DeepLearningYouTubeSponsorBlocker

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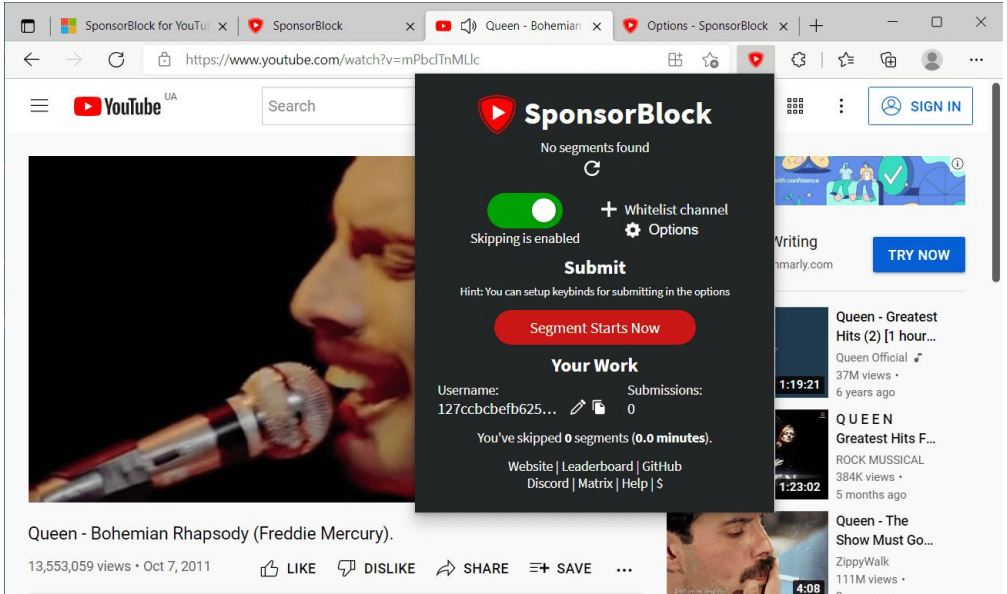
What is SponsorBlock?

- Browser extension
- Automatically skips sponsor ads (and more)
- Crowdsourced data
  - Voting system



My YouTube

Motivation

- Zero contribution to majority of videos
- Need to wait for new videos
- Sometimes only skips some ads

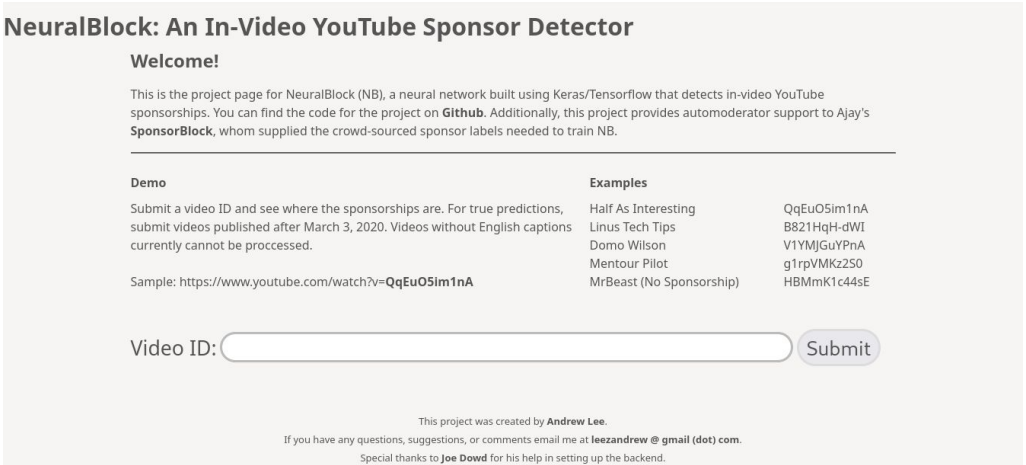
- Solution: Deep Learning model that can automate this

