Multimodal Dual Attention Networks for 2019 DramaQA Challenge

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DramaQA dataset for Video Story Understanding

- four levels of questions in the degree of difficulty to consider story level understanding for Video QA task

- descriptions are not used to train the model

- utilize image frames, subtitles of the video clip to answer the question

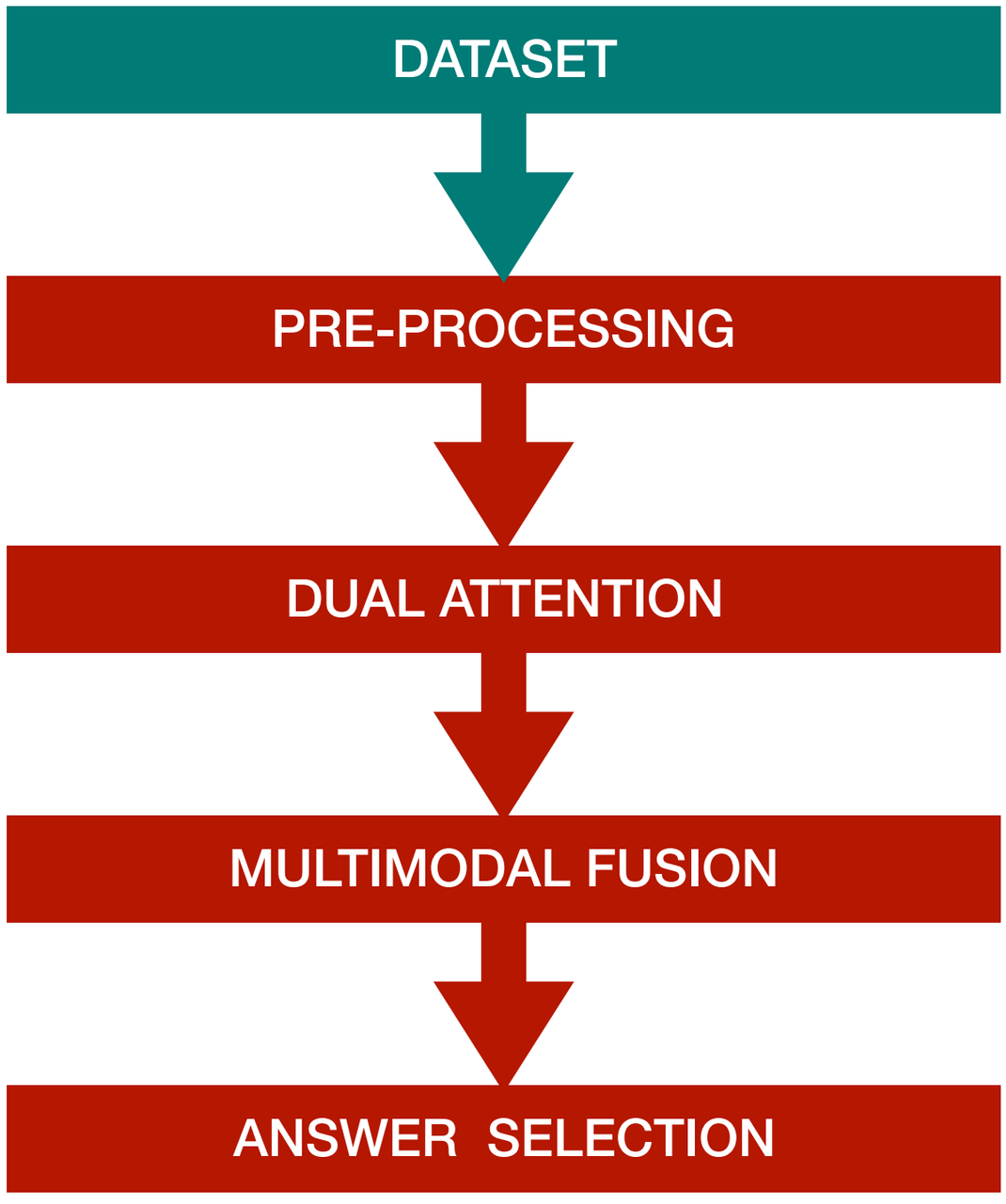
- for more information, https://dramaqa.github.io/Dataset

image frames	subtitles	QA
Scene: 317 Shot: 9332	subtitles of video clips which have vid as keys	Level1: 7991 Level2: 4116 Level3: 1833 Level4: 1821

Multimodal Dual Attention Networks

- inspired by *Kim, Kyung-Min, et al. "Multimodal dual attention memory for video story question answering." Proceedings of the European Conference on Computer Vision (ECCV). 2018*

