Data science HW2

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Due Date: 2023/04/15 23:59

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HW2

- Description
- How to submit and choose predictions
- Baseline method
- Hints

Kaggle

- HW2 will be held on Kaggle
  - **Please register a Kaggle account first**
- A platform of
  - Machine learning competition
  - Sharing dataset
- https://zh.wikipedia.org/wiki/Kaggle

HW2

- HW2 Kaggle link
  - https://www.kaggle.com/competitions/nthu-ds-11102-2023-hw2-vfinal/

- Deadline: 2023/04/15 23:59 (2 weeks)

- We will **use the result on Kaggle to score** this homework
  - **No need to hand in any files on eeclass**
  - **Remember to fill your Kaggle name in the google form** https://docs.google.com/spreadsheets/d/16vKdLeGYUUH8_TTVQsc--uMfn3zNQioBDjCKycxnLQM/edit?usp=sharing

Problem description

- **Supervised binary classification problem**
- Given a data set
  - Training set with label
  - Testing set without
- You need to predict the labels of testing data

Dataset description

- The dataset is **transformed** from real weather observations dataset

- 16 numeric features, 5 nominal features, 1 label
  - *Numeric feature are nonlinear transformed*
  - *About 20% data become missing value*

- Our dataset label is '**Weather**'

Output format

- For each testing instance, there is a unique id
- Output your prediction to csv file with the following format and submit to kaggle

Remember to output the first line

  - Id, Weather
  - Id1, Weather 1
  - Id2, Weather 2
  - …

1	Id	Weather
2	0	0
3	1	0
4	2	0
5	3	0
6	4	1
7	5	0
8	6	0

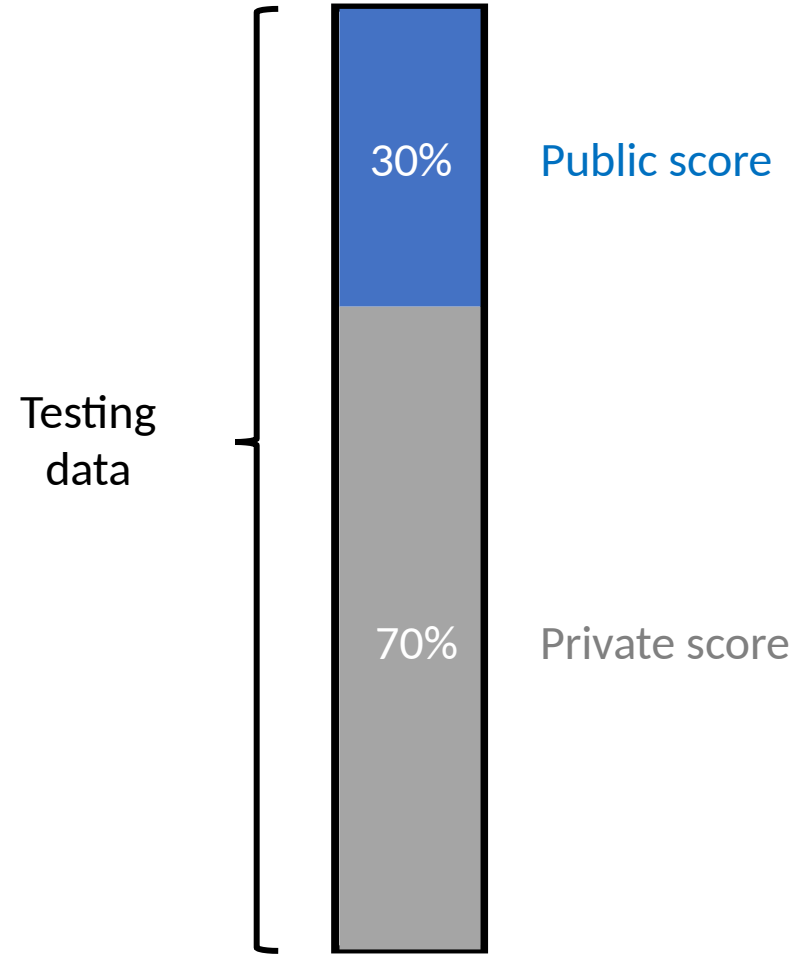
Evaluation

- We use F1-score

- There are two leaderboards on Kaggle
  - **Public**
    - Can be seen during competition
  - **Private**
    - Can be seen after competition

