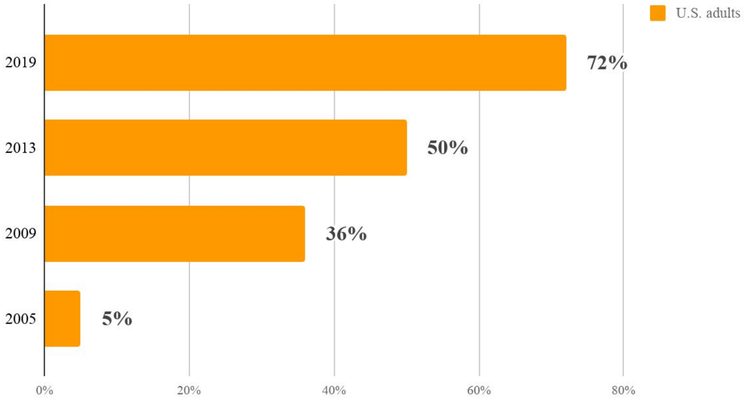
EMET : EMBEDDINGS FROM MULTILINGUAL-ENCODER TRANSFORMER FOR FAKE NEWS DETECTION

ICASSP May 04-08, 2020 Barcelona

Stephane Schwarz, Antônio Theóphilo, and Anderson Rocha
Institute of Computing, Unicamp, BR

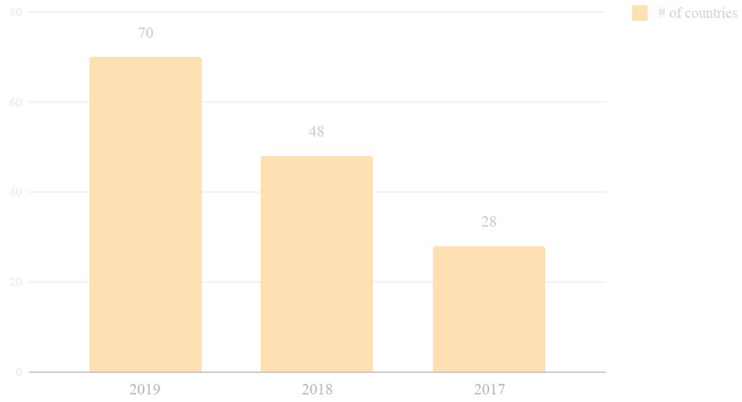
Motivation

% of U.S. adults who use at least one social media site



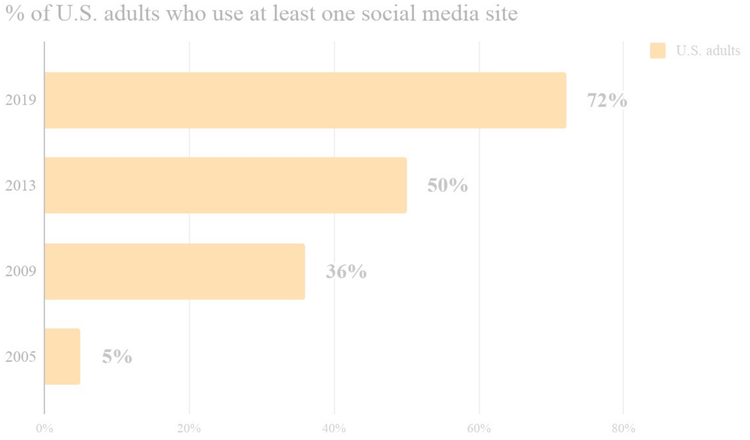
Pew Research Center [1]

Social media manipulation campaigns

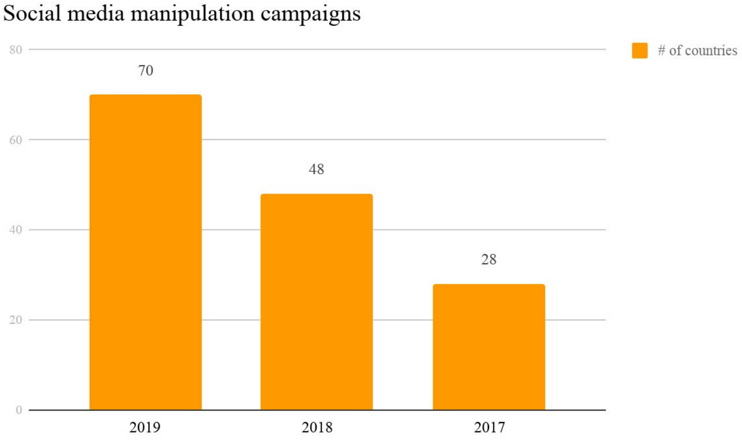


Oxford Internet Institute [2]

Motivation



Pew Research Center [1]



Oxford Internet Institute [2]

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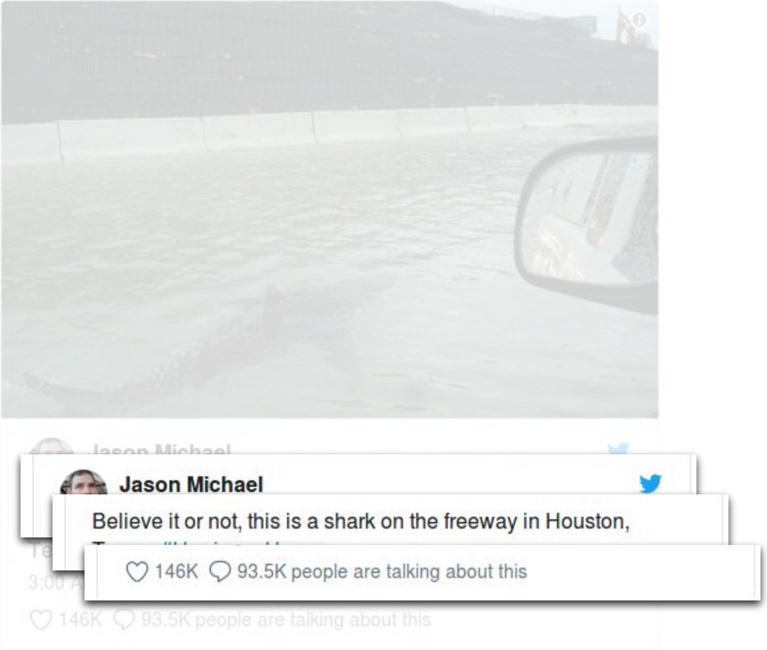
What is fake news?