- reference code https://github.com/gicheonkang/DAN-VisDial



preprocessing

frames | subtitles | questions | answers

ResNet50

nltk.word_tokenize

300-D GloVe word embeddings

1D-conv

max pool

$M_f : N \times 512$ | $M_s : N \times 256$ | $q : 1 \times 256$ | $A : 5 \times 256$

dual attention

self attention

Feed Forward | Feed Forward | Add & Norm

multi-head attention

Feed Forward | Feed Forward | Add & Norm

1D-conv | max pool

$f : 1 \times 512$ | $s : 1 \times 256$ | $q : 1 \times 256$

multimodal fusion

Deep Residual Block | Deep Residual Block

concatenation | Linear | tanh

$o : 1 \times 256$

PRE-PROCESSING

$$q = max(ReLU(conv(O_q, [windowsize])))$$

$$M_s[i] = max(ReLU(conv(O_S, [windowsize])))$$

$$A[j] = max(ReLU(conv(O_A, [windowsize])))$$

DUAL ATTENTION

$$head_i = average(DotProdAttn(pW_i^p, KW_i^K)))$$

$$head_i = DotProdAttn(qW_i^q, KW_q^K))$$

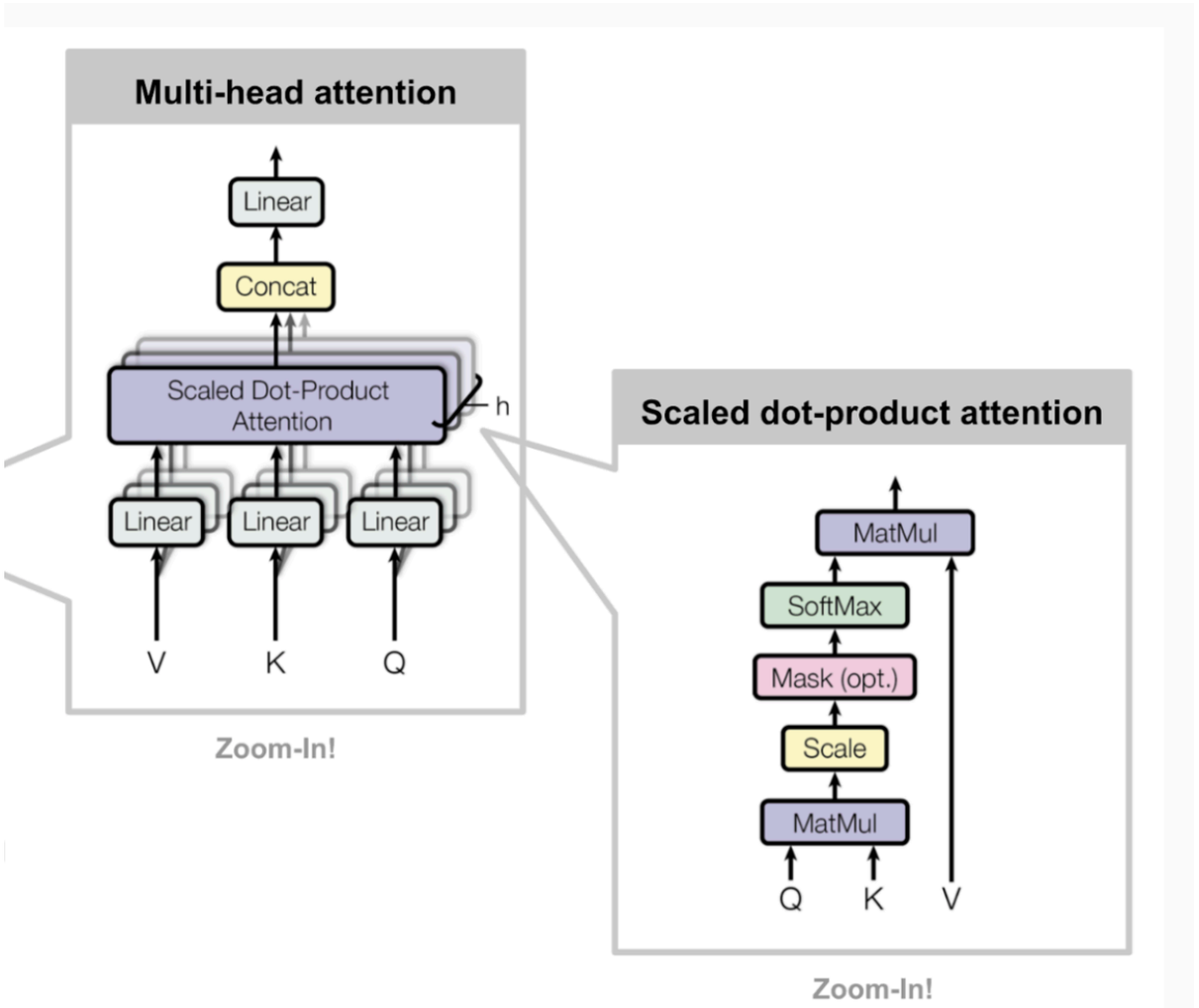
$$FFN(x) = ReLU(xW_1 + b_1)W_2 + b2$$

