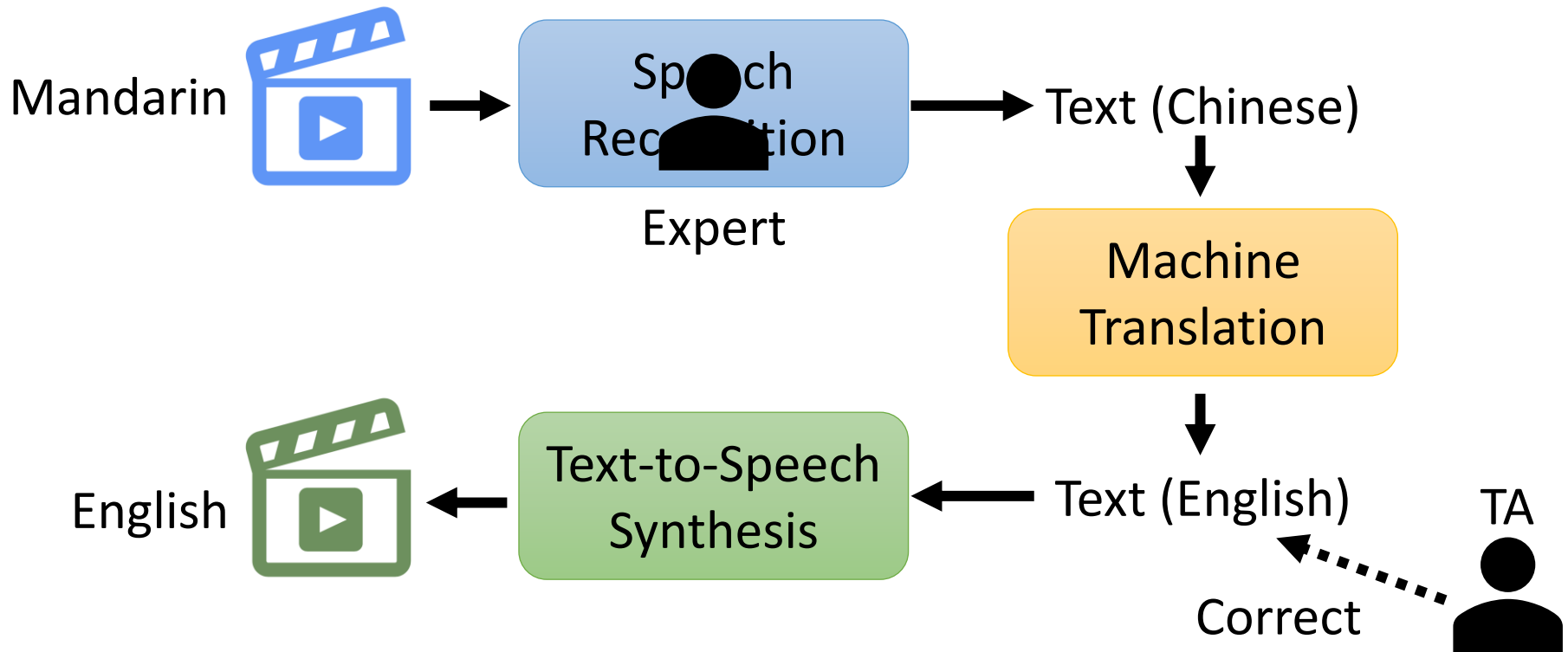National Taiwan University
Office of Academic Affairs

# About this course

- This course has both **Mandarin** and **English** versions.

- Time slot: 2:20 p.m. – 6:20 p.m., Friday

## How to achieve that?

# Help of Technology!

Mandarin → [video] → **Speech Recognition**
Expert

→ Text (Chinese)

↓

**Machine Translation**

↓

Text (English) ← **Text-to-Speech Synthesis** ← [video] English

Correct ⬸ TA

The lectures of the English course will be one week behind the Mandarin one.