Public and Private leaderboard

- **Public** (Can be seen during competition)
  - 30% testing data
  - For reference
- **Private** (Can be seen after competition)
  - the other 70%
  - **Use this result for final scoring**

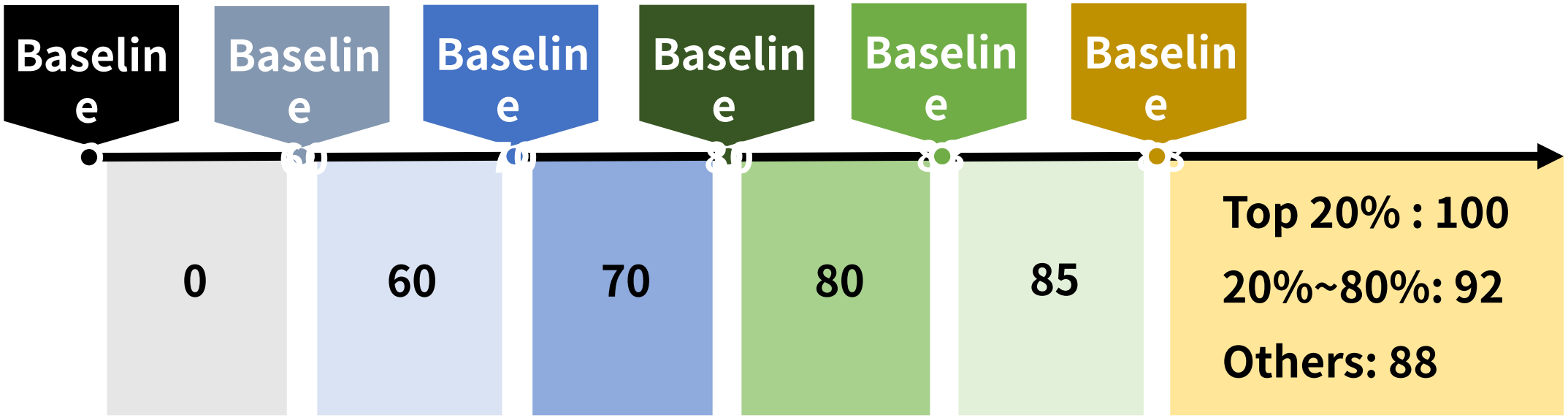


Scoring

- Use *private leaderboard result* for final scoring
- Baseline scores
  - We will score according to given 7 baseline scores

	Public	**Private**
Baseline 88	0.44521	**0.43324**
Baseline 83	0.40000	**0.38616**
Baseline 80	0.36378	**0.36201**
Baseline 70	0.32702	**0.33042**
Baseline 60	0.28194	**0.28420**
Baseline 0	0.25776	**0.26141**

Scoring



- You will get **0**, if your private score is between *baseline 0* and *baseline 60*
- You will get **60**, if your private score is between *baseline 60* and *baseline 70*
- You will get **70**, if your private score is between *baseline 70* and *baseline 80*
- And so on

Scoring

- Baseline scores
  - There are benchmarks on the leaderboard for reference

#	Team	Members	Score	Entries	Last
	baseline88		0.44521		
	baseline83		0.40000		
	baseline80		0.36378		
	baseline70		0.32702		
	baseline60		0.28194		
	baseline0		0.25776		