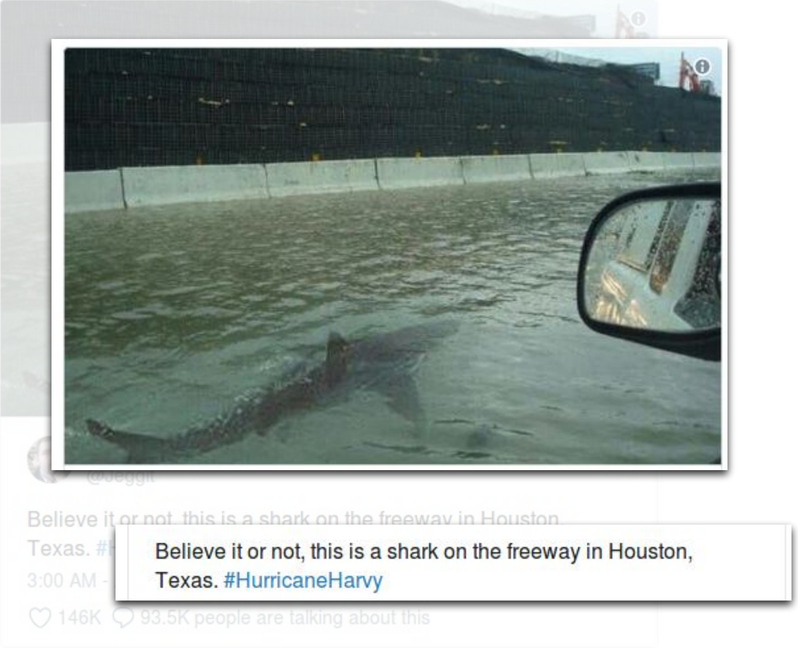
Prior Art: Heuristic-based

Caslillo et al. [3], Theóphilo et al.[5]



Prior Art: Multi-domain

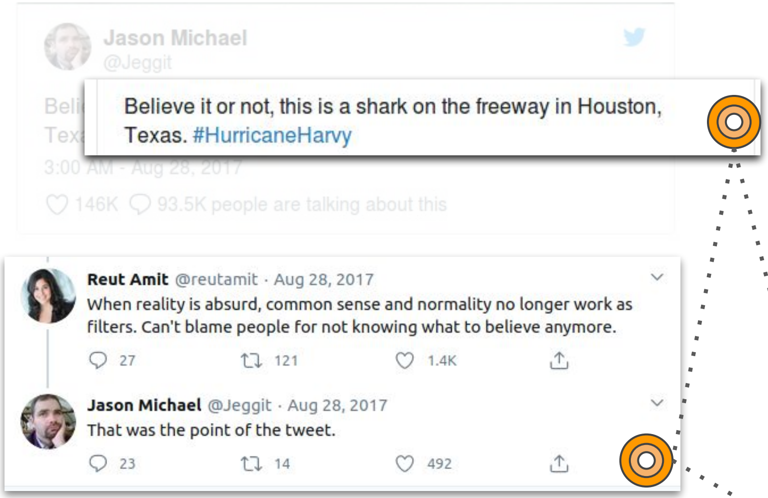
Qi et al. [4]

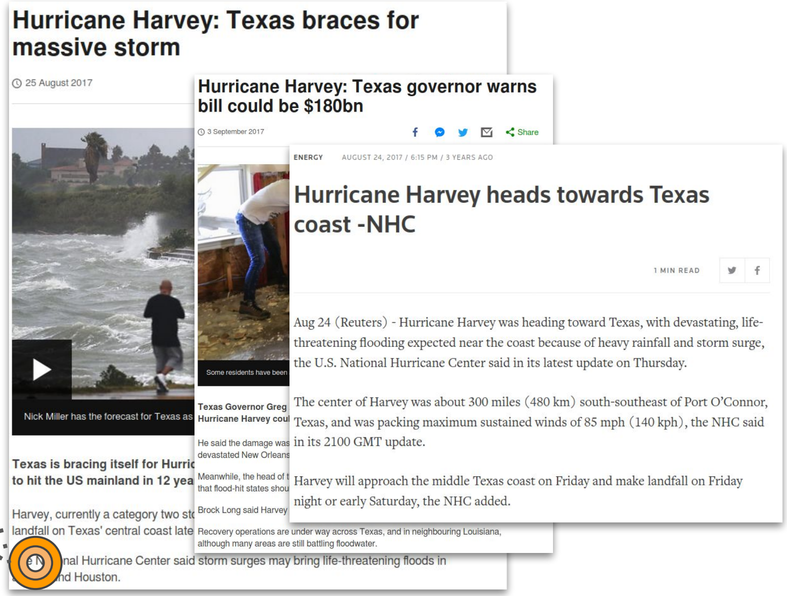


EMET: Our hypothesis

Jesus words: “Then you will know the truth, and the truth will set you free.”

