# Recovering Self-selected YouTube Video Categories

*CAPP 30255: Advanced Machine Learning for Public Policy*

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## 1 YouTube data

Videos by category

| Category | With captions | | Without captions | |
|---|---|---|---|---|
| Entertainment | 1149 | 28% | 1619 | 25% |
| How-to & Style | 515 | 13% | 595 | 9% |
| Comedy | 444 | 11% | 547 | 9% |
| People & Blogs | 354 | 9% | 498 | 8% |
| News & Politics | 302 | 7% | 505 | 8% |
| Science & Technology | 300 | 7% | 380 | 6% |
| Music | 235 | 6% | 799 | 13% |
| Education | 228 | 6% | 250 | 4% |
| Film & Animation | 212 | 5% | 318 | 5% |
| Sports | 165 | 4% | 451 | 7% |
| Pets & Animals | 67 | 2% | 138 | 2% |
| Gaming | 51 | 1% | 103 | 2% |
| Autos & Vehicles | 37 | 1% | 70 | 1% |
| Travel & Events | 34 | 1% | 60 | 1% |
| Nonprofits & Activism | 9 | 0% | 14 | 0% |
| Shows | 4 | 0% | 4 | 0% |
| Sum | 6351 | 100% | 4106 | 100% |

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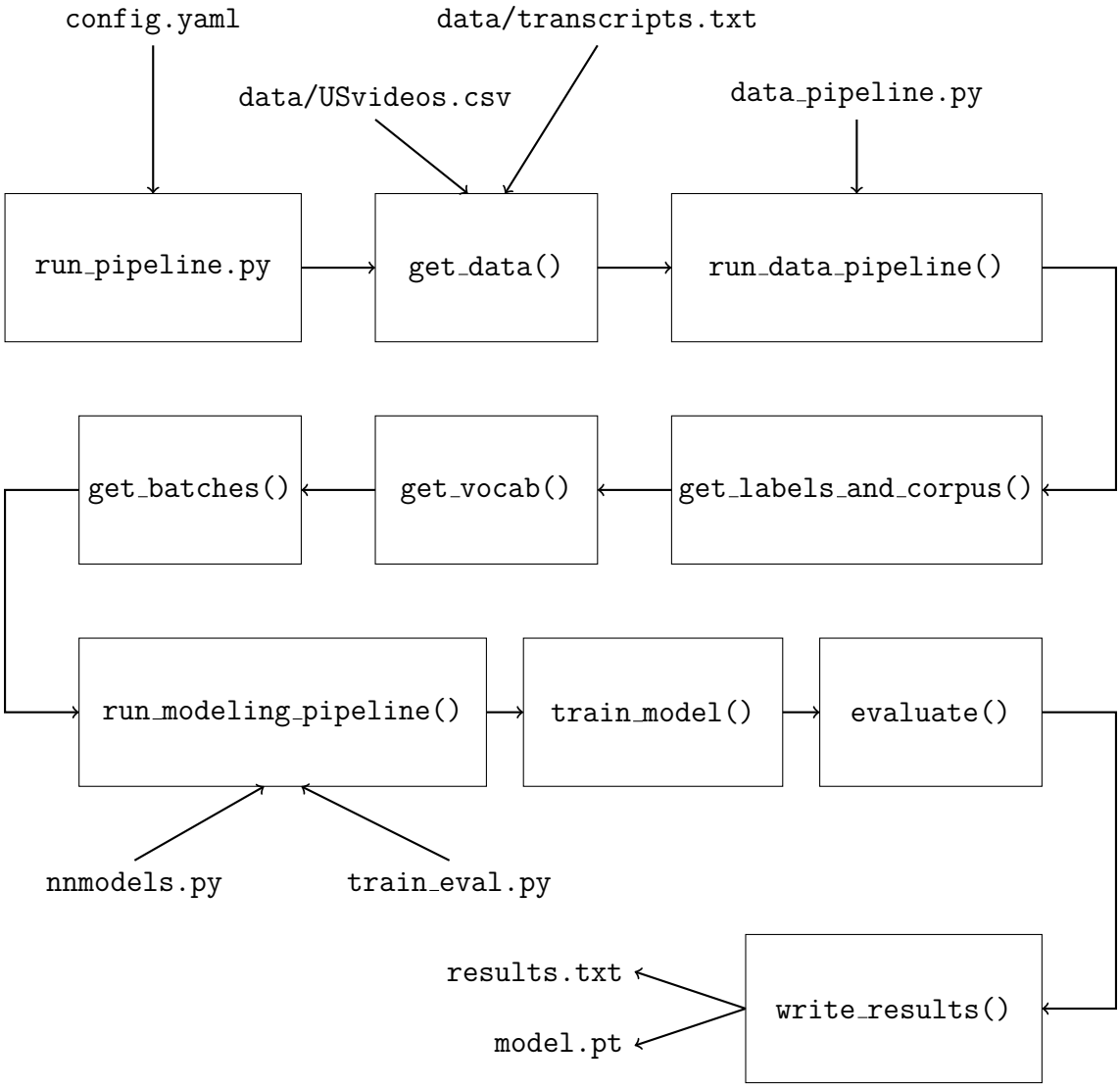
Vocabulary by category

