DataLab Cup 1: Predicting News Popularity

Yi-Ting Han & DataLab

Outline

- Competition information
- Method
- Evaluation metric
- Precautions

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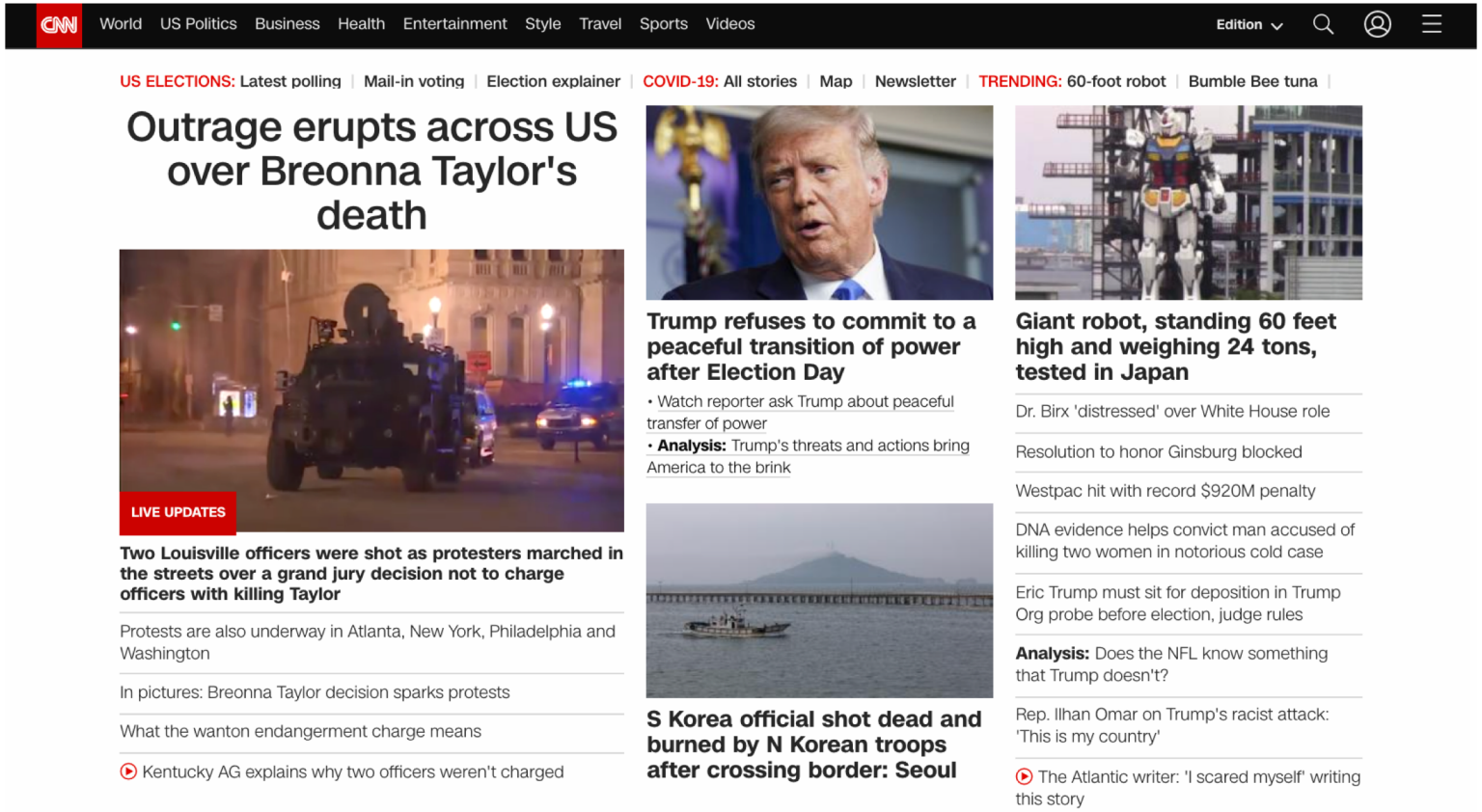
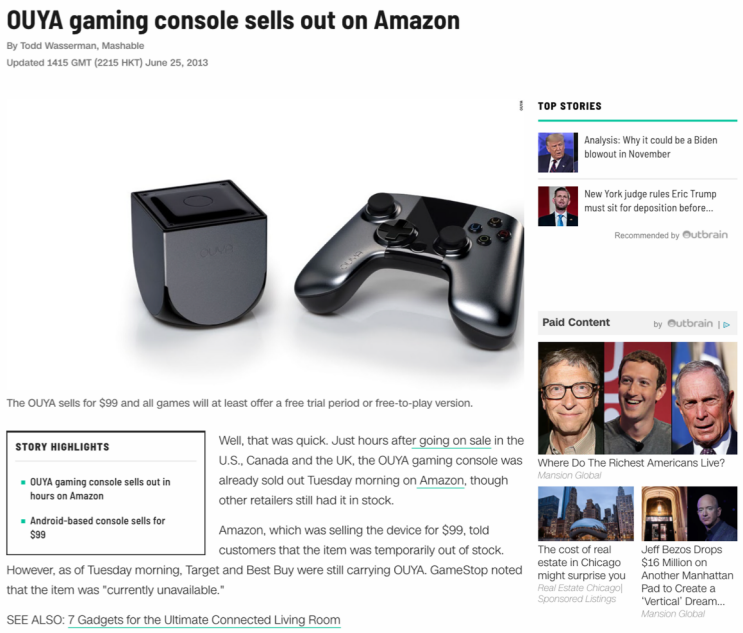
Competition Information - Goal

