



# **Selected Topics in Visual Recognition using Deep Learning**

## **Homework 1 announcement**

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# Homework 1

- **Deadline: 11/12, Thr at 23:59**
  1. Finish the Kaggle competition (check the leaderboard)

#	Team Name	Notebook	Team Members	Score	Entries	Last
1	Baseline			0.56153	1	6d

1. Upload your reports (pdf) to **E3 systems**





# HW1 Introduction: car brand classification

- 16,185 car images belonging to 196 classes (train: 11,185, test:5000)
- **NO external data should be used to train the model!**





# HW1 Kaggle competition: Sign In

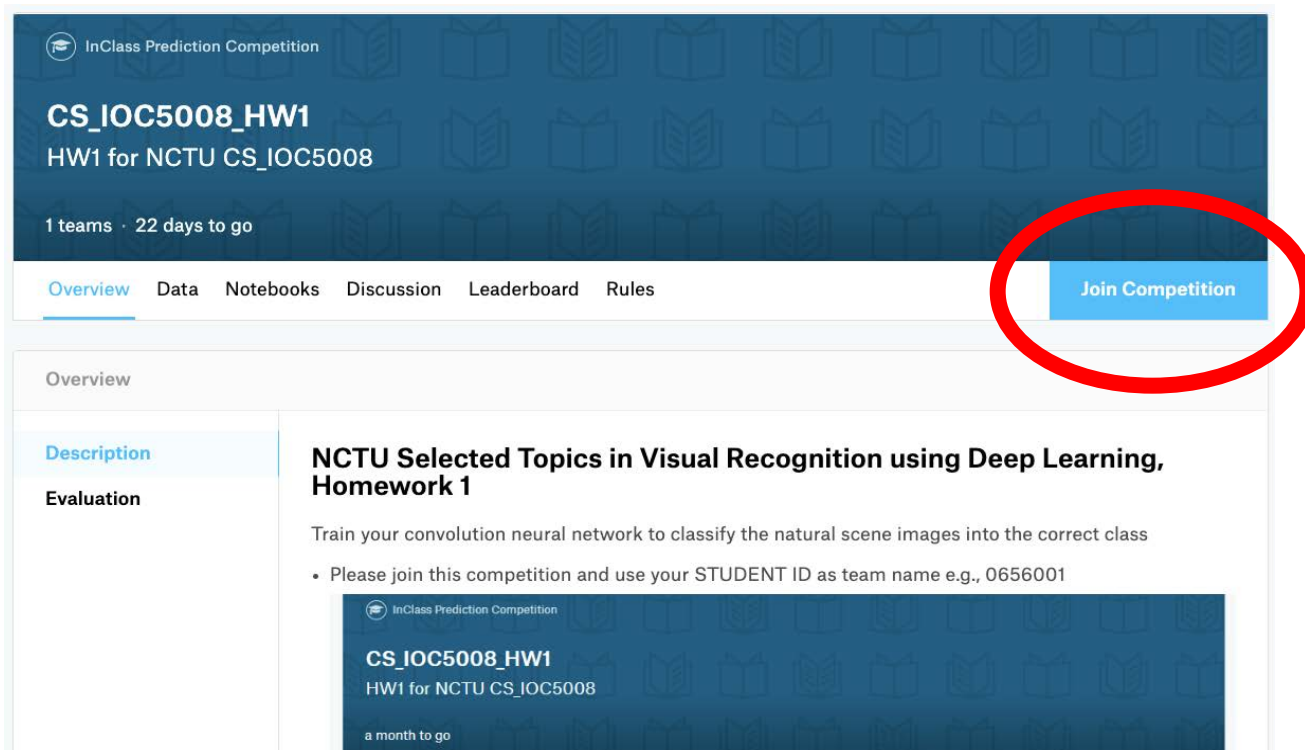
- HW 1 Kaggle competition link:  
<https://www.kaggle.com/t/14e99b9514d74996b6b04df4fed0ed19>
- **Sing In** first! (Create an account if you don't have one)