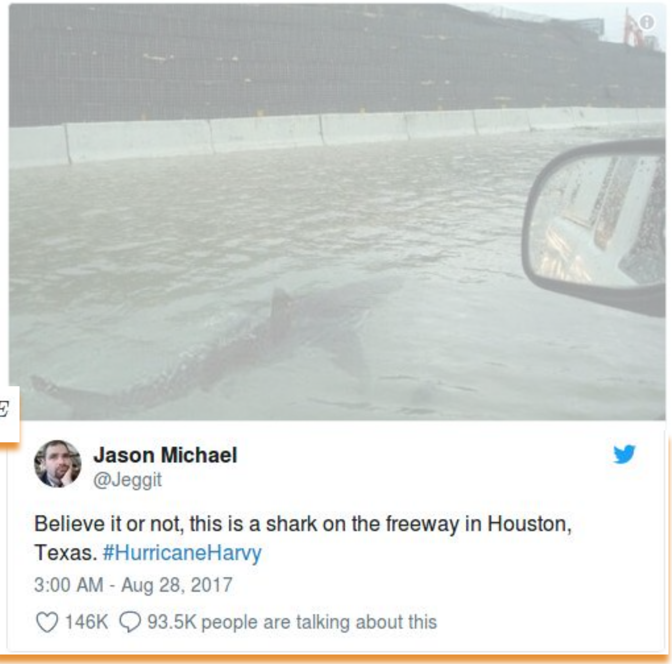
John 8 : 32





EMET: Problem statement

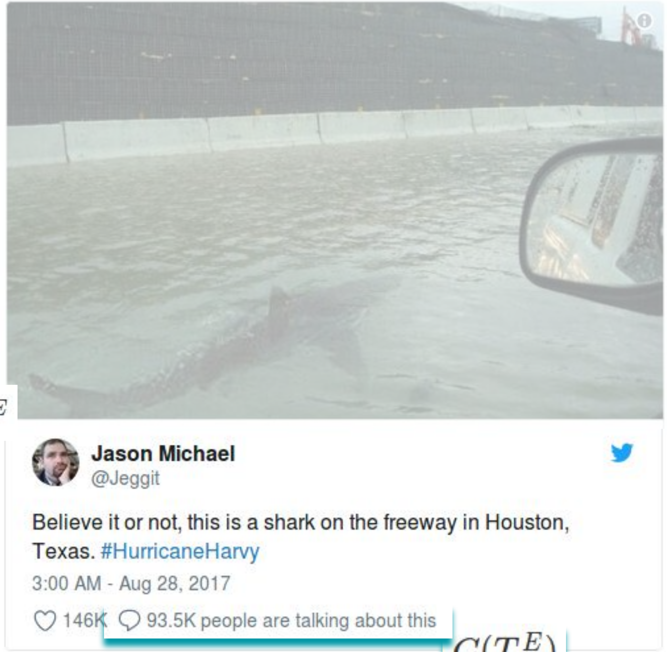
T_i^E



$$\mathcal{F} : (T_i^E \cdot C(T_i^E) \cdot N^E) \implies y$$

EMET: Problem statement

T_i^E

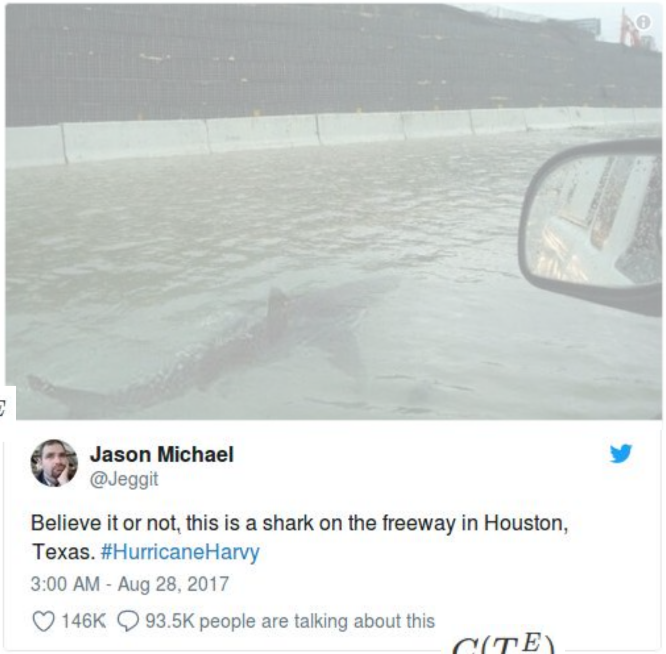


$C(T_i^E)$

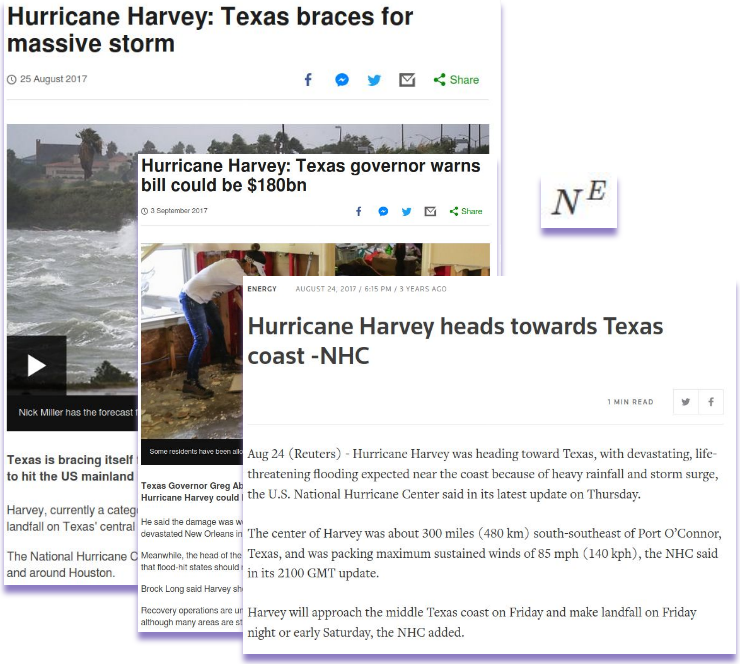
$$\mathcal{F} : (T_i^E \cdot C(T_i^E) \cdot N^E) \implies y$$