- Predict the news popularity



Competition Information - Dataset

- Training data
  - 27643 pieces of news
- Testing data
  - 11847 pieces of news



OUYA gaming console sells out on Amazon

By Todd Wasserman, Mashable

Updated 1415 GMT (2215 HKT) June 25, 2013

The OUYA sells for $99 and all games will at least offer a free trial period or free-to-play version.

STORY HIGHLIGHTS

- OUYA gaming console sells out in hours on Amazon
- Android-based console sells for $99

Well, that was quick. Just hours after going on sale in the U.S., Canada and the UK, the OUYA gaming console was already sold out Tuesday morning on Amazon, though other retailers still had it in stock.

Amazon, which was selling the device for $99, told customers that the item was temporarily out of stock. However, as of Tuesday morning, Target and Best Buy were still carrying OUYA. GameStop noted that the item was "currently unavailable."

SEE ALSO: 7 Gadgets for the Ultimate Connected Living Room

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Popularity (1/-1)


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Method - Feature Engineering

- The act of extracting features from raw data and then transforming them into something that we can use for a machine learning model

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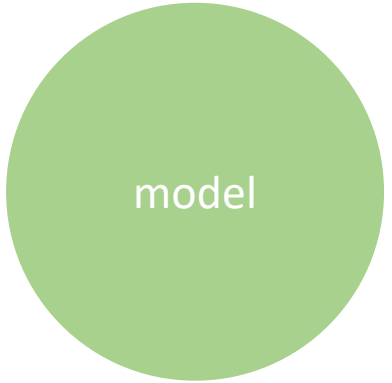

Raw Data

Feature Engineering

Classification

Method - Feature Engineering

- Data preprocess
- Convert words to vectors

Method - Feature Engineering

- Data preprocess
- Convert words to vectors

Data Preprocess

- Process HTML tags
  - Install Beautiful Soup to remove HTML tags
  - Select the specific tags

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Data Preprocess

- Process HTML tags
  - Install Beautiful Soup to remove HTML tags
  - Select the specific tags

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Extract <h1>

```
<h1 class="title">OUYA Gaming Console Already Sold Out on Amazon</h1>
```

