Incongruity Detection between Bangla News Headline and Body Content through Graph Neural Network

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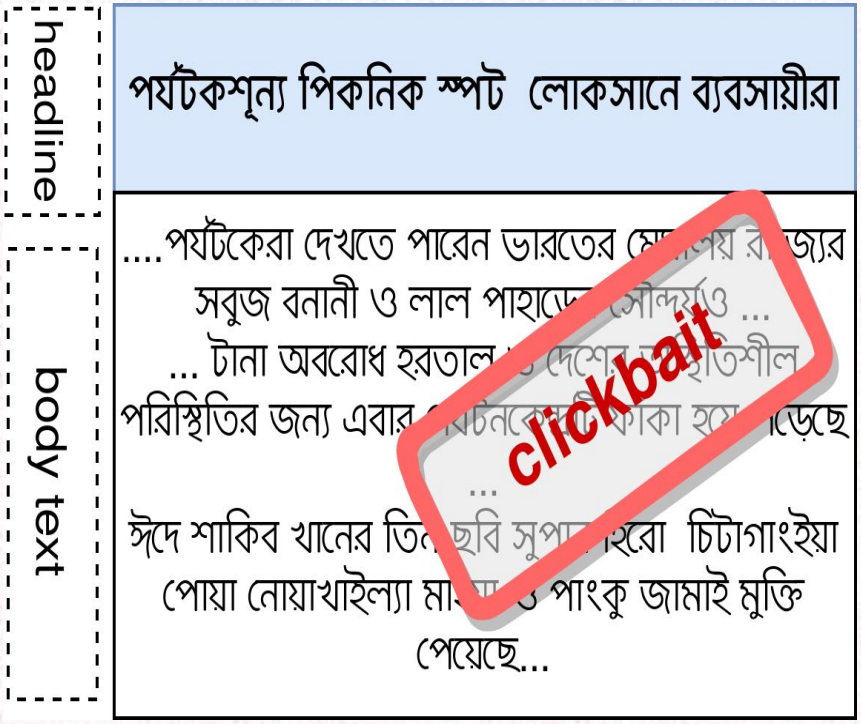
Research Problem

- **Detecting incongruity between news headline and body text** (i.e when news headline does not correctly represent the story in advertisements, clickbait, fake news, hijacked stories, etc.)



Why Is This an Important Problem?

- News headlines are known to play important role in making first impressions to readers, and thereby deciding the viral potential of news stories within social networks.

- people are less likely to read or click on the whole contents but just read news headlines.

➢ **much of news sharing is headline based**

Why Is This an Important Problem?

Detecting the prevalent deceptive and misleading news headlines on the web in advance will better assist readers in choosing proper news stories to consume.

Previous work

- Many works have proposed for detecting ambiguous and misleading news headlines. Such as -
  - Text similarity
  - Mutual Attentive Semantic Matching
  - Deep Hierarchical Encoder
  - Convolution Dual Encoder
  - Recurrent Dual Encoder and
  - Many other ML models (XGBoost, SVM)

Previous work

- However, various solutions are primarily being developed for English to address this problem, leaving low-resource languages out of the picture.
- So we are the first to address this kind of problem in Bangla language.
- Bangla has a more complex syntactic structure and fewer natural language processing resources, so it becomes challenging to perform NLP tasks like incongruity detection.

