SentiMeme

SENTIMENT IDENTIFICATION IN MEMES

CS541: Deep Learning
Final Project

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Introduction

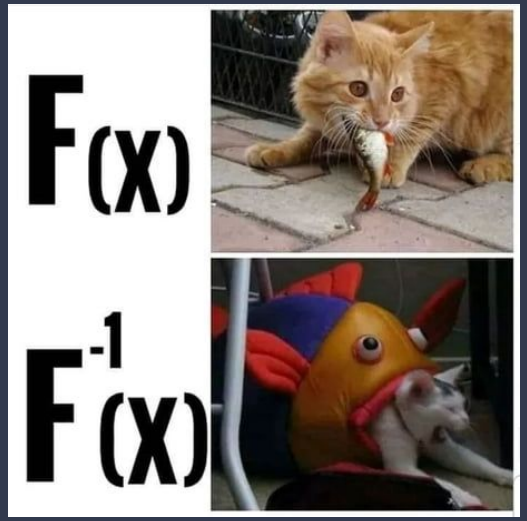


Image source: https://img-9gag-fun.9cache.com/photo/aNgDmOb_460s.jpg

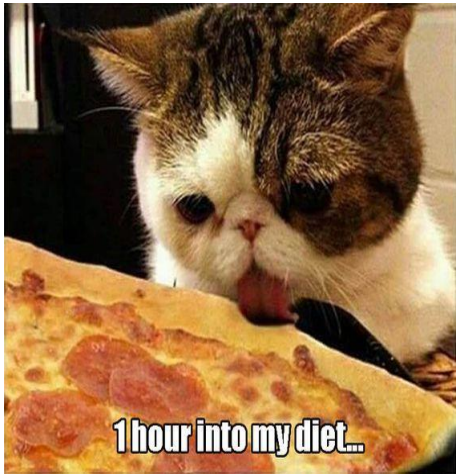
- **What are memes?**
  - “Units of culture”. Shared ideas, beliefs, patterns of behavior.
  - Ubiquitous growth on social media.
- **Why analyze internet memes?**
  - Analogous to text, memes can also convey hatred and disturb people.
  - Hate speech is a great societal responsibility.
  - Human intervention is not possible.
- **Why it is difficult to identify meme sentiment?**
  - It includes visual cues and language understanding.
  - Additional references: popular culture, current events.

Objective: Identify which Memes are classified as Negative, Neutral or Positive

-1 Negative

631 instances (9.02%)

0 Neutral



2198 instances (31.48%)

+1 Positive

4153 instances (59.50%)