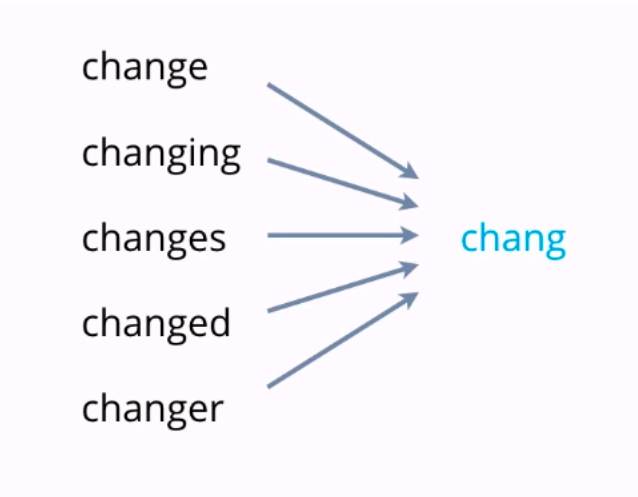
Data Preprocess

- Stop words
  - Stop words are common in a document but less information, they might misleading the classification model
  - You can use the stop words NLTK provided or create your own stop words

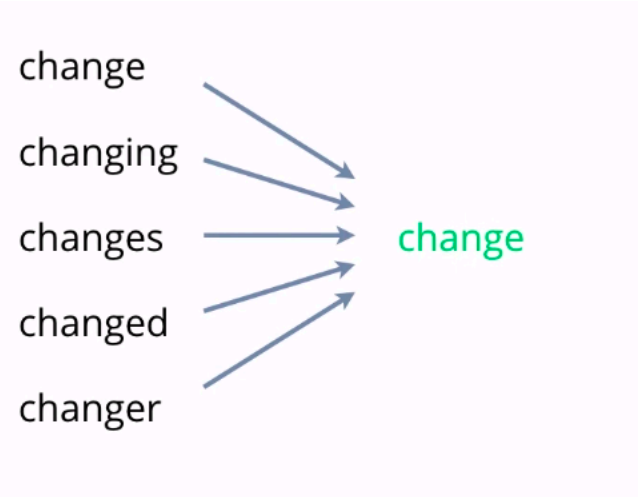
```
['i', 'me', 'my', 'myself', 'we', 'our', 'ours', 'ourselves', 'you', "you're", "you've", "you'll", "you'd", 'your',
'yours', 'yourself', 'yourselves', 'he', 'him', 'his', 'himself', 'she', "she's", 'her', 'hers', 'herself', 'it', "i
t's", 'its', 'itself', 'they', 'them', 'their', 'theirs', 'themselves', 'what', 'which', 'who', 'whom', 'this', 'tha
t', "that'll", 'these', 'those', 'am', 'is', 'are', 'was', 'were', 'be', 'been', 'being', 'have', 'has', 'had', 'havi
ng', 'do', 'does', 'did', 'doing', 'a', 'an', 'the', 'and', 'but', 'if', 'or', 'because', 'as', 'until', 'while', 'o
f', 'at', 'by', 'for', 'with', 'about', 'against', 'between', 'into', 'through', 'during', 'before', 'after', 'abov
e', 'below', 'to', 'from', 'up', 'down', 'in', 'out', 'on', 'off', 'over', 'under', 'again', 'further', 'then', 'onc
e', 'here', 'there', 'when', 'where', 'why', 'how', 'all', 'any', 'both', 'each', 'few', 'more', 'most', 'other', 'so
me', 'such', 'no', 'nor', 'not', 'only', 'own', 'same', 'so', 'than', 'too', 'very', 's', 't', 'can', 'will', 'just',
'don', "don't", 'should', "should've", 'now', 'd', 'll', 'm', 'o', 're', 've', 'y', 'ain', 'aren', "aren't", 'could
n', "couldn't", 'didn', "didn't", 'doesn', "doesn't", 'hadn', "hadn't", 'hasn', "hasn't", 'haven', "haven't", 'isn',
"isn't", 'ma', 'mightn', "mightn't", 'mustn', "mustn't", 'needn', "needn't", 'shan', "shan't", 'shouldn', "should
n't", 'wasn', "wasn't", 'weren', "weren't", 'won', "won't", 'wouldn', "wouldn't"]
```

Data Preprocess

- Word stemming
  - The process of reducing inflected (or sometimes derived) words to their word stem, e.g. runs, running, ran => run
  - NLTK provides two kind of algorithms to reduce the inflected words