The screenshot shows the Kaggle website interface. At the top, the 'kaggle' logo is on the left, followed by a search bar. Navigation links include 'Competitions', 'Datasets', 'Notebooks', 'Discussion', and 'Courses'. The 'Sign in' button is highlighted with a red circle, and a 'Register' button is next to it. Below the navigation bar, the main content area displays the 'InClass Prediction Competition' for 'CS\_IOC5008\_HW1'. It indicates '1 teams · 22 days to go'. A tabbed interface shows 'Overview', 'Data', 'Notebooks', 'Discussion', 'Leaderboard', and 'Rules'. The 'Overview' tab is active, showing a 'Description' section with the title 'NCTU Selected Topics in Visual Recognition using Deep Learning, Homework 1'. The text describes training a convolutional neural network to classify natural scene images. A bullet point instructs users to join the competition and use their STUDENT ID as the team name (e.g., 0656001).



# HW1 Kaggle competition

- Join Competition



The screenshot shows the Kaggle competition page for "CS\_IOC5008\_HW1". The header is dark blue with a book icon pattern. It displays the competition title, subtitle "HW1 for NCTU CS\_IOC5008", and status "1 teams · 22 days to go". A navigation bar includes links for Overview, Data, Notebooks, Discussion, Leaderboard, and Rules. A prominent blue "Join Competition" button is circled in red. Below the navigation bar, the "Overview" section is active, showing the description "NCTU Selected Topics in Visual Recognition using Deep Learning, Homework 1" and the evaluation method. A list of instructions includes joining the competition and using the student ID as the team name. A smaller version of the competition header is visible at the bottom of the overview section.

InClass Prediction Competition

## CS\_IOC5008\_HW1

HW1 for NCTU CS\_IOC5008

1 teams · 22 days to go

[Overview](#) [Data](#) [Notebooks](#) [Discussion](#) [Leaderboard](#) [Rules](#) [Join Competition](#)

### Overview

Description	Evaluation
<b>NCTU Selected Topics in Visual Recognition using Deep Learning, Homework 1</b>	
Train your convolution neural network to classify the natural scene images into the correct class	
<ul style="list-style-type: none"><li>Please join this competition and use your STUDENT ID as team name e.g., 0656001</li></ul>	

InClass Prediction Competition

### CS\_IOC5008\_HW1

HW1 for NCTU CS\_IOC5008

a month to go





# HW1 Kaggle competition: Team name

- Change your team name into your Student ID!! **(Important)**

**CS\_IOC5008\_HW1**  
HW1 for NCTU CS\_IOC5008

1 teams · 22 days to go

Overview Data Notebooks Discussion Leaderboard **Team** My Submissions Submit Predictions

Manage Team

Team Name

0656001 Save Team Name

This name will appear on your team's leaderboard position.



# HW1 Kaggle competition: Download data

- Get the data and train your model

**CS\_IOC5008\_HW1**  
HW1 for NCTU CS\_IOC5008

1 teams · 22 days to go

Overview **Data** Notebooks Discussion Leaderboard Rules Team My Submissions Submit Predictions

**Data Description**

**Restriction**

- No external data should be used for training your model!
- Only fully-automated methods, that is the methods that require no manual intervention during inferencing

Data (52 MB) API `kaggle competitions download -c cs-ioc5008-hw1` **Download All**

