HCMUS at the NTCIR-16 RCIR Task

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Common Pipeline

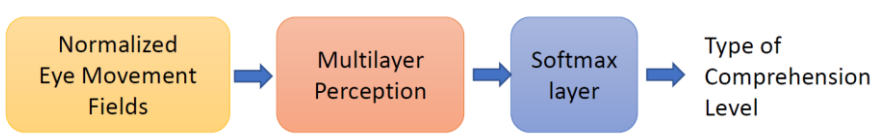
HCMUS team: define the common pipeline and strategy for proposed solutions.

- apply data pre-processing techniques to normalize the values of the attributes, or use PCA to reduce the dimensionality of data, as well as select meaningful attributes for information representation.
- propose some hand-crafted features or use BERT[5] to encode information of text document in English texts, and propose several representations for the feature vectors.
- use different machine learning techniques to compute the final results, namely Multilayer perceptron (MLP), Random Forest[4], AutoML[8]

Method 1 - Using only Eye Movement Data and Multilayer Perceptron

Goal: to evaluate if we can estimate the level of reading comprehension only based on eye-tracking data.

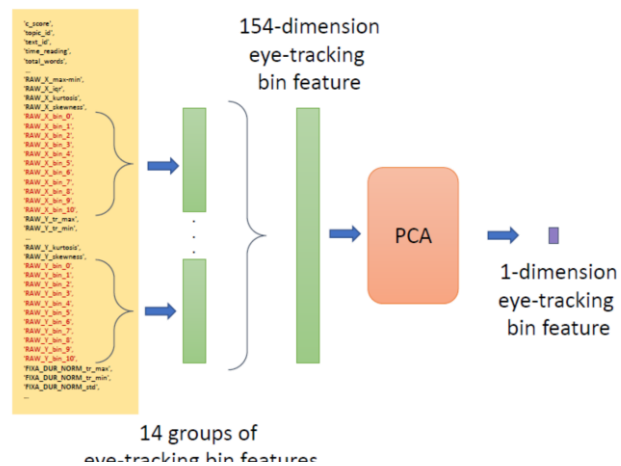
- Do not use text data in text content and questions + answers
- exploit only data captured from sensors related to experimental participants' activities in reading, especially the eyes information of participants.

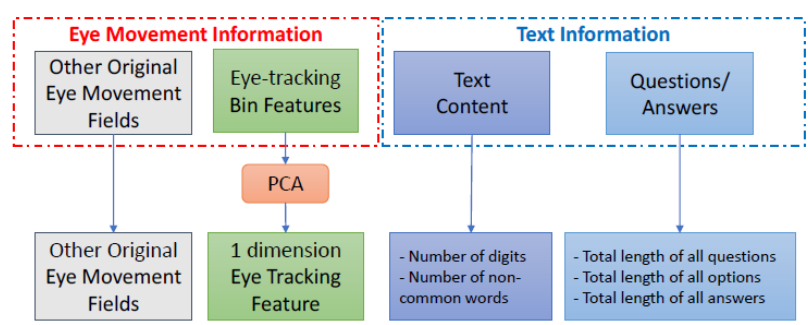


Method 2 - Combine Both Eye Movement & Text Data without Deep Feature

Utilize both eye movement and text data, including the text content as well as questions and answers related to that text.
Only use traditional techniques, not deep learning methods, to represent data feature and to predict output result.
Proposed hand-crafted features for text encoding:

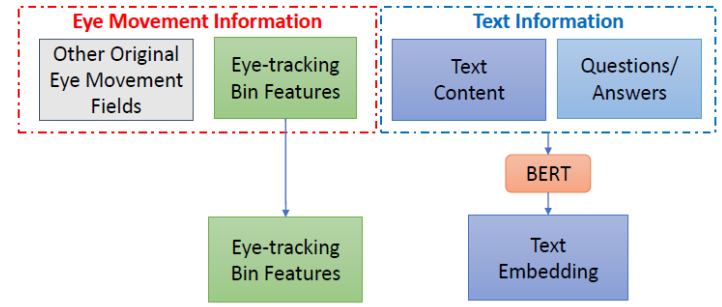
- The number of words that are actual digit numbers.
- The number of words that are not common English words
- The total length of all questions, in character level.
- The total length of all options, for all questions, in character level.
- The total length of all answers for all questions, in character level.





Method 3 - Deep Embedding and AutoML

Utilize both eye movement and text data
Use BERT to encode text content and combine this feature with the eye movement feature to form the feature vector.
Employ AutoML[8] to search for the model configuration that performs the best accuracy on our data.



Official Experimental Results

Method	Result
Method 1	0.40242
Method 2	0.49182
Method 3	0.50846

Results on official test set
(Spearmans correlation coefficient)

Conclusion and Future Work

We aim to study different techniques further to boost the results for text comprehension evaluation by taking advantage of helpful information from eye-tracking systems.