Porter Stemmer



Lemmatization

Feature Engineering

- Data preprocess
- Convert words to vectors

Convert Words to Vectors

- Bag of words (BOW)
- Term frequency-inverse document frequency (TF-IDF)
- Feature hashing

Convert Words to Vectors

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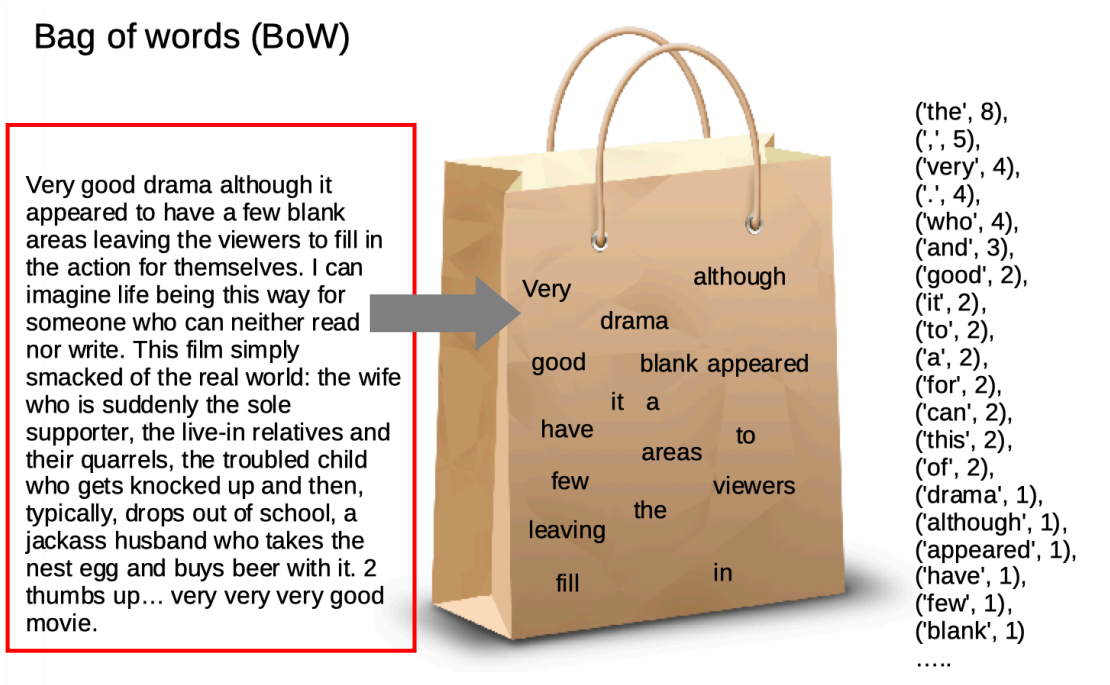
Bag of Words

- A simple way of representing text data used in natural language processing and information retrieval



Bag of Words

- A simple way of representing text data used in natural language processing and information retrieval

Bag of words (BoW)