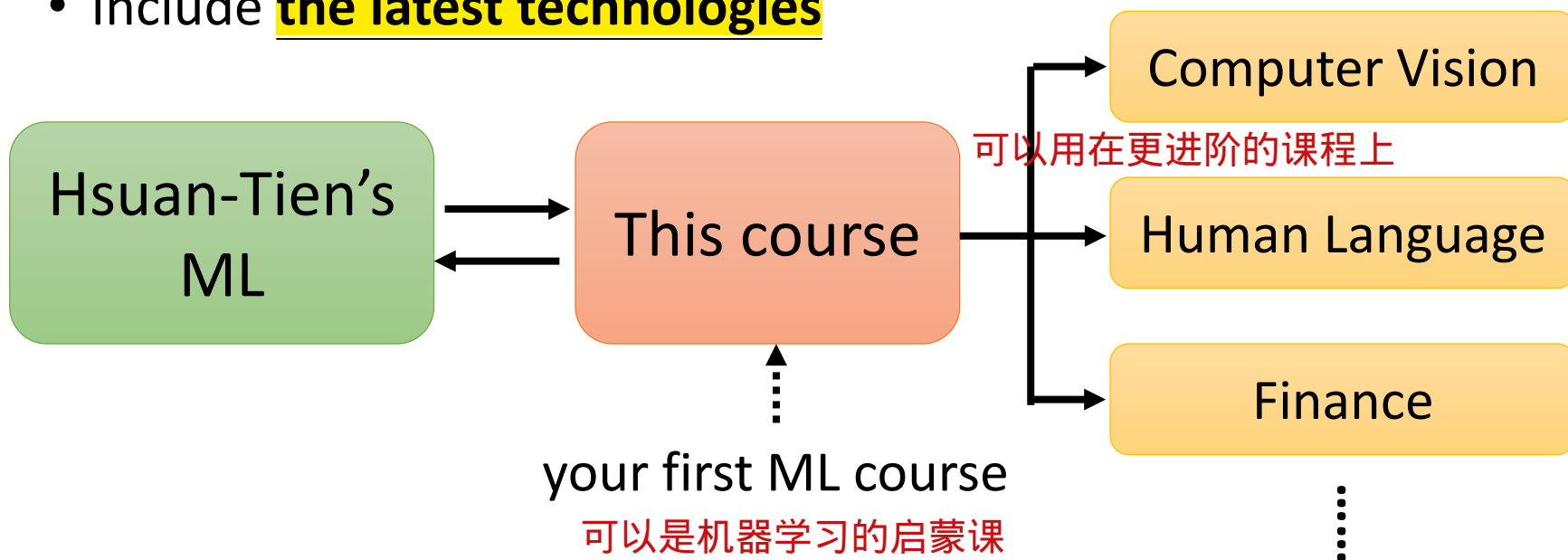The homework announcement and deadline of the English and Mandarin courses are the same.

# Orientation

- Focus on **deep learning**
  - This course can be your first ML course.
  - Little overlap with Hsuan-Tien Lin's (林軒田) *Machine Learning Foundations* and *Machine Learning Techniques.*

- Include **the latest technologies**

# Orientation

It's buffet style.

# Assignment

# Prerequisite

- **Math:** Calculus (微積分), Linear algebra (線性代數) and Probability (機率)

- **Programming**
  - All the assignments have <mark>sample codes</mark> based on **Python**.
  - You need to be able to read and modify the sample codes. **This course will not teach Python.**
  - **This course will not teach any Python package, except** <mark>PyTorch</mark>.
  - Only focus on ML. TAs do not have to answer the questions not related to ML or PyTorch.

- **Hardware**: All assignments can be done by <mark>Google Colab</mark>. You do not need to prepare hardware or install anything.

# Assignment

- Each assignment includes multiple-choice questions and/or leaderboard (排行榜).
  - Multiple-choice questions: submitted via NTU COOL.
  - Leaderboard: Kaggle or JudgeBoi (our in-house Kaggle ☺ )
    - Explain later
- You also need to submit the related codes of each assignment via NTU COOL.

JudgeBoi    Kaggle

# Grading Criterion

- There are 15 assignments (each has 10 points, only count the 10 assignments with the highest points)

- You don't need to do all the assignments. Choose the ones you are interested in.

- You are encouraged to complete all 15 assignments!

**You decide how much you want to learn.**

T-shirt

# Assignment Schedule

| | | Start | End | Kaggle | JudgeBoi | MC |
|---|---|---|---|---|---|---|
| 1 | Regression | 3/05 | 3/26 | O | | |
| 2 | Classification | 3/12 | 4/02 | O | | O |
| 3 | CNN | 3/26 | 4/16 | O | | |
| 4 | Self-attention | 3/26 | 4/16 | O | | |
| 5 | Transformer | 4/09 | 4/30 | | O | |
| 6 | GAN | 4/16 | 5/14 | | O | |
| 7 | BERT | 4/30 | 5/21 | O | | |
| 8 | Autoencoder | 4/30 | 5/21 | O | | |
| 9 | Explainable AI | 5/07 | 5/28 | | | O |
| 10 | Attack | 5/07 | 5/28 | | O | |
| 11 | Adaptation | 5/21 | 6/11 | O | | |
| 12 | RL | 6/04 | 6/25 | | O | |
| 13 | Compression | 6/11 | 7/02 | O | | |
| 14 | Life-long | 6/11 | 7/02 | | | O |
| 15 | Meta Learning | 6/18 | 7/09 | | | O |

# Grading Criterion

**C-**
- The assignments have sample codes.
- Simply running all the sample codes leads to C-.

這不是一門甜涼的通識課

**A-**
- There is **guidance** for each homework
- Write your codes following the guidance.

**A+**
- We set some challenges for you.
- Conquer by yourself (think, read papers, etc.)

You decide how deep you want to learn.