**Data Sources**

- dataset
  - test
  - train

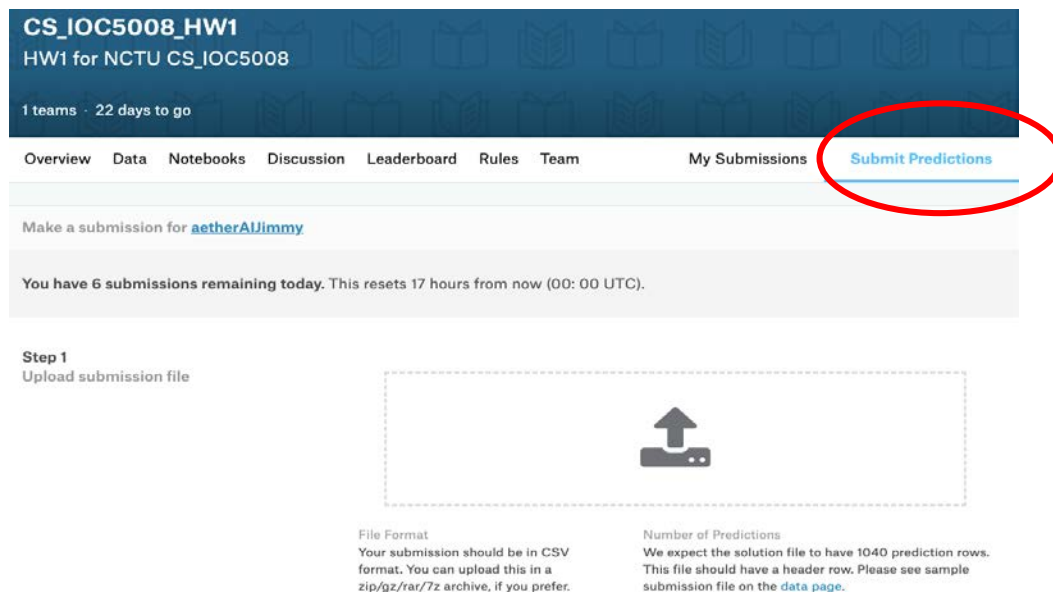
**About this file**

No description yet



# HW1 Kaggle competition: Submit Predictions

- Infer the test data by your model and submit your predictions with .csv format and check your accuracy on leaderboard



**CS\_IOC5008\_HW1**  
HW1 for NCTU\_CS\_IOC5008

1 teams · 22 days to go

Overview Data Notebooks Discussion Leaderboard Rules Team My Submissions **Submit Predictions**

Make a submission for [aetherAUimmy](#)

You have 6 submissions remaining today. This resets 17 hours from now (00: 00 UTC).

**Step 1**  
Upload submission file

**File Format**  
Your submission should be in CSV format. You can upload this in a zip/gz/rar/7z archive, if you prefer.

**Number of Predictions**  
We expect the solution file to have 1040 prediction rows. This file should have a header row. Please see sample submission file on the [data page](#).

```
id,label
009350,Ford F-150 Regular Cab 2007
002645,BMW X6 SUV 2012
002267,BMW 1 Series Coupe 2012
008553,Fisker Karma Sedan 2012
006990,Dodge Ram Pickup 3500 Crew Cab 2010
007368,Dodge Dakota Crew Cab 2010
005765,Chevrolet Monte Carlo Coupe 2007
000833,Aston Martin Virage Coupe 2012
012869,MINI Cooper Roadster Convertible 2012
001798,Audi S5 Coupe 2012
005705,Chevrolet Express Van 2007
007416,Dodge Dakota Club Cab 2007
007116,Dodge Ram Pickup 3500 Quad Cab 2009
013832,Nissan Leaf Hatchback 2012
016015,Volvo 240 Sedan 1993
009313,Ford F-150 Regular Cab 2007
005059,Chevrolet Sonic Sedan 2012
008780,Ford Freestar Minivan 2007
010109,Geo Metro Convertible 1993
```






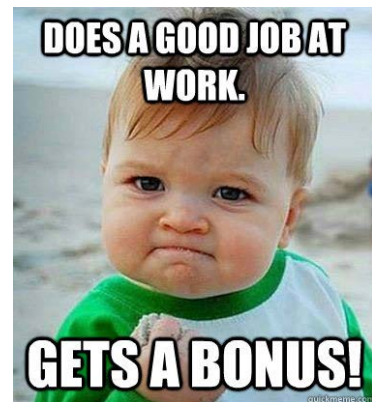


# Grading policy: Model performance (70%)

- Get at least 56% ( $70\% \times 0.8$ ) by scoring over the baseline

#	Team Name	Notebook	Team Members	Score ?	Entries	Last
1	Baseline			0.56153	1	6d

- Rank top 3 on the final leaderboard will be invited to give a 10 mins presentation to share your methodology and get a bonus on your score





# Grading policy: Reports & code readability (30 points)

- Document your work (**in PDF**)
  - GitHub/ GitLab link of your code
  - **reference if you used any code from GitHub**
  - Brief introduction
  - Methodology (Data pre-process, Model architecture, Hyperparameters,...)
  - Summary
- **Meet requirements above can get 80% of points (16 points)**





# Reports bonus

- Sufficient experimental results
- Related work survey and implementation
- Interesting findings or novel methodology

[From Kayo Yin 0845051](#)

## Anti-aliasing

Most modern convolutional networks, such as ResNet18, are not shift-invariant. The network outputs can change drastically with small shifts or translations to the input. This is because the striding operation in the convolutional network ignores the Nyquist sampling theorem and aliases, which breaks shift equivariance.