EMET: Problem statement

T_i^E



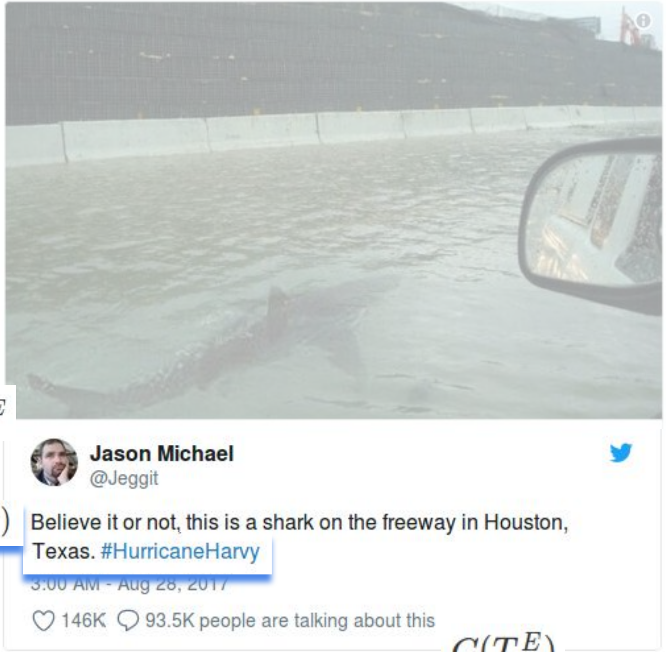
$C(T_i^E)$



N^E

$$\mathcal{F} : (T_i^E \cdot C(T_i^E) \cdot N^E) \implies y$$

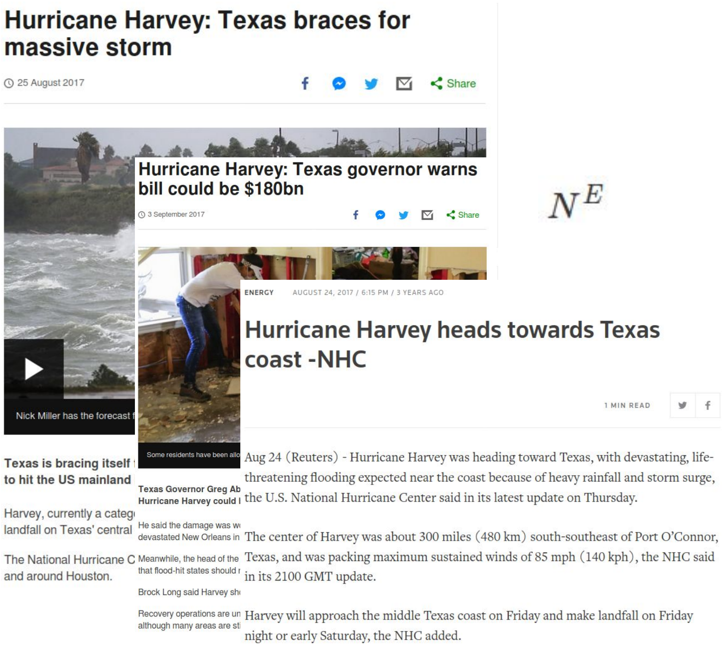
EMET: Problem statement



T_i^E

$K(T_i^E)$

$C(T_i^E)$



N^E

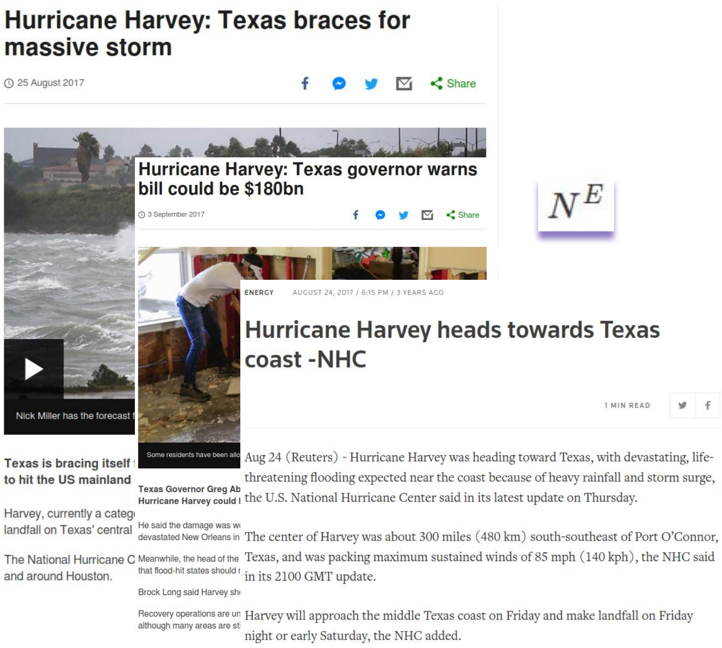
$$\mathcal{F} : (T_i^E \cdot C(T_i^E) \cdot N^E) \implies y$$

EMET: Problem statement

T_i^E

$K(T_i^E)$

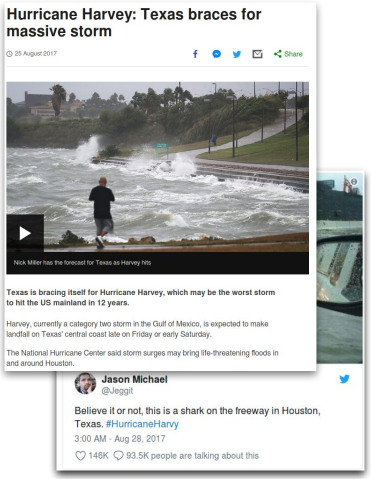
$C(T_i^E)$



N^E

$$\mathcal{F} : (T_i^E \cdot C(T_i^E) \cdot N^E) \implies y$$

EMET: Dataset



Hurricane Harvey: Texas braces for massive storm

25 August 2017

Share

Nick Miller has the forecast for Texas as Harvey hits

Texas is bracing itself for Hurricane Harvey, which may be the worst storm to hit the US mainland in 12 years.

Harvey, currently a category two storm in the Gulf of Mexico, is expected to make landfall on Texas' central coast late on Friday or early Saturday.

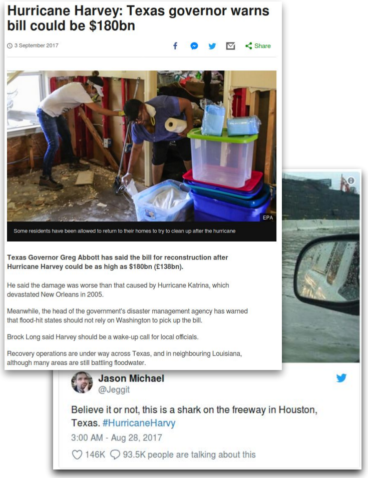
The National Hurricane Center said storm surges may bring life-threatening floods in and around Houston.

Jason Michael
@Jeggit

Believe it or not, this is a shark on the freeway in Houston, Texas. #HurricaneHarvy

3:00 AM - Aug 28, 2017

146K 93.5K people are talking about this



Hurricane Harvey: Texas governor warns bill could be $180bn

3 September 2017

Share

Some residents have been allowed to return to their homes to try to clean up after the hurricane

Texas Governor Greg Abbott has said the bill for reconstruction after Hurricane Harvey could be as high as $180bn (£138bn).

He said the damage was worse than that caused by Hurricane Katrina, which devastated New Orleans in 2005.

Meanwhile, the head of the government's disaster management agency has warned that flood-hit states should not rely on Washington to pick up the bill.

Brock Long said Harvey should be a wake-up call for local officials.

Recovery operations are under way across Texas, and in neighbouring Louisiana, although many areas are still battling floodwater.

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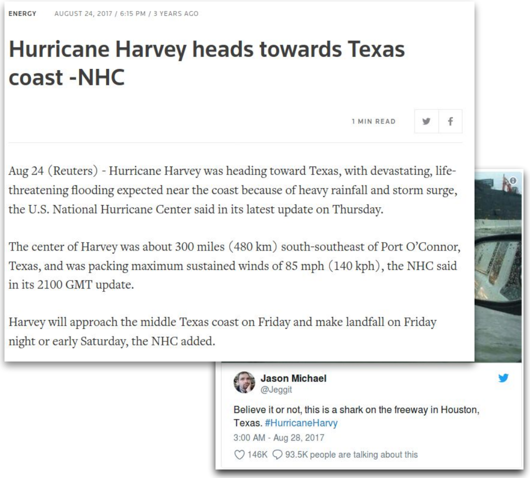

ENERGY AUGUST 24, 2017 / 6:15 PM / 3 YEARS AGO

Hurricane Harvey heads towards Texas coast -NHC

1 MIN READ

Aug 24 (Reuters) - Hurricane Harvey was heading toward Texas, with devastating, life-threatening flooding expected near the coast because of heavy rainfall and storm surge, the U.S. National Hurricane Center said in its latest update on Thursday.

The center of Harvey was about 300 miles (480 km) south-southeast of Port O'Connor, Texas, and was packing maximum sustained winds of 85 mph (140 kph), the NHC said in its 2100 GMT update.

Harvey will approach the middle Texas coast on Friday and make landfall on Friday night or early Saturday, the NHC added.

Jason Michael
@Jeggit

Believe it or not, this is a shark on the freeway in Houston, Texas. #HurricaneHarvy

3:00 AM - Aug 28, 2017

146K 93.5K people are talking about this

Training News was obtained from BBC and for Test set from Reuters.

EMET: Dataset

Class	Train	Test	Augmen. Train	Augmen. test
Real	4314	2200	9304	22000
Fake	6690	3732	23026	36262
Unknown	1416	600	2361	600

