

Numeral Attachment with Auxiliary Tasks

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Task Definition

Numeral Attachment:

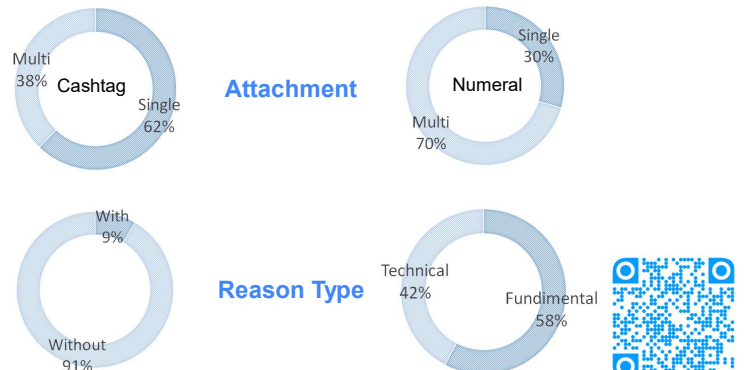
\$NE OK NE, last time oil was over \$65 you were close to \$8. Giddy-up...

Reasoning:

\$IBB had to ride this Train with Reversal candle. Down more than 9% from 342.50

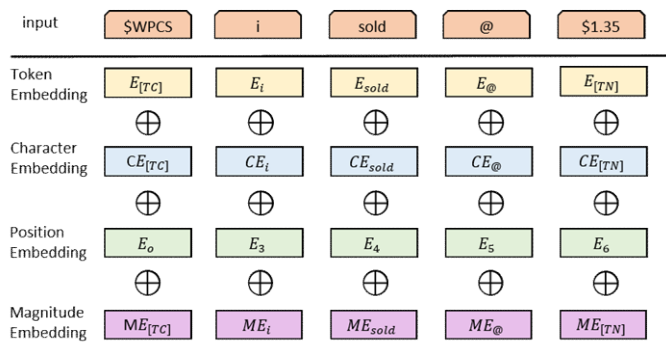
| Reason Type | Reason | Numeral | Example Tweet |
|-------------|-----------------|---------|---|
| Asset | stake | 700 | (T3) SNL has \$700m in SKRO stake. |
| Liability | bonds | 49 | (T4) SWIN bought back \$49mm worth of bonds and 9.1mm shares in the quarter. |
| Equity | shares | 9.1 | (T6) SWATT SBRCM is contact, revenue \$500M (Apple alone). |
| Income | revenue | 500 | (T7) BoFA cuts Q4 GDP from 2.3% to 1.8% on surge in trade deficit SGLD SSLV |
| Economics | GDP | 2.3 | (T8) SSOXL 133.5 entry, stop loss 130, target 50 dma 143.5. |
| Indicator | dma | 143.5 | (T9) SIBB had to ride this Train with Reversal candle. Down more than 9% from 342.50. |
| Pattern | Reversal candle | 342.5 | (T10) SAMD OMG where was all these people when Samd price was 2 us dollars ??? |
| No Reason | | 2 | |

NumAttach Dataset

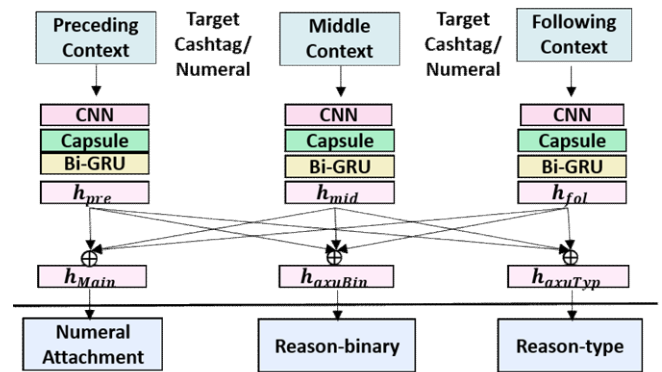


<http://numattach.nlpfin.com>

Text Representation



The Joint Model



Experimental Results

Logistic Regression

Logistic regression with the bag of words features

Adversarial Training (AT)

The model for relation extraction, which adds some perturbations during training the model constructed by bidirectional LSTM and CRF.

Attentive-CNN

We add an attention layer as the first layer of the capsule network model, and replace the capsule network in our model with a two-layer CNN.

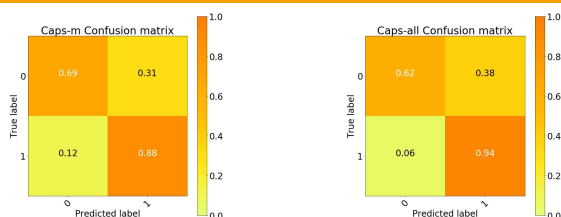
| Model | Macro-F1 |
|---------------------|----------|
| Logistic Regression | 51.11% |
| AT | 53.36% |
| Attentive-CNN | 72.64% |
| Capsule-based | 73.46% |

Ablation Analysis

| Model | Caps-m | Caps-mb | Caps-mt | Caps-all |
|---------------|--------|---------|---------|----------|
| Main Task | v | v | v | v |
| Reason-binary | | v | | v |
| Reason-type | | | v | v |
| Macro-F1 | 67.14% | 69.97% | 66.95% | 73.46% |

| Model | Caps-w | Caps-wc | Caps-wcp | Caps-all |
|-----------|--------|---------|----------|----------|
| Token | v | v | v | v |
| Character | | v | v | v |
| Position | | | v | v |
| Magnitude | | | | v |
| Macro-F1 | 60.08% | 69.59% | 69.73% | 73.46% |

Error Analysis



Related Works

FinNum-2 Shared Task in NTCIR 2020

- The pilot dataset proposed in this paper is available now.
- More than 15,000 instances in 10,000 unique tweets will be available.
- Macro-F1 score is adopted for evaluating the experimental results.

<http://finnum.nlpfin.com>

Numeracy-600K in ACL 2019

- Learning Numeracy for Detecting Exaggerated Information in Market Comments

<http://numeracy600k.nlpfin.com>