I decided to apply an anti-aliasing method proposed in the recent April 2019 paper: “Making Convolutional Networks Shift-Invariant Again”. This is done by simply adding a “BlurPool” layer, that is a blurring filter and a subsampling layer, after the convolution layers of





# Code readability

- Write beautiful Python code with [PEP8 guidelines](#) for readability.
- Base requirement: use whitespace correctly!
- Short comment for your code

## Python

```
# Recommended
def function(default_parameter=5):
    # ...

# Not recommended
def function(default_parameter = 5):
    # ...
```

## Python

```
# Recommended
my_list = [1, 2, 3]

# Not recommended
my_list = [ 1, 2, 3, ]
```

## Python

```
x = 5
y = 6

# Recommended
print(x, y)

# Not recommended
print(x , y)
```



# Code readability bonus

- Clear structure and README for details
- <https://github.com/pudae/kaggle-hpa>

If not, you will only receive half points of code readability and adjustment for your model performance

## Reproducing Submission

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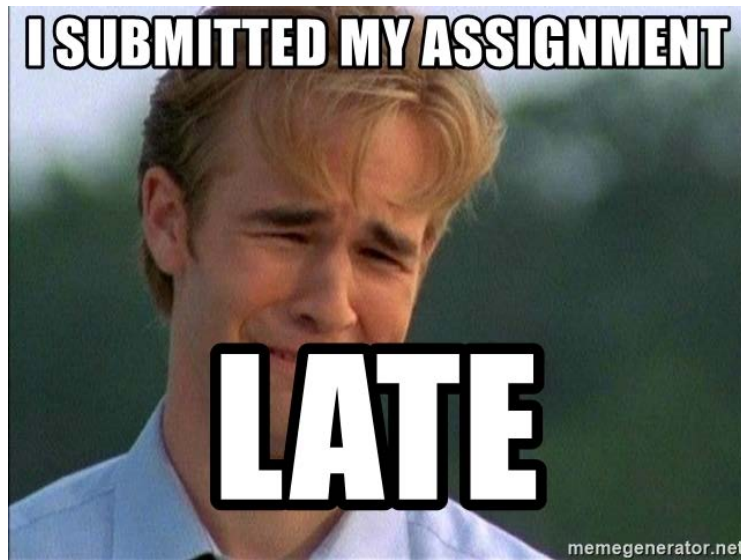
To reproduce my submission without retrainig, do the following steps:

1. Installation
2. Download Official Image
3. Make RGBY Images for official.
4. Download Pretrained models
5. Inference
6. Make Submission



# Late Policy

- We will deduct a late penalty of 20% per additional late day
- For example, If you get 90% of HW1 but delay for two days, your will get only  $90\% - (20\% \times 2) = 50\%$ !





# Keywords

- Beat the baseline
  - Data preprocess (normalization), Data augmentation, Proper hyperparameter setting (learning rate, optimizer)
- Rank Top 3!
  - Transfer learning, Modern CNN architecture, learning rate schedule, Model ensemble, Hyperparameter tuning, Hard negative mining, ...
  - Google fine-grained image classification





# FAQ

- Can I use any code/tools/Library from GitHub or other resources?
  - Yes! We encourage you to learn how to apply existing tools on your own task, such as Keras: applications, Pytorch: torchvision, TensorFlow: model zoo

**But DO NOT copy code from your classmate!**

- Pre-trained model is usable for this homework
- How to deal with GPU Out-Of-Memory (OOM) errors?
  - Lower your image size / batch size or use smaller network
- Which score will be used if I submit multiple predictions
  - Only the highest one will be used to grade your homework





# Notice

- Check your email regularly, we will mail you if there are any updates or problems of the homework
- If you have any questions or comments for the homework, please mail me and cc Prof. Lin
  - Prof. Lin: [lin@cs.nctu.edu.tw](mailto:lin@cs.nctu.edu.tw)
  - Jimmy: [d08922002@ntu.edu.tw](mailto:d08922002@ntu.edu.tw)



# Have fun!