EMET: Dataset

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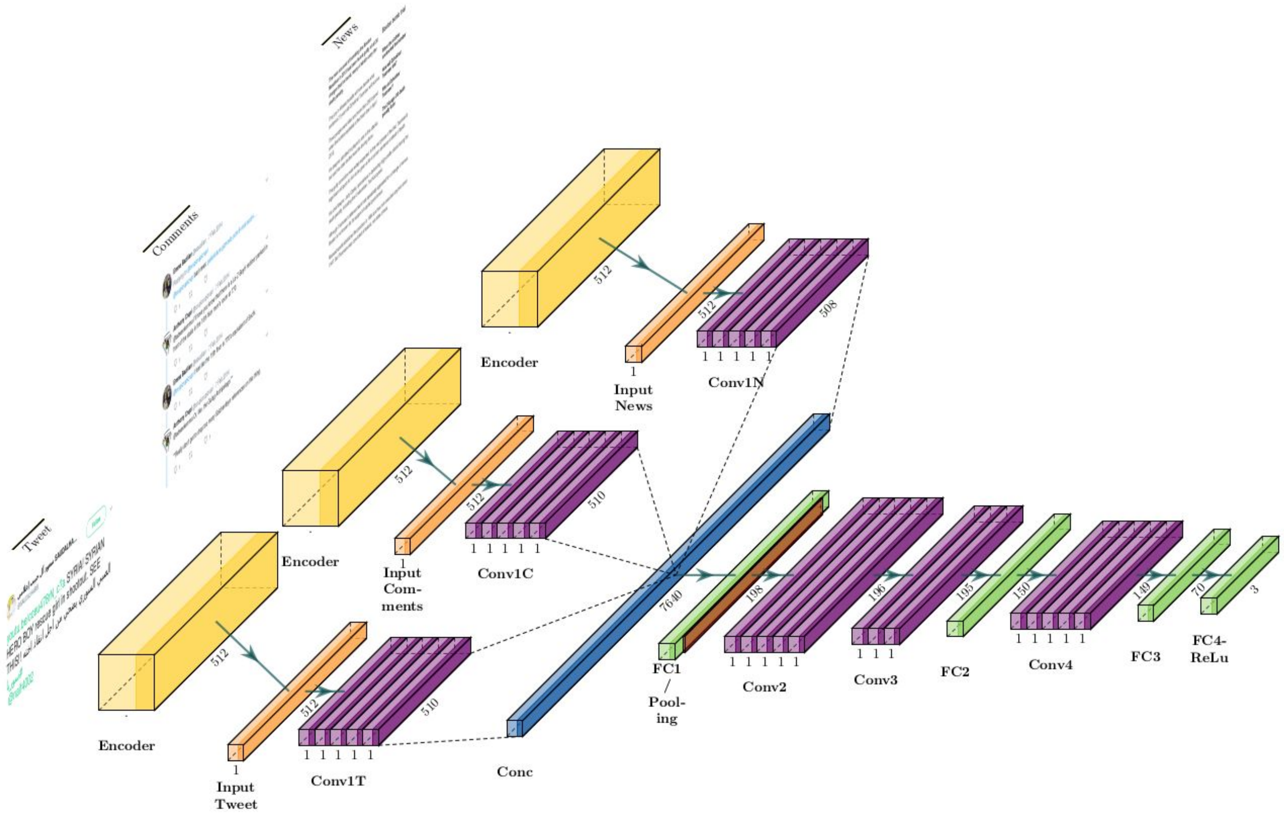
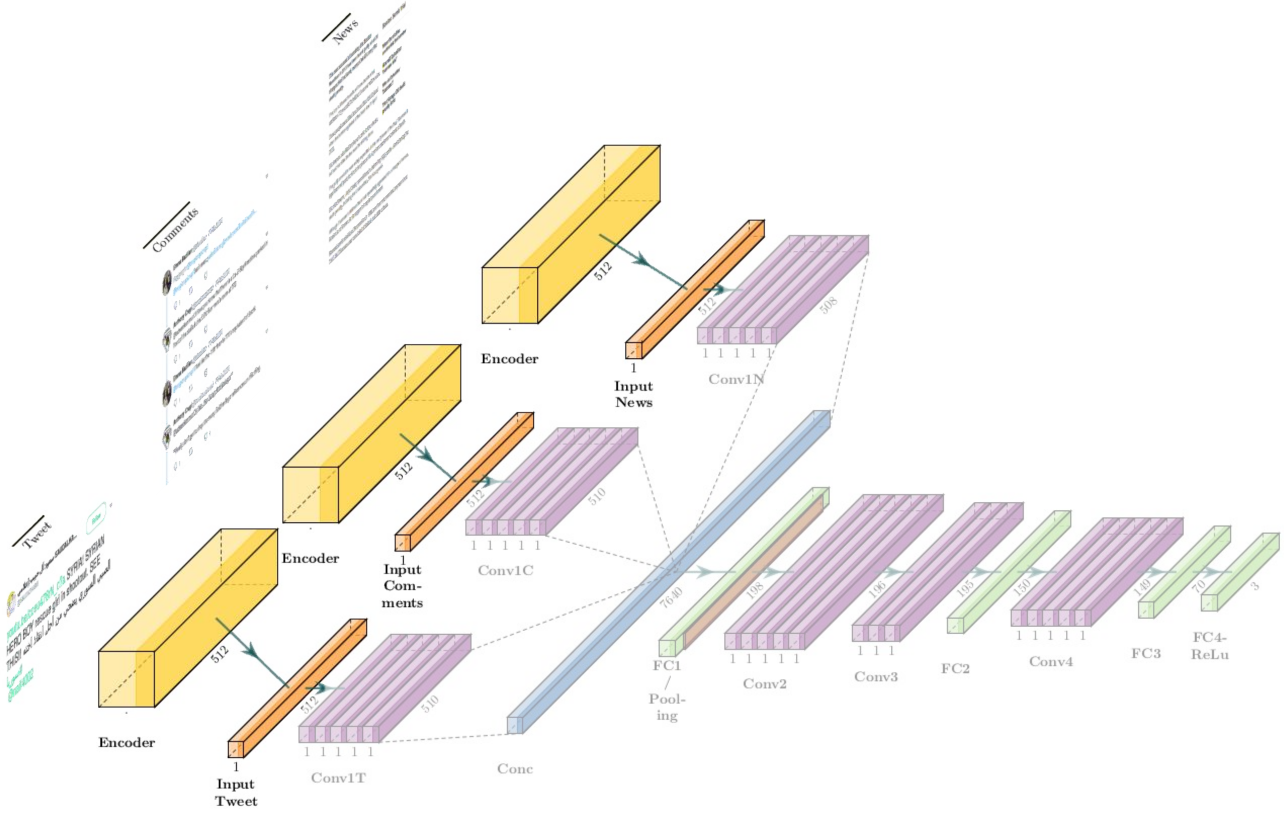
EMET: Problem statement