# Lecture Schedule

| Date | Topic | HW |
|------|-------|-----|
| 2/26 | Introduction | |
| 3/05 | Deep Learning | Regression |
| 3/12 | Self-attention | Classification |
| 3/19 | Theory of ML (Prof. Pei-Yuan Wu) | |
| 3/26 | Transformer | CNN / Self-attention |
| 4/02 | Spring break (No class) | |
| 4/09 | Generative Model | Transformer |
| 4/16 | Self-supervised | GAN |
| 4/23 | Midterm (No class) | |
| 4/30 | Explainable AI / Adversarial Attack | BERT / Autoencoder |
| 5/07 | Domain Adaptation / RL | Explainable AI / Attack |
| 5/14 | Privacy v.s. ML (Prof. Pei-Yuan Wu) | |
| 5/21 | RL | Adaptation |
| 5/28 | Quantum ML (Prof. Hao-Chung Cheng) | |
| 6/04 | Life-long / Compression | RL |
| 6/11 | Meta Learning | Life-long / Compression |
| 6/18 | | Meta Learning |

# Lecture Schedule

- Assignment announcement: 2:20 p.m. – 3:30 p.m. (approx.)
- Lectures: 3:30 p.m. - 6:20 p.m.
  - Highly related to the assignment next week
  - We will usually finish the lectures before 6:20 p.m.
  - The rest is TA hour.
- Assignment announcement and lectures will be recorded.
  - **This course can completely learn online.**

| Date | Topic | HW |
|------|-------|-----|
| 2/26 | Introduction | |
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| 5/07 | Domain Adaptation / RL | Explainable AI / Attack |
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| 5/21 | RL | Adaptation |
| 5/28 | Quantum ML (Prof. Hao-Chung Cheng) | |
| 6/04 | Life-long / Compression | RL |
| 6/11 | Meta Learning | Life-long / Compression |
| 6/18 | | Meta Learning |

# Kaggle

# Kaggle (JudgeBoi is similar)

https://www.kaggle.com/



- Some assignments are in-class competition on Kaggle.

- Register a Kaggle account by yourself.

This leaderboard is calculated with approximately 50% of the test data.

The final results will be based on the other 50%, so the final standings may be different.

⬇ Raw Data    ↻ Refresh

| # | Team Name | Notebook | Team Members | Score ❓ | Entries | Last |
|---|-----------|----------|--------------|-------|---------|------|
| 1 | b06902021_rm -f trained_model | | | 0.77550 | 38 | 9mo |
| 2 | b05901176_\ ⌠•д•⌡ / | | | 0.77400 | 28 | 9mo |
| 3 | b05901063_QQ | | | 0.77380 | 23 | 9mo |
| 4 | r07522839_劉承岳 | | | 0.77130 | 11 | 9mo |
| 5 | b06902030_5/14資訊之夜 | | | 0.77020 | 30 | 9mo |
| 6 | b04901147_系吃隊長 | | | 0.76920 | 24 | 9mo |

**display name**    **score**

Your Best Entry ⬆

Your submission scored 0.76920, which is not an improvement of your best score. Keep trying!

| 7 | r07943150_ML靠賽 輕鬆自在 | | | 0.76830 | 35 | 9mo |
| 8 | r07943156_慈母守中線遊子逛野... | | | 0.76770 | 19 | 9mo |

# Kaggle

- The display name should be

<STUDENT ID>_<ANY THING>

b93901106                    truly any thing ☺

- Example    ◯ b93901106_pui pui pui pui pui pui pui pui

    ◯ b93901106_

    ✖ b93901106 puipui

We will not find your submission if your format is wrong!

Public score: You can see it right after the submission.

Public Leaderboard | Private Leaderboard | Public | Private

This leaderboard is calc...
The final results will be...