Related Work

1. NeuralBlock
   - https://github.com/andrewzlee/NeuralBlock
2. DeepSponsorBlock
   - https://github.com/DeepSponsorBlock/DeepSponsorBlock
3. reBlock
   - https://github.com/MonliH/reBlock
4. SponsorBlock-ML
   - https://github.com/xenova/sponsorblock-ml

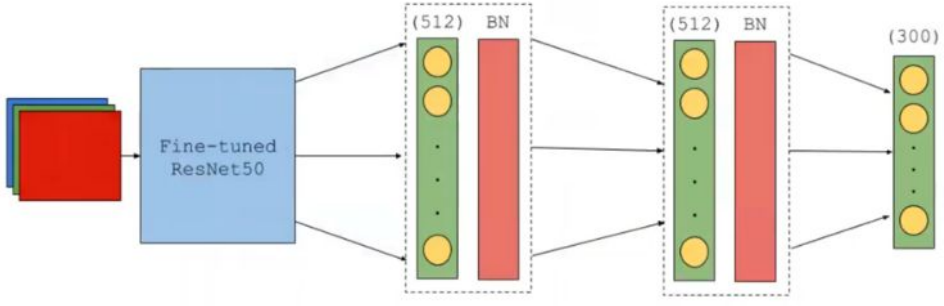
Related Work: NeuralBlock

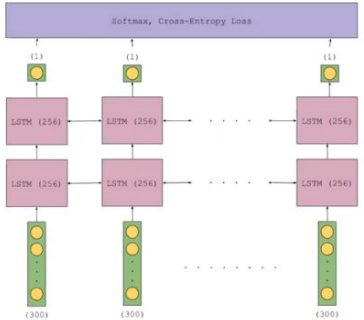
- First serious model to attempt this problem
- Endorsed by SponsorBlock creator
- BiLSTM: predict start and end of segment



Related Work: DeepSponsorBlock

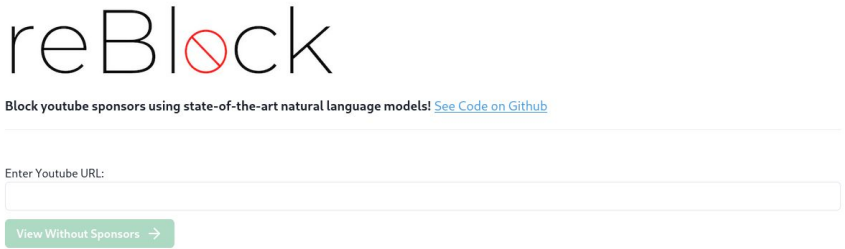
- Stanford CS230 project
- Uses video frames instead of transcripts
- Architecture:
  - Resnet50 CNN: feature extraction from frame
  - BiLSTM: predict start and end of segment
- Suffered from overfitting





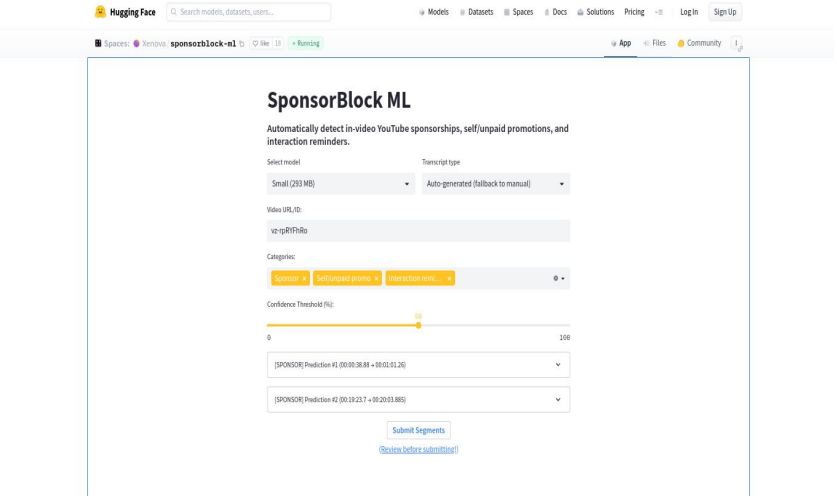
Related Work: reBlock

- Hackathon project
- DeBERTa: token classification
  - Max: 4096 tokens in one pass
  - ["this", "video", "is", "sponsored", "by", "NordVPN", "so", ...]
    [1, 1, 1, 1, 1, 1, 0, ...]