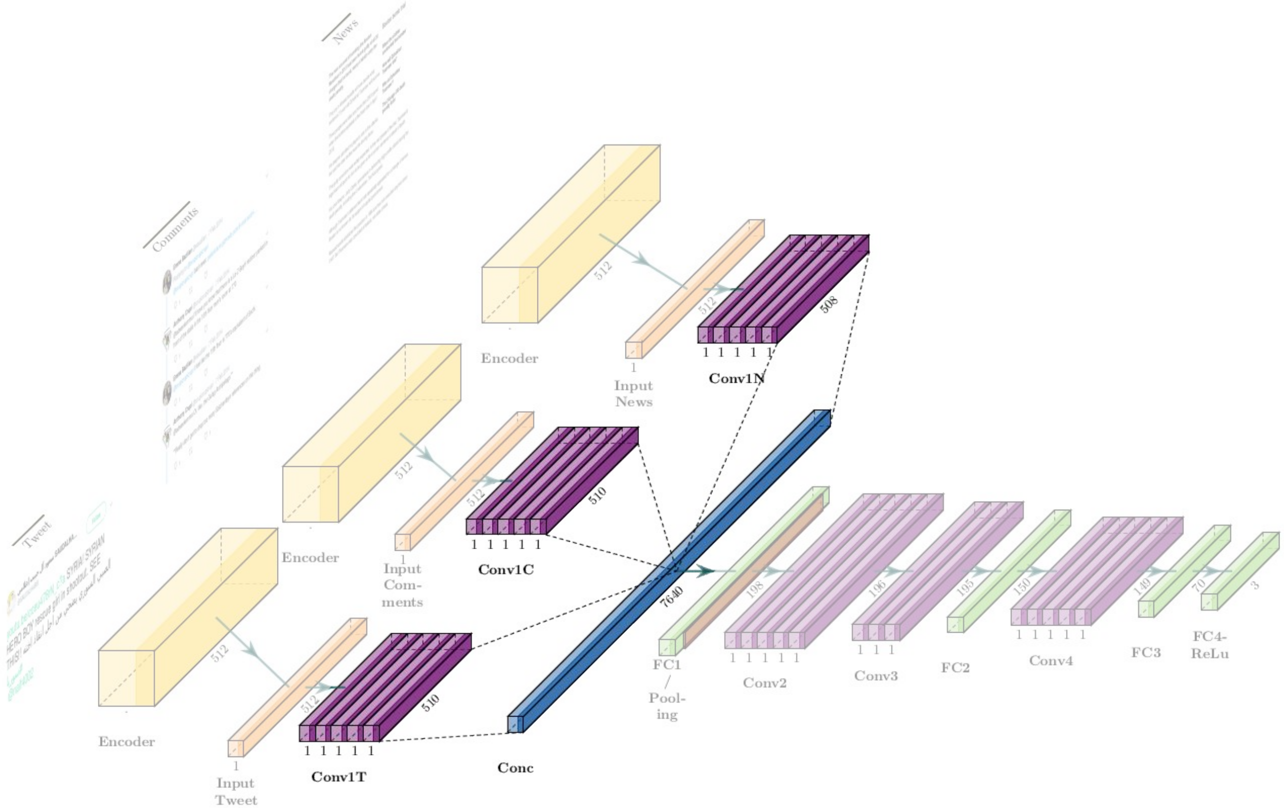


EMET: Input

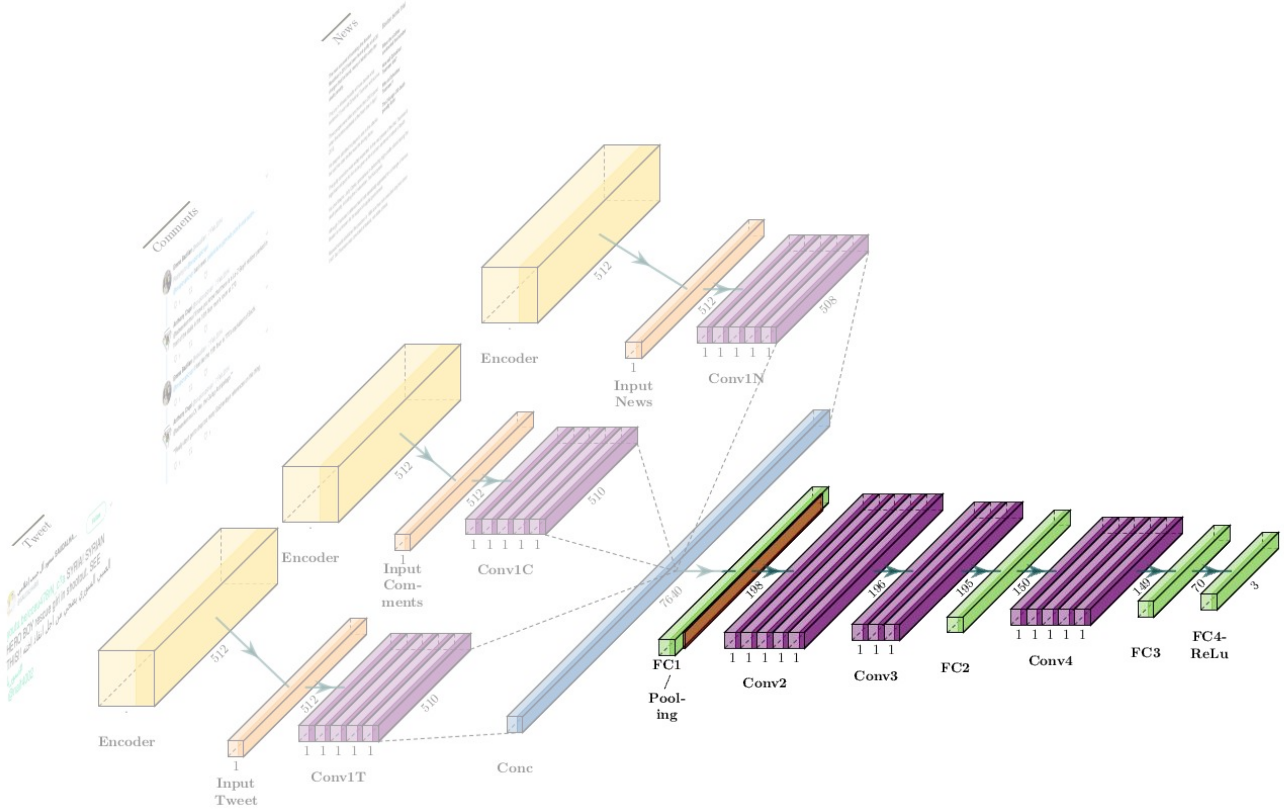


Tweet
Comments
News
Encoder
Encoder
Encoder
512
512
512
1
Input Tweet
1
Input Com-ments
1
Input News
Conv1T
Conv1C
Conv1N
510
510
508
Conc
7640
FC1 / Pool-ing
198
Conv2
196
Conv3
195
FC2
150
Conv4
140
FC3
70
FC4-ReLu
3