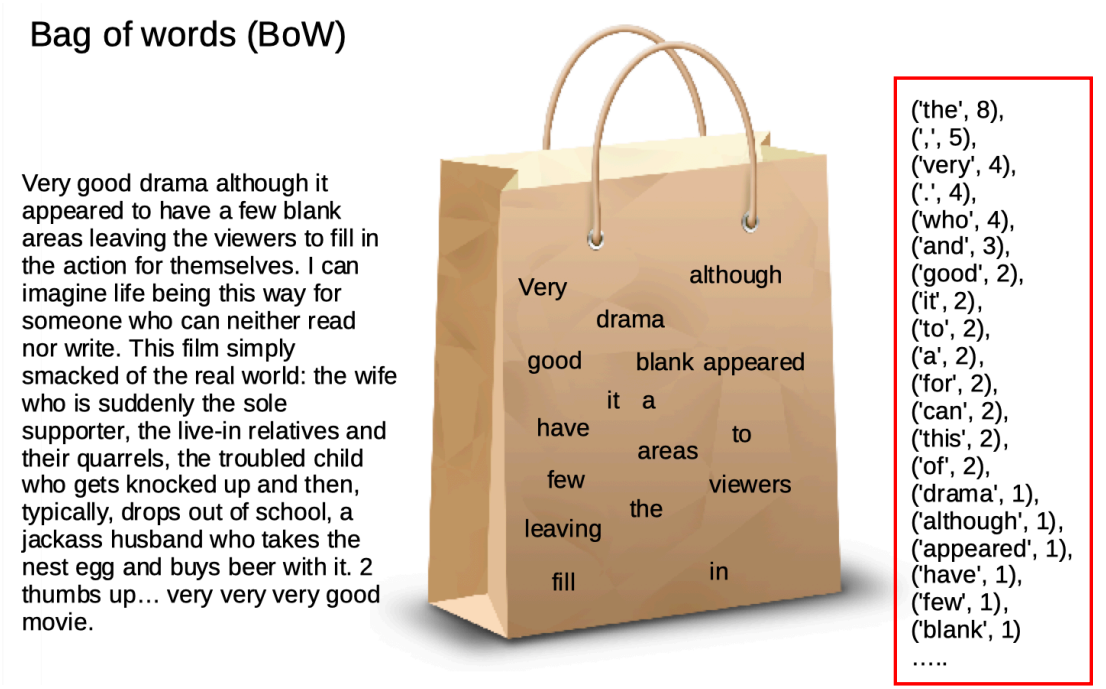
Very good drama although it appeared to have a few blank areas leaving the viewers to fill in the action for themselves. I can imagine life being this way for someone who can neither read nor write. This film simply smacked of the real world: the wife who is suddenly the sole supporter, the live-in relatives and their quarrels, the troubled child who gets knocked up and then, typically, drops out of school, a jackass husband who takes the nest egg and buys beer with it. 2 thumbs up… very very very good movie.

('the', 8),
(',', 5),
('very', 4),
('.', 4),
('who', 4),
('and', 3),
('good', 2),
('it', 2),
('to', 2),
('a', 2),
('for', 2),
('can', 2),
('this', 2),
('of', 2),
('drama', 1),
('although', 1),
('appeared', 1),
('have', 1),
('few', 1),
('blank', 1)
…..

Throw all the words into the bag

Bag of Words

- A simple way of representing text data used in natural language processing and information retrieval



Record how many times each word appear in the document

Bag of Words

- Example

Review 1: This movie is very scary and long
Review 2: This movie is not scary and is slow
Review 3: This movie is spooky and good

	1 This	2 movie	3 is	4 very	5 scary	6 and	7 long	8 not	9 slow	10 spooky	11 good	Length of the review(in words)
Review 1	1	1	1	1	1	1	1	0	0	0	0	7
Review 2	1	1	2	0	0	1	1	0	1	0	0	8
Review 3	1	1	1	0	0	0	1	0	0	1	1	6

Vector of Review 1: [1 1 1 1 1 1 1 0 0 0 0]

Vector of Review 2: [1 1 2 0 0 1 1 0 1 0 0]

Vector of Review 3: [1 1 1 0 0 0 1 0 0 1 1]

Bag of Words

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Vector of Review 1: [1 1 1 1 1 1 1 0 0 0 0]

Vector of Review 2: [1 1 2 0 0 1 1 0 1 0 0]

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Bag of Words

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Vector of Review 1: [1 1 1 1 1 1 1 0 0 0 0]

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Vector of Review 3: [1 1 1 0 0 0 1 0 0 1 1]

Convert Words to Vectors

- Bag of words (BOW)
- Term frequency-inverse document frequency (TF-IDF)
- Feature hashing

TF-IDF

- A numerical statistic that intended to reflect how important a word is to a document in a collection or corpus

- The tf-idf value increases proportionally to the number of times a word appears in a document and is offset by the number of documents in the corpus that contain the word

TF-IDF

- Term frequency (tf)
  - It is a measure of how frequently a term appears in a document
  - $tf_{i,j} = \frac{n_{i,j}}{\sum_k n_{k,j}} = \frac{Number\ of\ times\ term\ i\ appears\ in\ the\ document}{Total\ number\ of\ terms\ in\ the\ document}$