| | WITH CAPTIONS | | WITHOUT CAPTIONS | |
|---|---|---|---|---|
| News & Politics vs: | Size | Shared | Size | Shared |
| Self | 22650 | 100% | 8278 | 100% |
| Entertainment | 25002 | 50% | 20509 | 55% |
| How-to & Style | 25002 | 44% | 12119 | 37% |
| Comedy | 20800 | 41% | 8517 | 35% |
| People & Blogs | 23392 | 45% | 10187 | 38% |
| Science & Technology | 21897 | 43% | 8579 | 35% |
| Music | 12385 | 28% | 11270 | 34% |
| Education | 20491 | 42% | 7853 | 31% |
| Film & Animation | 18525 | 40% | 8056 | 32% |
| Sports | 12707 | 31% | 5951 | 27% |
| Pets & Animals | 6781 | 19% | 3512 | 19% |
| Gaming | 8685 | 24% | 2528 | 14% |
| Autos & Vehicles | 5363 | 16% | 2246 | 13% |
| Travel & Events | 5786 | 15% | 2230 | 13% |
| Nonprofits & Activism | 3837 | 13% | 908 | 6% |
| Shows | 950 | 3% | 221 | 2% |
| Corpus | 25002 | 53% | 25002 | 62% |

*Note: vocabulary capped at 25,000 most frequent words, excluding stop words, plus tokens for unknown words and padding.*

```
{
  video_id: 1ZAPwfrtAFY,

  title: 'The Trump Presidency: Last Week Tonight with John Oliver (HBO)',

  category_id: 24,  // Entertainment

  tags: 'last week tonight trump presidency|"last week tonight donald trump"
    "john oliver trump"|"donald trump"',

  description: "One year after the presidential election, John Oliver
  discusses what we've learned so far and enlists our catheter cowboy to
  teach Donald Trump what he hasn't.\\n\\nConnect with Last Week Tonight...",

  caption: 'The presidency of Donald Trump. The man voted "Least Edible" by
  Cannibal Magazine -six years in a row. -(AUDIENCE LAUGHING) -A-- And I know,
  I honestly know that the prospect of talking about Trump yet again feels...'
}
```

# 2 Pipeline


config.yaml
data/transcripts.txt
data/USvideos.csv
data_pipeline.py
run_pipeline.py
get_data()
run_data_pipeline()
get_batches()
get_vocab()
get_labels_and_corpus()
run_modeling_pipeline()
train_model()
evaluate()
nnmodels.py
train_eval.py
results.txt
model.pt
write_results()

```
data:
  col_labels: 'category_id'
  col_corpus: ['title', 'tags', 'description', 'caption']
  label_target: 'News & Politics'
  label_others: ['Entertainment']
  splits: [0.4, 0.4, 0.2]
  ngram_size: 1
  vocab_size: 25000
  batch_size: 64
models:
  - model: CNN
    embedding_dim: 100
    n_filters: 200
    filter_sizes: [3, 4, 5]
    output_dim: 1
    dropout: 0.5
  - model: LSTM
    embedding_dim: 100
    hidden_dim: 50
    output_dim: 1
    n_layers: 4
    bidirectional: True
    dropout: 0.5
decision_metric: 'loss'
out_directory: 'politics_entertainment/'
```