Methodology

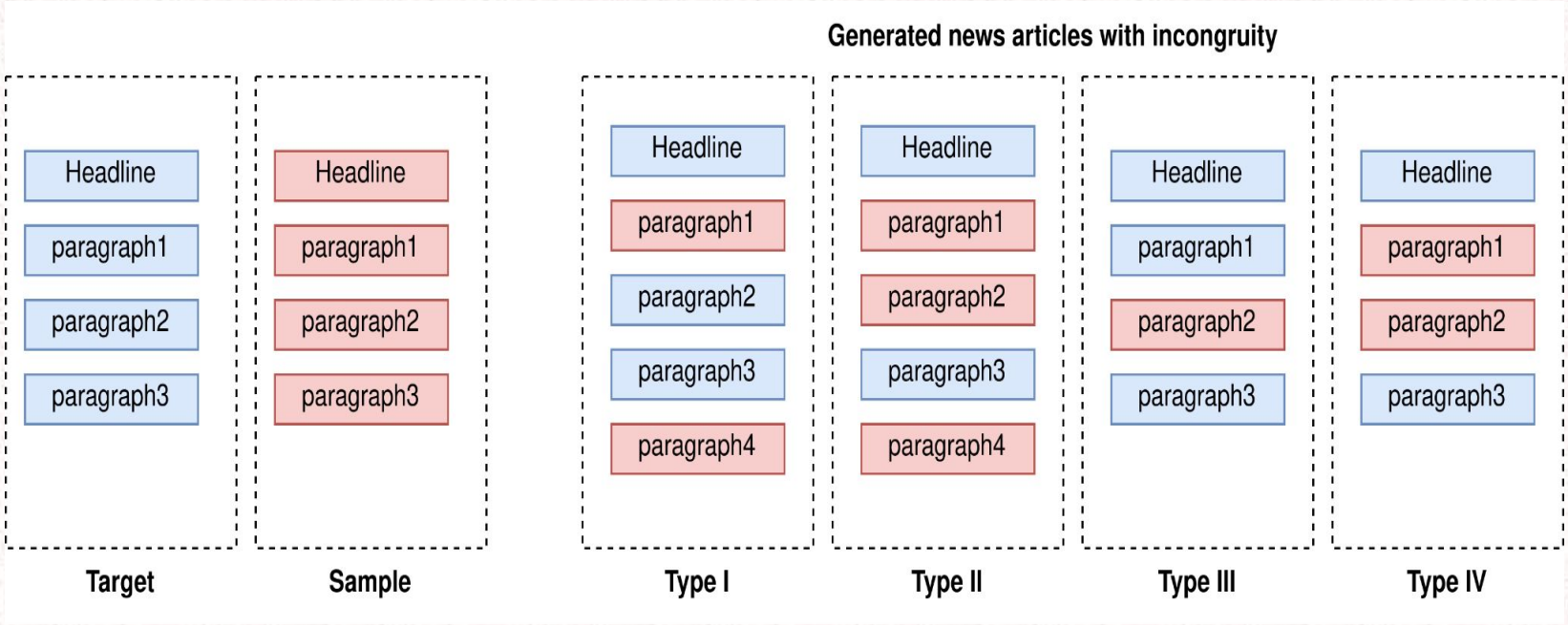
- To tackle this problem, we've addressed our problem solution into two important parts-
  - **Synthetic Data Generation**
    - 400k+ bangla news samples, 25+ categories
  - **Proposed a graph-based model and method**
    - Bangla graph-based hierarchical dual encoder (BGHDE)

Generate Dataset for Research

- The main challenges for our problem is the lack of a large training dataset.
- We did not find any dataset for Bangla language for detecting ambiguous and misleading news headlines.

Generate Dataset for Research

Injecting paragraphs from a set of sample news articles into target news articles to generate incongruent news article