- Inverse document frequency (idf)
  - It is a measure of how important a term is
  - $idf_i = \log(\frac{|D|}{|\{j: t_i \in d_i\}|}) = \log(\frac{Total\ number\ of\ documents}{Number\ of\ documents\ with\ term\ i\ in\ it})$

- $tf\text{-}idf_{i,j} = tf_{i,j} * idf_i$

Convert Words to Vectors

- Bag of words (BOW)
- Term frequency-inverse document frequency (TF-IDF)
- Feature hashing

Feature Hashing

- Reduce the dimension vocabulary space by hashing each vocabulary into a hash table with a fixed number of buckets
- There are some cons, e.g. the information will be less than TF-IDF
- However, you can do out-of-core learning when using hashing which means you only load part of the dataset at a time similar to the concept of batch

Outline

- Competition information
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- Evaluation metric
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Evaluation Metric

- We will use Area Under Curve (AUC) as our metric in this competition
- AUC is the area under the ROC curve

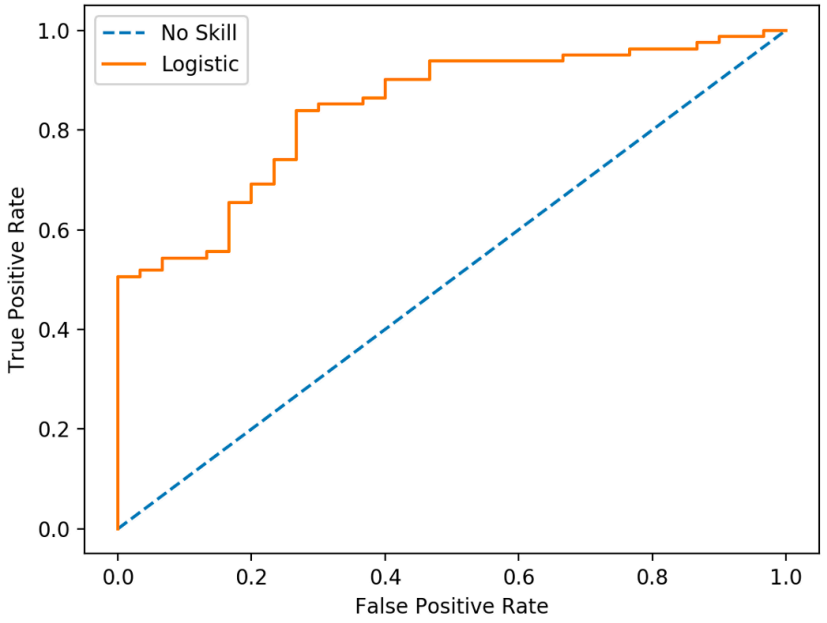
Evaluation Metric

- Confusion matrix
  - A specific table layout that allows visualization of the performance of an algorithm

	Actually Positive (1)	Actually Negative (0)
Predicted Positive (1)	True Positives (TPs)	False Positives (FPs)
Predicted Negative (0)	False Negatives (FNs)	True Negatives (TNs)

Evaluation Metric

- Receiver operating characteristic curve (ROC curve)
  - A graphical plot that illustrates the diagnostic ability of a binary classifier system as its discrimination threshold is varied
  - False positive rate $= \frac{False\ positive}{ALl\ negative\ samples}$
  - True positive rate $= \frac{Ture\ positive}{ALl\ positive\ samples}$



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- Competition information
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Precautions

- Timeline
  - 2020/10/15 (Thur) - competition announced
  - 2020/10/29 (Thur) 23:59pm (UTC) - competition deadline
  - 2020/11/01 (Sun) 23:59pm - report deadline (to iLMS)
  - 2020/11/05 (Thur) - show off
- Scoring
  - Private leaderboard - 80%
  - Report - 20%

Precautions

- Rules
  - What you can do
    - Use untaught APIs: you can use any machine learning tools you like as well as models/techniques that are not taught in the class
  - What you can't do
    - Create specific deterministic rules that make predictions
    - Train models using representation learning based on neural networks
    - Use datasets and references beyond those made available by the competition
    - Abuse the competition infrastructure to gain an edge
    - Copy code from other teams