Why?

| # | Team Name | Notebook | Team Members | Score | Entries | Last |
|---|---|---|---|---|---|---|
| 1 | b06902021_rm -f trained_model | | | 0.77550 | 38 | 9mo |
| 2 | b05901176_\(∫●д●\) | | | 0.77400 | 28 | 9mo |
| 3 | b05901063_QQ | | | 0.77380 | 23 | 9mo |
| 4 | r07522839_劉承岳 | | | 0.77130 | 11 | 9mo |
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| 8 | r07943156_慈母守中線遊子逛野... | | | 0.76770 | 19 | 9mo |

Private score: You can only see the score after the assignment deadline.

# Kaggle

- You need to select two results for evaluating on the private set before the assignment deadline.



- You only have <mark>limited submission times</mark> per day.

**Why?**

Rules

# Rules – Common Sense

- <mark>Don't plagiarize</mark> other's code and don't submit other's results to the leaderboards.
  - "***Other***" means *all creatures in the universe*
  - Changing the names of variables also considered plagiarism. (Plagiarism is checked by the software!)
- <mark>Protect your efforts!</mark> Don't let others see your codes, don't give others your results.
  - Lending your codes to others or allowing others to copy your work will be considered as collusion, thus receiving the same punishment as the plagiarist.

# Rules – For Kaggle and JudgeBoi

- There is a limited number of submissions to all the leaderboards (Kaggle and JudgeBoi).
  - Don't try to have multiple accounts. (It also violates the rules of Kaggle.)
  - Don't borrow account from others and don't give you account to others.
  - Don't submit to the leaderboards of the previous semesters.
  - **Don't use any approach to increase the submission numbers**

# Rules – For Kaggle and JudgeBoi

- The results submitting to the leaderboards should **only come from machines**.
    - Don't label the testing data by humans (or any other approaches)!
- The data used in assignments is publicly available. **Don't use the labels of testing data in any way!**
    - **Tip**:
        - Don't try to find the data used in assignments online at the very beginning.
        - Only use the data provided in each assignment.

# Rules - Codes

- You need to submit codes for each assignment via NTU COOL.

- Your codes need to be able to generate the results you submit to the leaderboard.
  - If not, it would be considered **cheating** and get punishment.
  - TAs may not run all the codes, but TAs will check some of them.
  - If you get 10 points in the assignment, your code will be open to the whole class (作業觀摩).
  - TAs and the lecturer decide cheating or not.

# Punishment

- The **first time** you violate the rules.
  - The final score of this semester times 0.9.
- The **second time** you violate the rules.
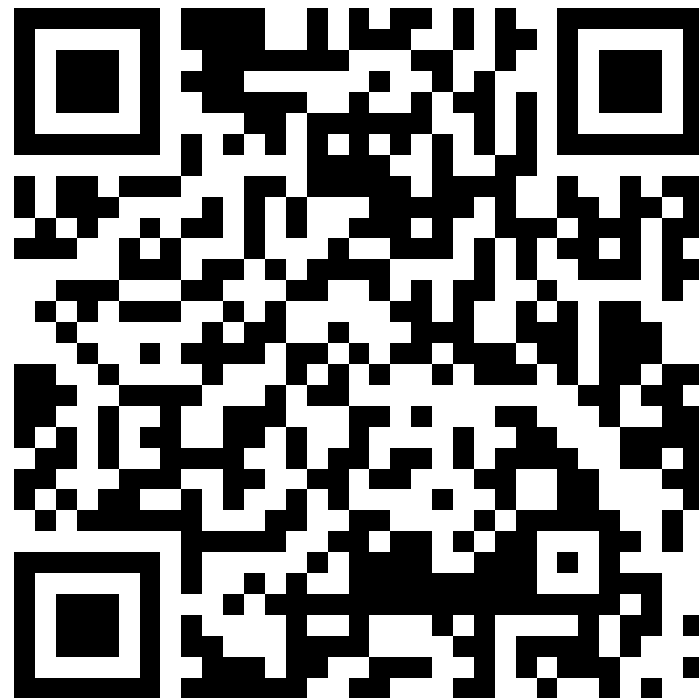  - Fail the course.

Information

# Webpage

You can find slides and lecture recordings here.



**姜成翰**

who made this webpage



https://speech.ee.ntu.edu.tw/~hylee/ml/2021-spring.html

# Questions

- **Option 1**: Ask at TA hour
- **Option 2**: Post your questions on NTU COOL
  - Your questions are also other's questions.
- **Option 3**: Mail to the following address
  - E-mail: ntu-ml-2021spring-ta@googlegroups.com
  - E-mail title includes "[hwX]" (e.g. [hw3])
- Don't direct message to TAs. The TAs will only answer the questions by the above alternatives.

**張凱為**

Mandarin Course
TA head

**黃冠博**

English Course
TA head

TA email: ntu-ml-2021spring-ta@googlegroups.com