MULTIMODAL FUSION

$$o = \sigma(W_o(H(L_m)(q, f) \otimes H(L_m)(q, s)))$$

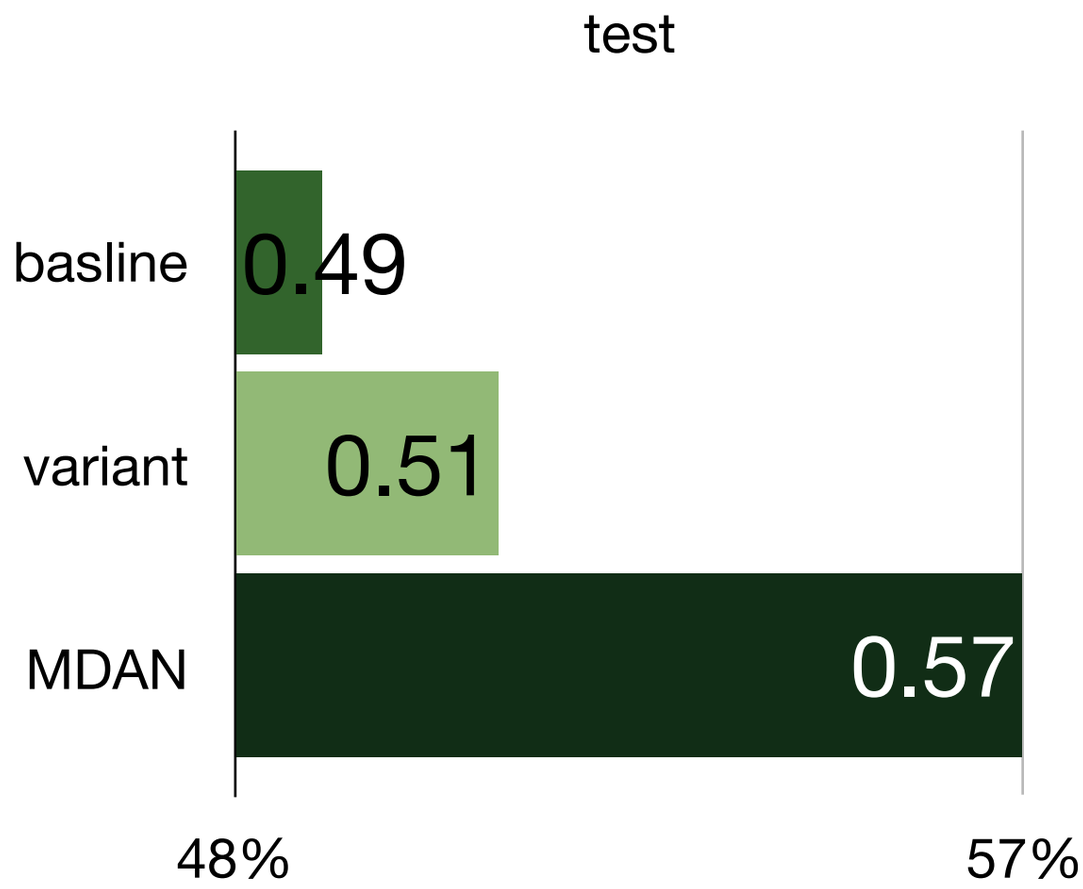
Dual Attention?

- self-attention module
- multi-head attention module
- key set(frames or subtitles) K, using pivot p, update to $\hat{K}$
- for self-attention, $p \in K$
- for multi-head attention module, $p = q(question)$
- from $head_1$ to $head_h$, $h = 4$ is used for implementation



Experiments

- batch size: 12
- number of epochs: 20
- optimization: Adagrad
- regularization: dropout 0.5
- 1) baseline model: 2 layer single-directional encoder-decoder GRU model with linear layer fusion
- 2) variant model: 2 layer bi-directional encoder-decoder GRU model with residual block fusion
- 3) Multimodal Dual Attention Network



Method	Test
GRU + linear fusion	0.49
Bidirectional GRU + MLP	0.50
MDAN	0.57

Any Questions?

for more information, please refer to
https://github.com/sally20921/MDANforDramaQA2019