Images 60, 632 and 942 taken from dataset

Methodology: Referential Architecture

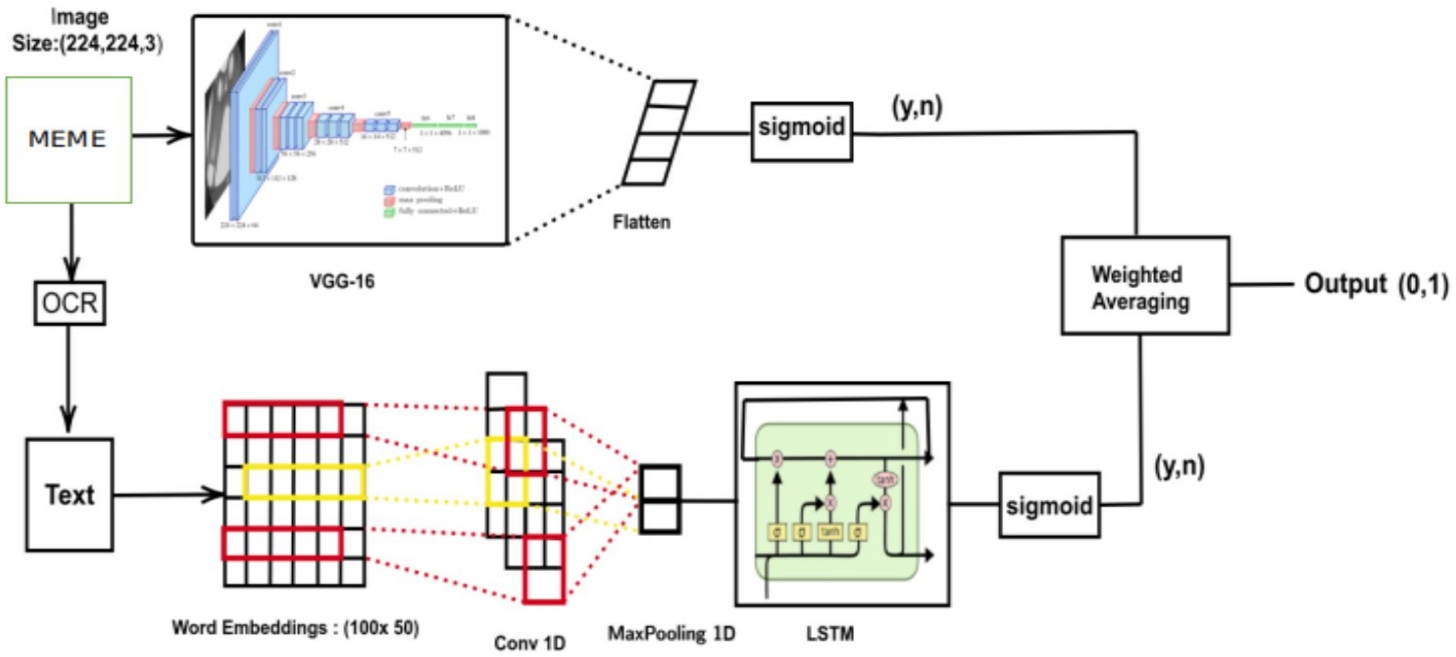
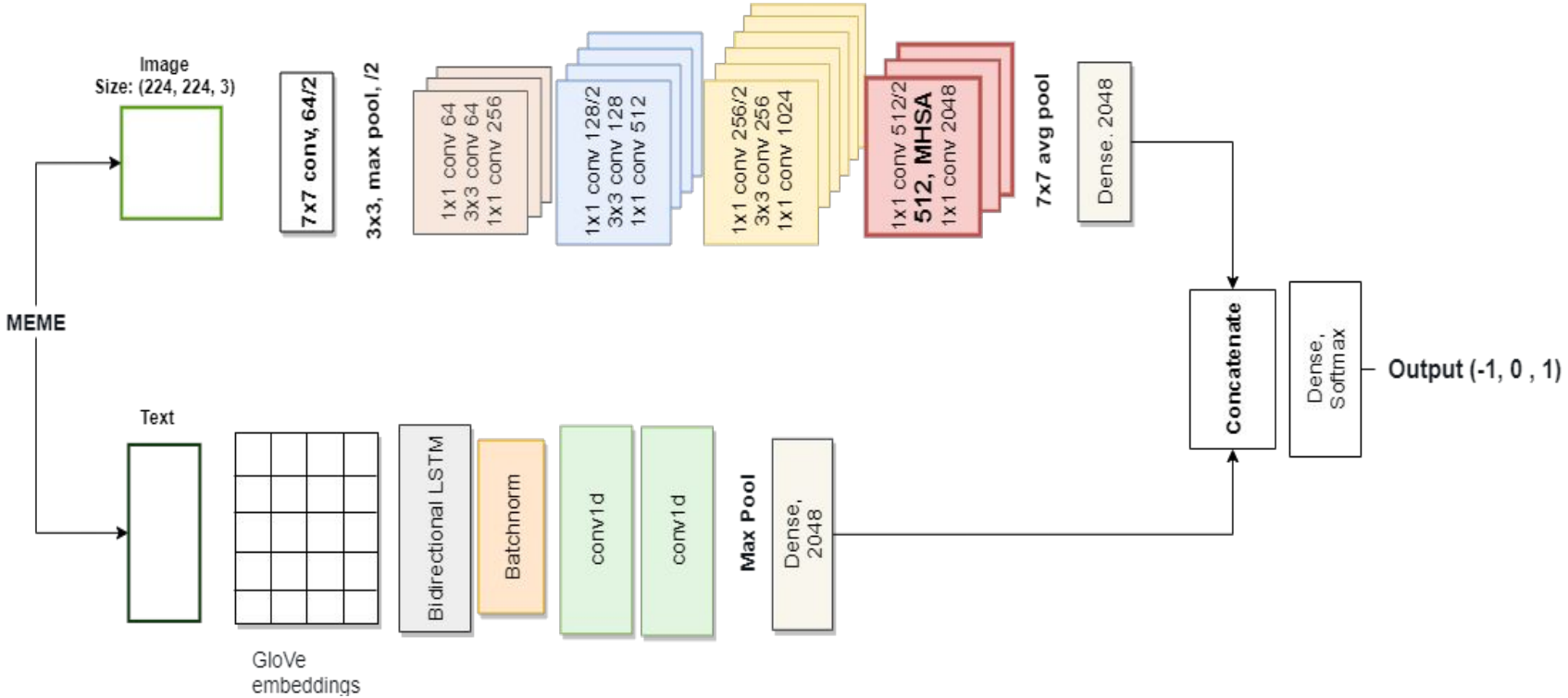
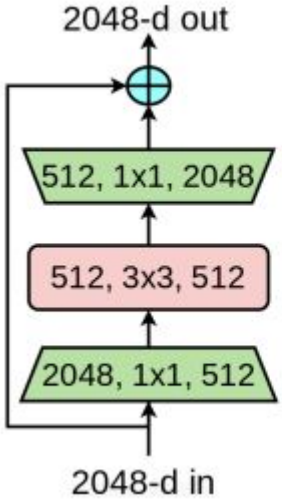


Image source: Sharma, Chhavi, et al. "SemEval-2020 Task 8: Memotion Analysis--The Visuo-Lingual Metaphor!."