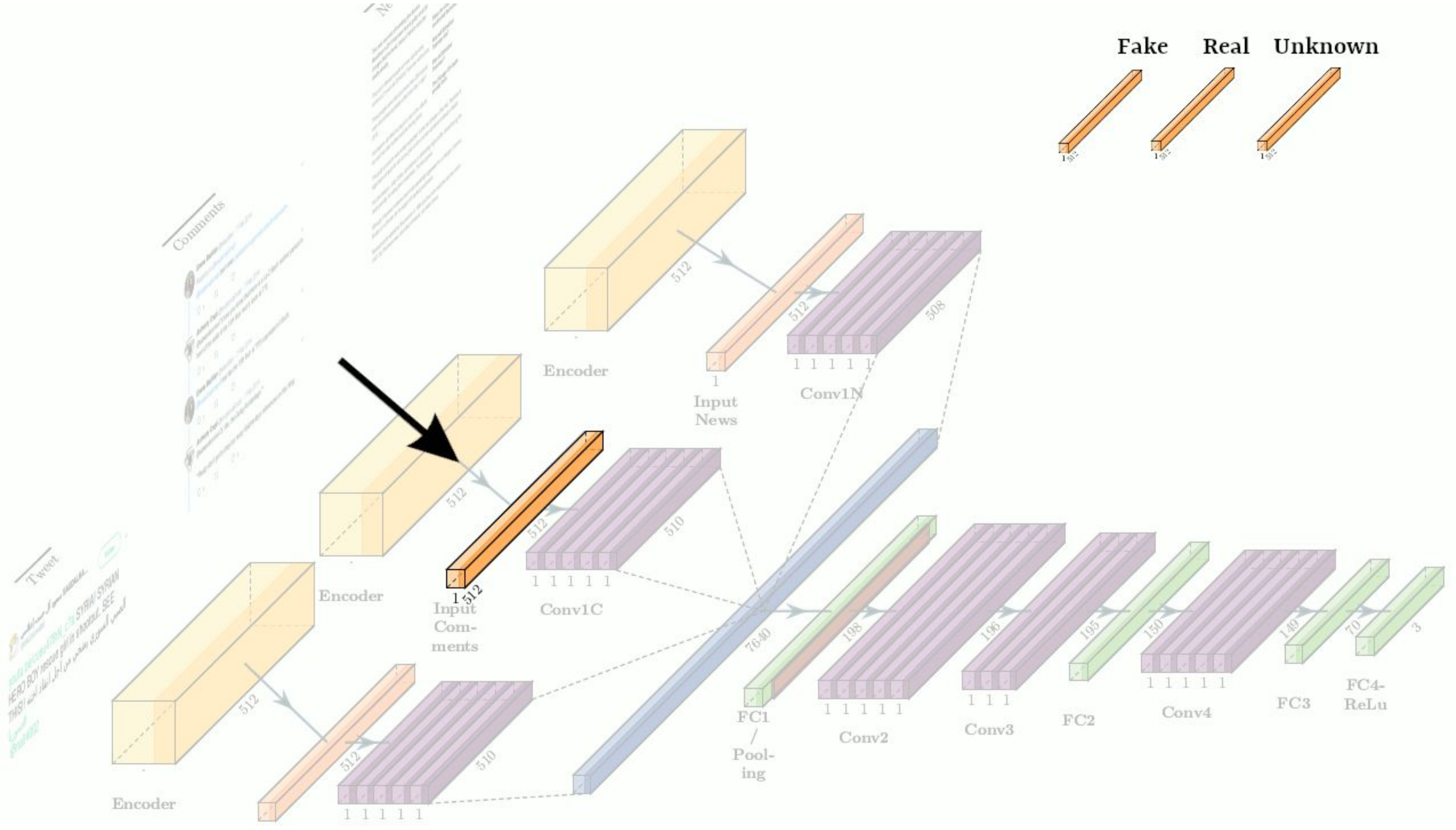
EMET: Convolution



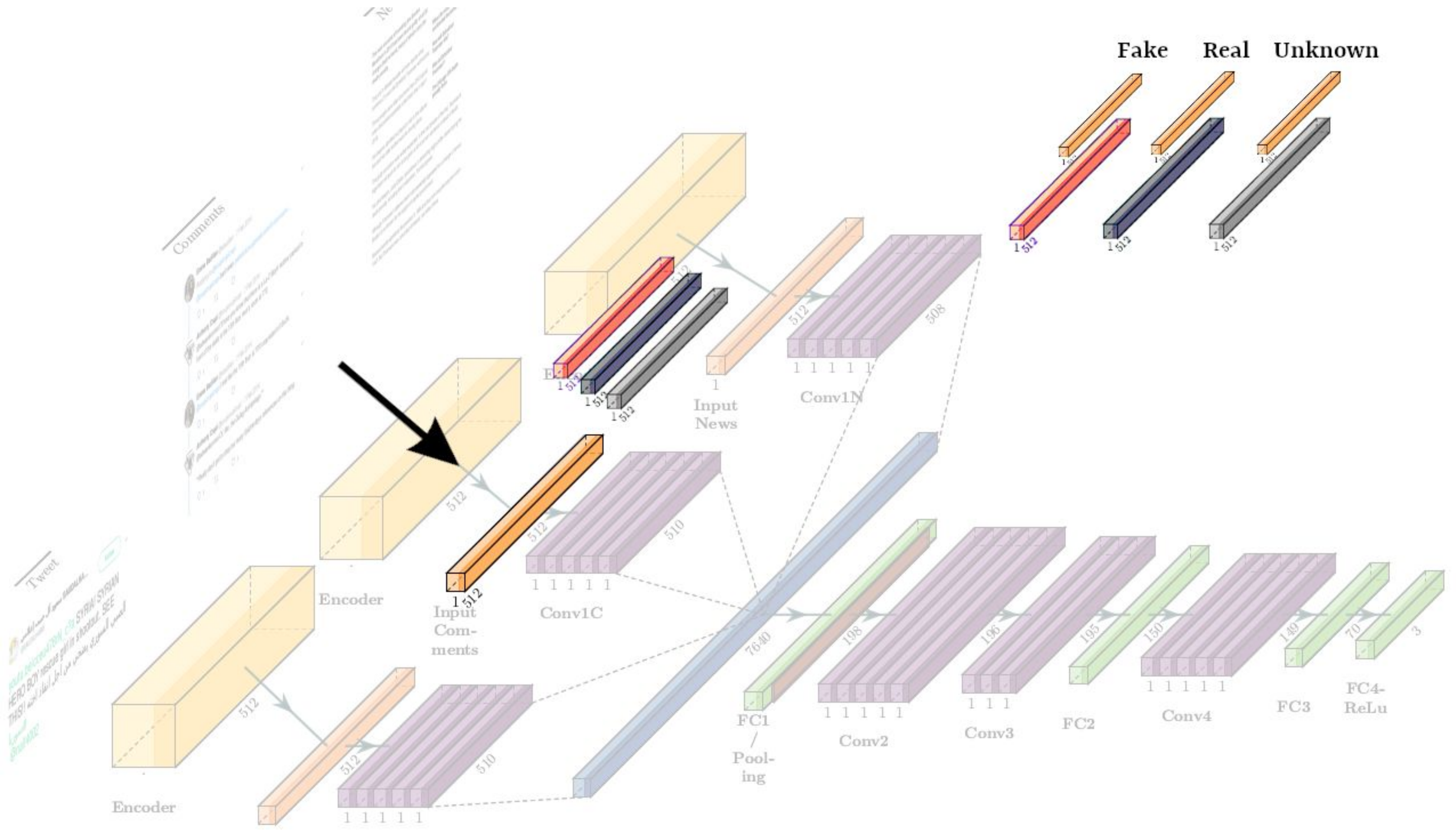
EMET: Fully-connected



EMET : Classification Ensemble - Training



EMET : Classification Ensemble- Testing



Experimental Results: Questions

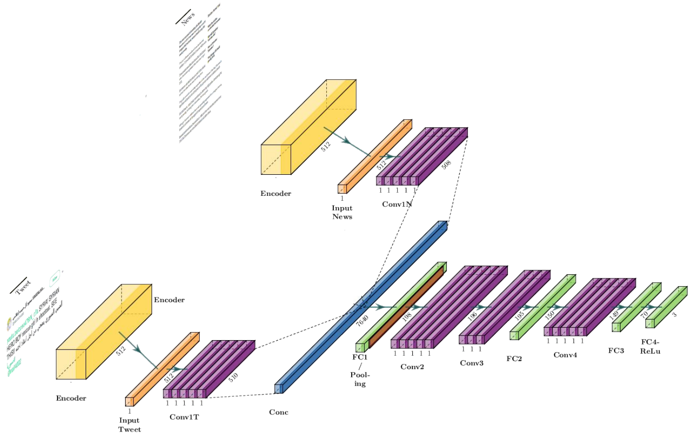
- How text embeddings from a multilingual encoder and the us-age of news pieces improve the identification of misleading content on social media?