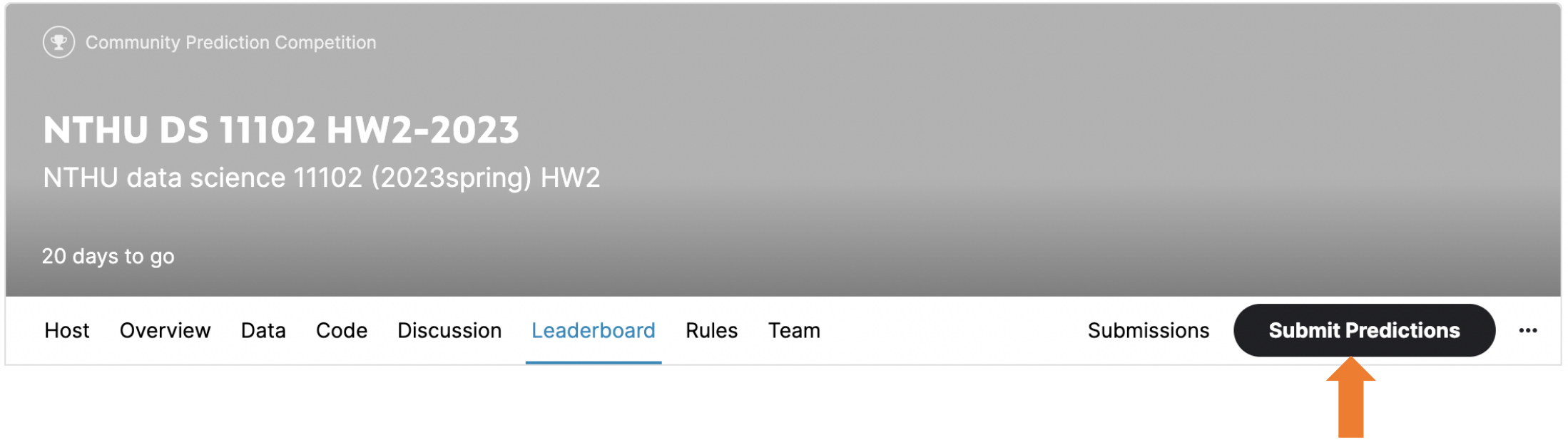
Other rules

- You can submit 20 times per day
- You can choose 4 predictions for final scoring
  - Kaggle will use the best one to be your final result