Related Work: SponsorBlock-ML

- Currently used to check submissions
- Architecture:
  - t5: Summarizer
  - bert: Classifier
- Can detect:
  - Sponsor segments
  - Interactions
  - Self Promotions



Dataset

- SponsorBlock API (14M+ contributions)
  - 10K most votes
- (Unofficial) Youtube Transcript API
  - Auto-generated captions only
  - https://github.com/jdepoix/youtube-transcript-api

Model: v1

- Dataset:
  - <label>, <caption>
  - 1154 transcripts
- RoBERTa: classification of each line
- Parameters:
  - Learning rate: 4e-5
  - Optimizer: AdamW
  - Epochs: 5

Metric: Matthew Correlation Coefficient (MCC)

- Precision and Recall score using TP, TN, FP, FN
- Quality of classification:
  - +1: perfect prediction
  - 0: random prediction
  - -1: inverse prediction

	$y = 1$	$y = 0$	total
$x = 1$	n_{11}	n_{10}	$n_{1\bullet}$
$x = 0$	n_{01}	n_{00}	$n_{0\bullet}$
total	$n_{\bullet 1}$	$n_{\bullet 0}$	n

$$\phi = \frac{n_{11}n_{00} - n_{10}n_{01}}{\sqrt{n_{1\bullet}n_{0\bullet}n_{\bullet 0}n_{\bullet 1}}}.$$

Results: v1

MCC	0.4625
TP	434
TN	410
FP	156
FN	154

Model: v2 - Data

- Segmentation Dataset:
  - <label>, <caption1> <caption2>
  - Size: 2M+
  - Undersampled -> 4393
- Multiclass Classification Dataset:
  - <label>,
  - 0: None, 1: Sponsor, 2: Self-promo, 3: Interaction
  - Size: 10992

Model: v2 - models

- Topic Segmentation
  - BERT, RoBERTa, XLNet, XLM-RoBERTa
- Text Classification
  - RoBERTa
- Parameters:
  - Learning rate: 4e-5
  - Optimizer: AdamW
  - Epochs: 5

Results: v2

Segmentation

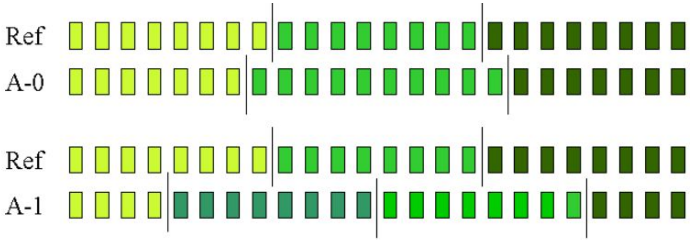
	BERT	RoBERTa	XLNET	XLM_RoBERTa
MCC	0.5826	0.6131	0.5472	0.5947
TP	1720	1750	1535	1703
TN	1755	1792	1847	1797
FP	423	386	331	381
FN	495	465	680	512

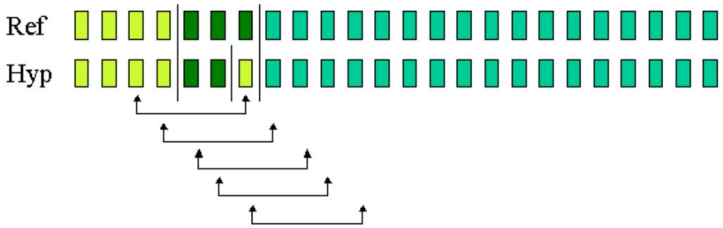
Classification

MCC	0.8785

Metric: Problem

- MCC: penalizes near-misses
- Solution: Pk score (lower the better)





Conclusion and Future Work

- Pk metric
- Sentence-BERT
- Use Whisper if no transcript available
- Integrate video frame data

Thank You