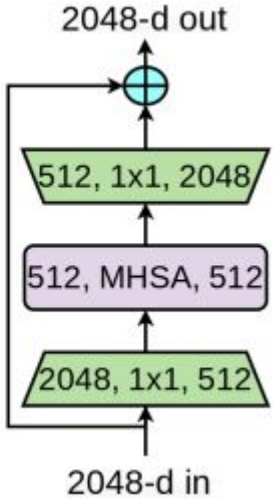
Methodology: Proposed Architecture



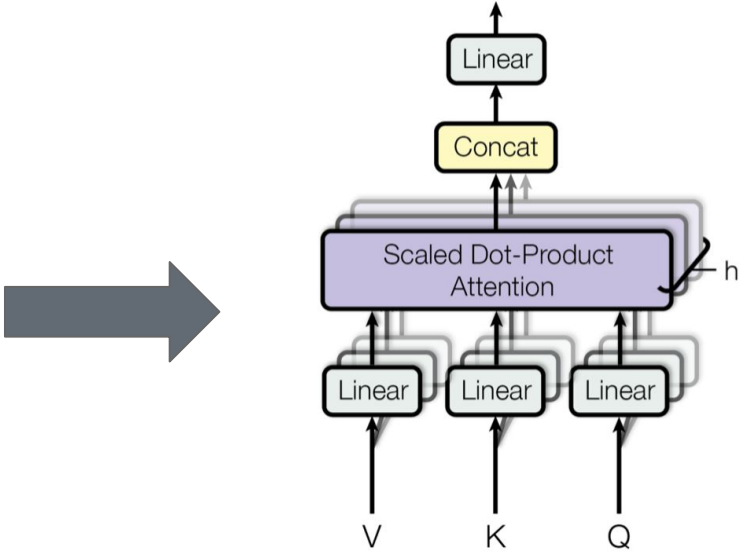
BoTNet



ResNet Bottleneck



BoTNet Bottleneck



Multihead Self Attention

Image source: Srinivas, Aravind, et al. "Bottleneck Transformers for Visual Recognition"

Experimental Setup & Results

- Train/Test Split : 80 - 20
- Train/Validation Split: 85 - 15
- Meta Cost Learning due to unbalanced training data.
- Class Weights: {Positive: 0.56, Negative: 3.68, Neutral: 1.05}
- Optimizer: Adam
- Loss: Categorical Cross Entropy
- Classes: {Positive: 1, Negative: -1, Neutral: 0}

Data	Macro F1-Score		
	Ours	Baseline	Best in Competition
Text	0.49	0.21	-
Image	0.48	0.18	-
Text + Image	**0.52**	0.21	0.35

Results of our Proposed Approach

Text

	-1	0	1
-1	7	35	84
0	20	138	282
1	46	267	518

Image

	-1	0	1
-1	5	19	102
0	12	81	347
1	41	147	643

Text + Image

	-1	0	1
-1	8	31	87
0	31	140	269
1	67	269	495

Confusion Matrix

Disclaimer

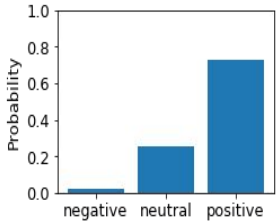
The labels in the dataset do not represent the view of the authors.

The authors sometimes agree with the model’s wrong predictions more than the labeled “ground truths”.

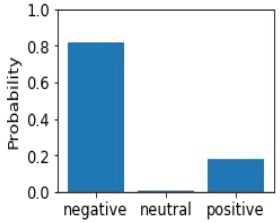
Sample Predictions

Correct

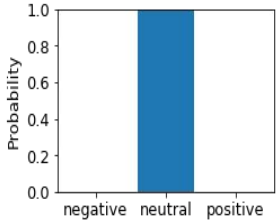
Positive



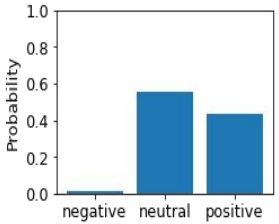
Negative

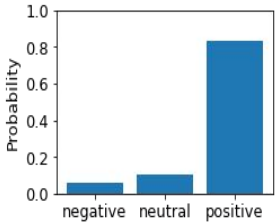


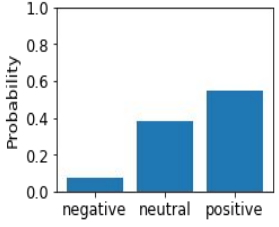
Neutral



Incorrect







Wrap-up / Conclusions

- Detection of hate speech on internet is a societal responsibility.
- “Internet Memes” has doubled the challenge.
- Memes are the combination of image and text, and conveys the meaning when both are considered together.
- We predicted the meme sentiment with a Macro-F1 Score of 0.52 (+0.31 in comparison with baseline).
- BoTNet improved the performance of image classification.
- Macro-F1 for Image classification increased to 0.48 in comparison to baseline (0.18).

References

- Srinivas, A., Lin, T.Y., Parmar, N., Shlens, J., Abbeel, P., & Vaswani, A. (2021). Bottleneck transformers for visual recognition. *arXiv preprint arXiv:2101.11605*.
- Sharma, C., Bhageria, D., Scott, W., PYKL, S., Das, A., Chakraborty, T., Pulabaigari, V., & Gamback, B. (2020). SemEval-2020 Task 8: Memotion Analysis–The Visuo-Lingual Metaphor!. *arXiv preprint arXiv:2008.03781*.