# 3 Models

Results from average word embedding models

| | WITH CAPTIONS | | | WITHOUT CAPTIONS | | |
|---|---|---|---|---|---|---|
| News & Politics vs: | Accuracy | Precision | Recall | Accuracy | Precision | Recall |
| Entertainment | 0.77 | — | 0.00 | 0.70 | — | 0.13 |
| How-to & Style | 0.65 | — | 0.01 | 0.55 | 0.51 | 0.61 |
| Comedy | 0.55 | — | 0.00 | 0.53 | 0.52 | 0.57 |
| People & Blogs | 0.57 | 0.83 | 0.52 | 0.62 | 0.65 | 0.65 |
| Science & Technology | 0.50 | 0.40 | 0.28 | 0.54 | 0.55 | 0.95 |
| Music | 0.63 | 0.62 | 1.00 | 0.45 | 0.40 | 0.43 |
| Education | 0.59 | 0.59 | 1.00 | 0.72 | 0.72 | 1.00 |
| Film & Animation | 0.60 | 0.60 | 1.00 | 0.57 | 0.58 | 0.99 |
| Sports | 0.70 | 0.69 | 1.00 | 0.52 | 0.66 | 0.28 |
| Corpus | 0.92 | — | 0.00 | 0.87 | — | 0.02 |

Results from CNN models

| | WITH CAPTIONS | | | WITHOUT CAPTIONS | | |
|---|---|---|---|---|---|---|
| News & Politics vs: | Accuracy | Precision | Recall | Accuracy | Precision | Recall |
| Entertainment | 0.77 | — | 0.00 | 0.75 | — | 0.00 |
| How-to & Style | 0.65 | — | 0.00 | 0.47 | 0.47 | 0.98 |
| Comedy | 0.55 | — | 0.00 | 0.49 | 0.51 | 0.27 |
| People & Blogs | 0.49 | — | 0.00 | 0.51 | 0.56 | 0.23 |
| Science & Technology | 0.48 | 0.48 | 0.00 | 0.54 | 0.54 | 0.99 |
| Music | 0.63 | 0.62 | 1.00 | 0.57 | 0.50 | 0.48 |
| Education | 0.59 | 0.59 | 1.00 | 0.39 | 0.62 | 0.29 |
| Film & Animation | 0.60 | 0.60 | 1.00 | 0.59 | 0.58 | 1.00 |
| Sports | 0.39 | 0.71 | 0.21 | 0.49 | 0.49 | 1.00 |
| Corpus | 0.92 | — | 0.00 | 0.91 | — | 0.00 |

Results from LSTM models

| | WITH CAPTIONS | | | WITHOUT CAPTIONS | | |
|---|---|---|---|---|---|---|
| News & Politics vs: | Accuracy | Precision | Recall | Accuracy | Precision | Recall |
| Entertainment | 0.68 | 0.27 | 0.20 | 0.74 | — | 0.08 |
| How-to & Style | 0.40 | 0.32 | 0.58 | 0.45 | 0.45 | 0.83 |
| Comedy | 0.61 | 0.54 | 0.73 | 0.46 | 0.47 | 0.70 |
| People & Blogs | 0.59 | 0.70 | 0.39 | 0.55 | 0.56 | 0.84 |
| Science & Technology | 0.44 | 0.45 | 0.79 | 0.56 | 0.58 | 0.69 |
| Music | 0.56 | 0.63 | 0.67 | 0.58 | 0.54 | 0.39 |
| Education | 0.49 | 0.56 | 0.56 | 0.66 | 0.71 | 0.89 |
| Film & Animation | 0.47 | 0.55 | 0.54 | 0.48 | 0.56 | 0.51 |
| Sports | 0.63 | 0.69 | 0.82 | 0.48 | 0.44 | 0.24 |
| Corpus | 0.92 | — | 0.00 | 0.91 | — | 0.02 |

Results from GRU models

| | WITH CAPTIONS | | | WITHOUT CAPTIONS | | |
|---|---|---|---|---|---|---|
| News & Politics vs: | Accuracy | Precision | Recall | Accuracy | Precision | Recall |
| Entertainment | 0.63 | 0.28 | 0.37 | 0.72 | 0.33 | 0.11 |
| How-to & Style | 0.48 | 0.36 | 0.59 | 0.49 | 0.46 | 0.37 |
| Comedy | 0.50 | 0.43 | 0.35 | 0.49 | 0.55 | 0.20 |
| People & Blogs | 0.54 | 0.53 | 0.83 | 0.58 | 0.59 | 0.79 |
| Science & Technology | 0.59 | 0.63 | 0.35 | 0.46 | 0.51 | 0.40 |
| Music | 0.61 | 0.68 | 0.69 | 0.49 | 0.48 | 0.32 |
| Education | 0.53 | 0.65 | 0.41 | 0.64 | 0.71 | 0.84 |
| Film & Animation | 0.59 | 0.67 | 0.63 | 0.54 | 0.58 | 0.81 |
| Sports | 0.63 | 0.69 | 0.84 | 0.54 | 0.51 | 0.72 |
| Corpus | 0.92 | — | 0.00 | 0.92 | — | 0.00 |