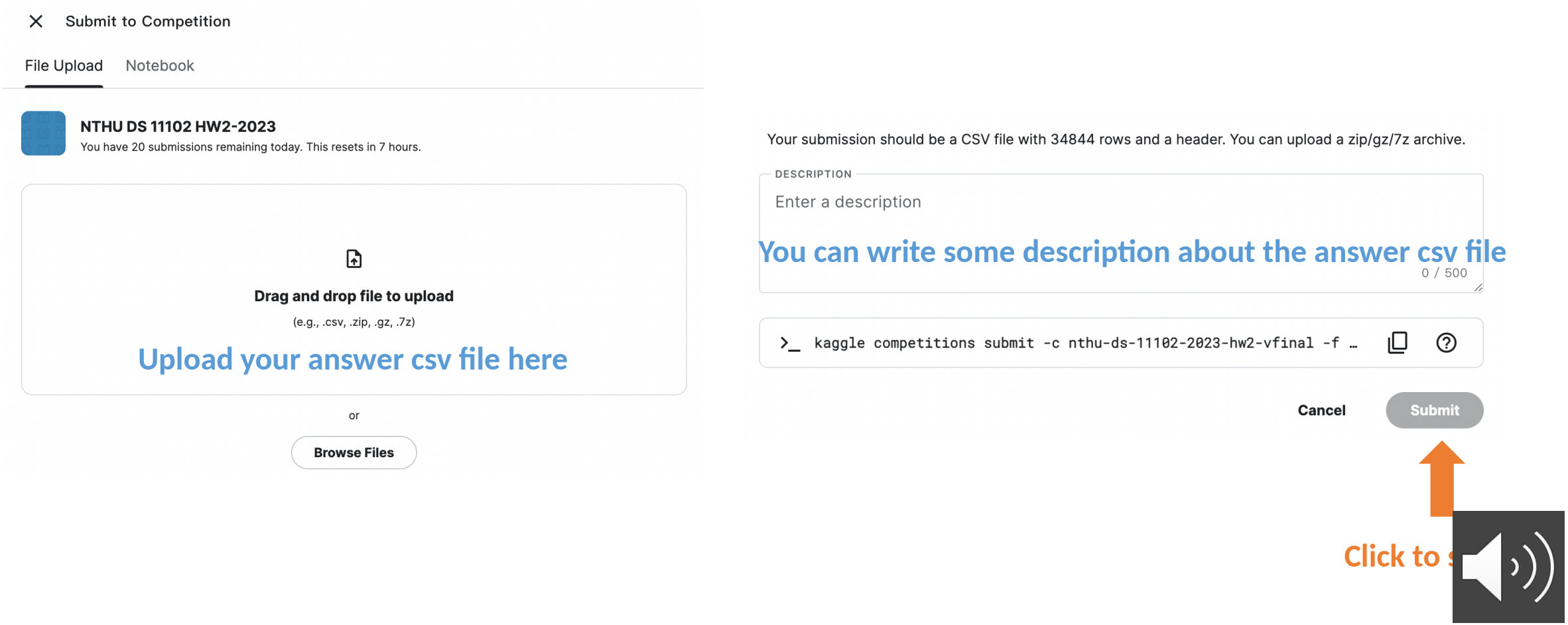
How to submit and choose predictions

How to submit

- Click ‘***Submit Predictions***’ button on the navigation bar

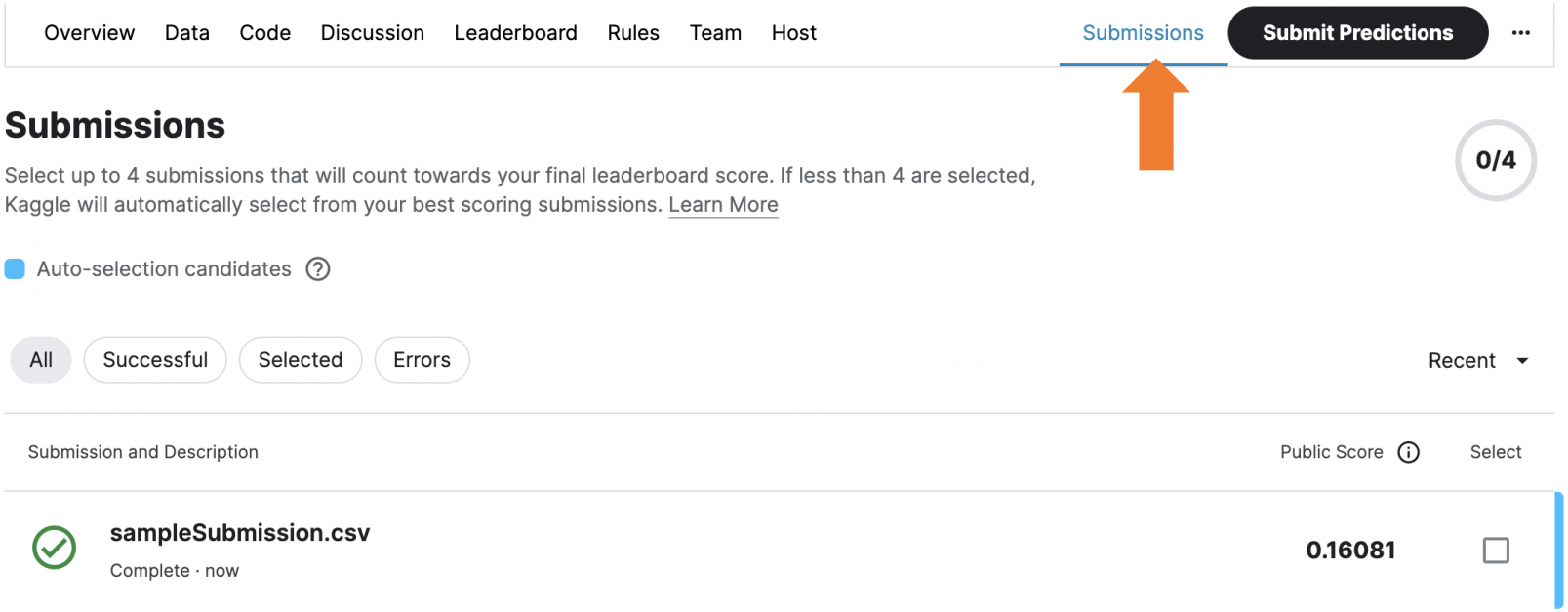


How to submit



Choose predictions for final scoring

- You can see all your submissions in ***'Submissions'***



Remember to choose 4 predictions before the deadline

Baseline method

Baseline method

- We provide a simple baseline method code for your reference
  - **Baseline 0**

- The steps in baseline are as below
  - Read training/testing data
  - Drop columns which are not numeric features
  - Fill missing value
  - Train a *decision tree* classifier
  - Output prediction