- How the comments contribute to improving classification performance?

- How the ensemble method capture general information to better model the test set?

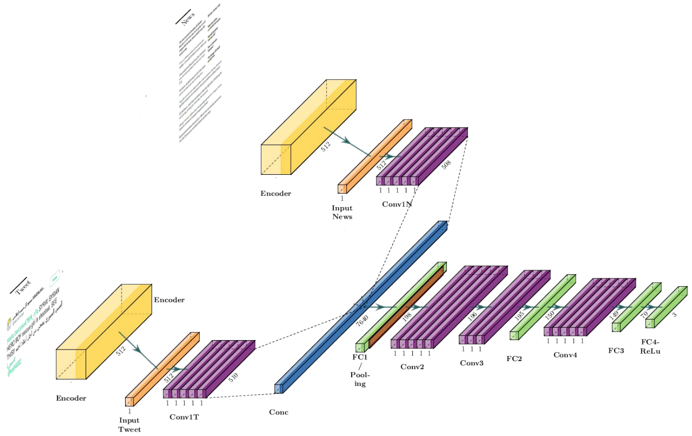
Experimental Setup: Unchecked news (UNC)

Method	Accuracy	Precision	Recall	F1
UCN	76.4	76.9	76.4	75.2
EANN-Text [6]	53.2	59.8	54.1	56.8
MVAE-Text [7]	52.6	52.7	53.9	53.2



Experimental Setup: Checked news (CN)

Method	Accuracy	Precision	Recall	F1
CN	92.92	92.99	92.92	92.94
EANN-Text	53.2	59.8	54.1	56.8
MVAE-Text	52.6	52.7	53.9	53.2



Experimental Results: Questions

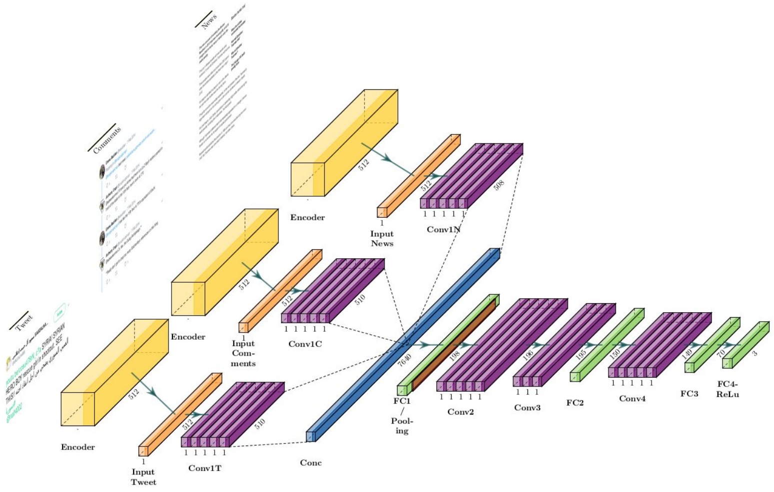
- How text embeddings from a multilingual encoder and the us-age of news pieces improve the identification of misleading content on social media?

- How the comments contribute to improving classification performance?

- How the ensemble method capture general information to better model the test set?

Experimental Setup: CN and comments (CNC)

Method	Accuracy	Precision	Recall	F1
CN	92.92	92.99	92.92	92.94
CNC	93.47	**93.91**	**93.47**	**93.61**



Experimental Results: Questions

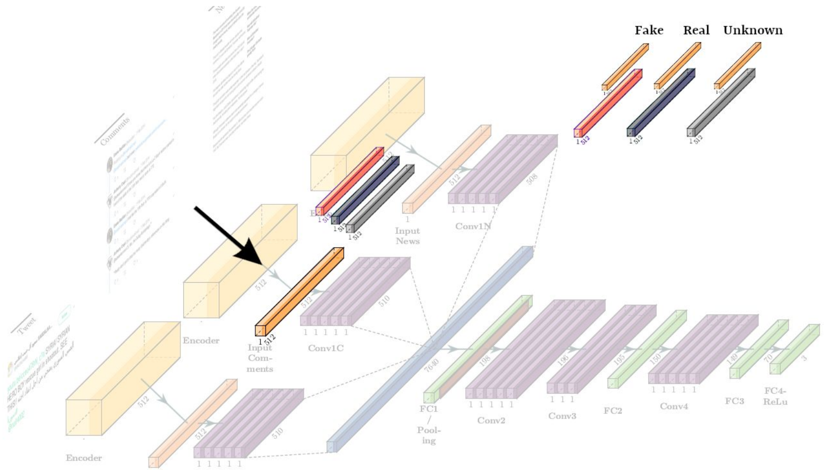
- How text embeddings from a multilingual encoder and the us-age of news pieces improve the identification of misleading content on social media?

- How the comments contribute to improving classification performance?

- How the ensemble method capture general information to better model the test set?

Experimental Setup: CNC and ensemble (CNCE)

Method	Accuracy	Precision	Recall	F1
CNC	93.47	**93.91**	**93.47**	**93.61**
CNCE	**94.08**	91.31	91.21	91.26



Conclusion

EMET helps to address the problem of fake news detection on social media platforms in a multilingual scenario.

Future work

Explore Multi Domain data (Image + Text)

Acknowledgments

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References

[1] Pew Research Center. Social media fact sheet. https://www.pewresearch.org/internet/fact-sheet/social-media

[2] Samantha Bradshaw and Philip N. Howard. 2019 global inventory of organised social media manipulation. https://comprop.oii.ox.ac.uk/wp-content/uploads/sites/93/2019/09/CyberTroop-Report19.pdf ,2019.[Online;accessed on October 10 th , 2019].

[3] Carlos Castillo et al.. Information credibility on twitter. In Proceedings of the 20th international conference on World wide web, pages 675–684. ACM, 2011.

[4] Peng Qi, et al. Exploiting multi-domain visual information for fake news detection. arXiv preprint arXiv:1908.04472, 2019.

[5] Antônio Theóphilo et al. A needle in a haystack? harnessing onomatopoeia and user-specific stylometrics for authorship attribution of micromessages. In ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pages 2692–2696. IEEE, 2019.

[6] MediaEval Multimedia Benchmark. 2015 verifying multimedia use dataset. http://www.multimediaeval.org/mediaeval2015/verifyingmultimediause/, 2015. [Online; accessed on October 10 th , 2019].

[7] Yaqing Wang et al.. Eann: Event adversarial neural networks for multi-modal fake news detection. In Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, pages 849–857. ACM, 2018.

[8] Dhruv Khattar et al. Mvae: Multimodal variational autoencoder for fake news detection. In The World Wide Web Conference, pages 2915–2921. ACM, 2019.

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