Baseline 0 method

- Read training/testing data

[1]

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

[2]

```
# 為了處理方便，把 'train.csv' 和 'test.csv' 合併起來，'test.csv'的 Weather 欄位用 0 補起來。
df = pd.read_csv('train.csv')
df_test = pd.read_csv('test.csv')
df_test['Weather'] = np.zeros((len(df_test),))

# 以 train_end_idx 作為 'train.csv' 和 'test.csv' 分界列，
train_end_idx = len(df)
df = pd.concat([df, df_test], sort=False)
```

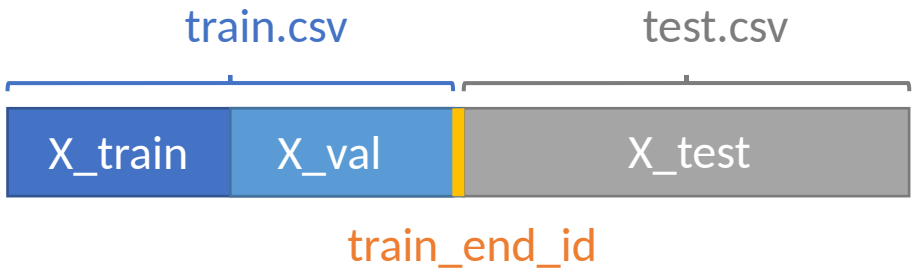
Baseline 0 method

- Drop columns which are not numeric features
- Fill missing value

```
# 將非數值欄位拿掉
df = df.drop(columns = [col for col in df.columns if df[col].dtype == np.object])

# 將 missing value 補 0
df = df.fillna(0)
```

Baseline 0 method



- Split dataset

```
[4]  ▷ ▸≡ M↓
from sklearn.model_selection import train_test_split

X_train, X_val, y_train, y_val = train_test_split(
    df.drop(columns = ['Weather']).values[:train_end_idx, :],
    df['Weather'].values[:train_end_idx], test_size=0.5)

X_test = df.drop(columns = ['Weather']).values[train_end_idx:, :]
```

Baseline 0 method

- Train a decision tree classifier and output prediction

[5]

```
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score, f1_score

#train tree model
model = DecisionTreeClassifier()
model.fit(X_train,y_train)

#predict
y_pred_decision = model.predict(X_val)
print('Accuracy: %f' % accuracy_score(y_val, y_pred_decision))
print('f1-score: %f' % f1_score(y_val, y_pred_decision))
```

```
Accuracy: 0.837695
f1-score: 0.264122
```

[6]

```
ans_pred = model.predict(X_test)
df_sap = pd.DataFrame(ans_pred.astype(int), columns = ['Weather'])
df_sap.to_csv('myAns.csv',  index_label = 'Id')
```

Hints

Hints

- You can try to encode features in object type
  - Some features in object type may contain important information

```
from sklearn.preprocessing import LabelEncoder
labelencoder = LabelEncoder()
df['Loc'] = labelencoder.fit_transform(df['Loc'])
...
```

Hints

- Fillna with median in numeric features instead of 0

```
df[i] = df[i].fillna(median)
```

- Deal with data imbalance

```
from imblearn.over_sampling import SMOTE
sm = SMOTE(random_state=42)
X_train,y_train = m.fit_resample(X_train,y_train)
```

Complete these may achieve the same or higher effect as the baseline 60

Hints

- Try different models
  - KNN, SVM, Logistic Regression, Random Forest ...

```
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.naive_bayes import GaussianNB
```

Finetune the model may achieve higher effect than the baseline 70 and 80

Hints

- More techniques for better performance
  - Feature selection
  - Normalization
  - Dimension reduction (PCA, TSNE)
  - Try other different models
  - …
- We use private leaderboard as the final score
  - Use public score to choose your model is dangerous
  - It’s better to perform validation

Packages you may use

- Scikit-learn
  - https://scikit-learn.org/stable/index.html
- Pandas
  - https://pandas.pydata.org/pandas-docs/stable/
- Imbalance learn (for over sampling and down sampling)
  - https://imbalanced-learn.org/stable/