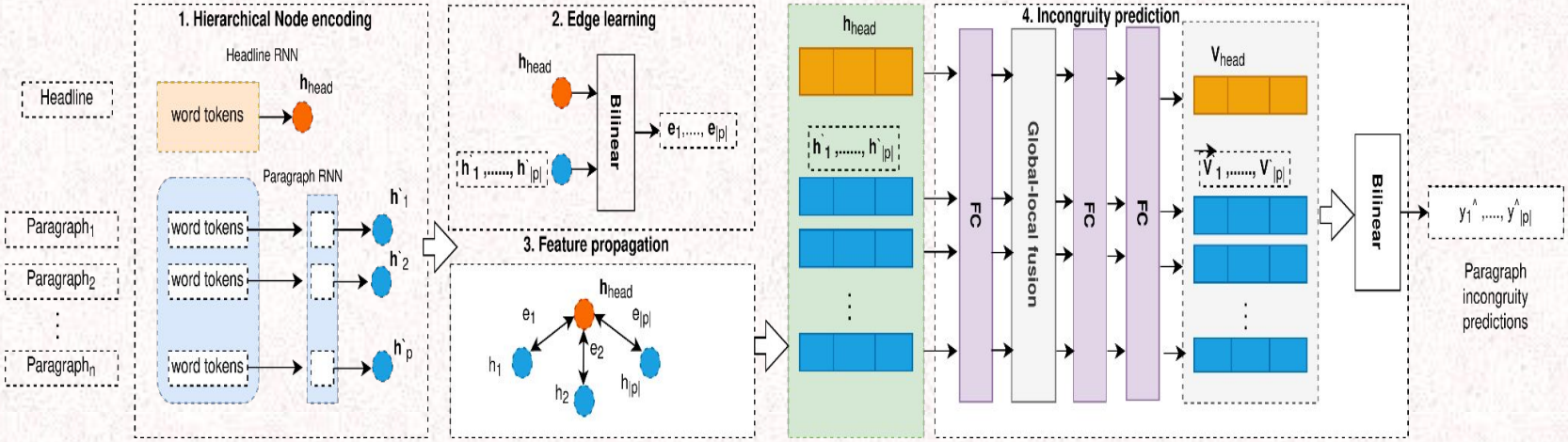
Generate Dataset for Research

The overall data distribution of our generated synthetic dataset.

		Headline		Content	
Dataset	**Samples**	**Avg.**	**Std**	**Avg.**	**Std**
Train	228000	5.58	1.45	319.35	205.41
Dev	120000	5.58	1.43	319.01	241.06
Test	120000	5.57	1.43	323.55	214.124

Proposed Model

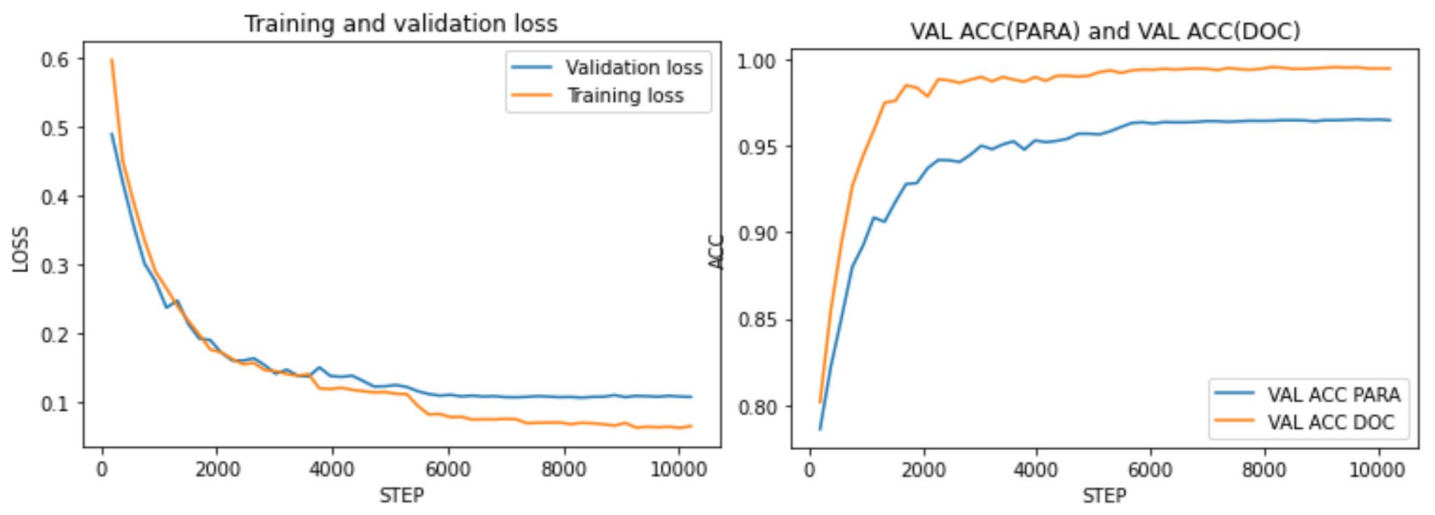
- Bangla Graph-based Hierarchical Dual Encoder (BGHDE)



- The Hierarchical Node Encoding Step
- The Edge Learning and Feature Propagation Step
- The Incongruity Prediction Step

Experiments

- Pre-trained Bangla GloVe [12] embedding consisting of 300 dimensional vectors to initialize the word embeddings.
- Model is trained on google colab and kaggle kernel.



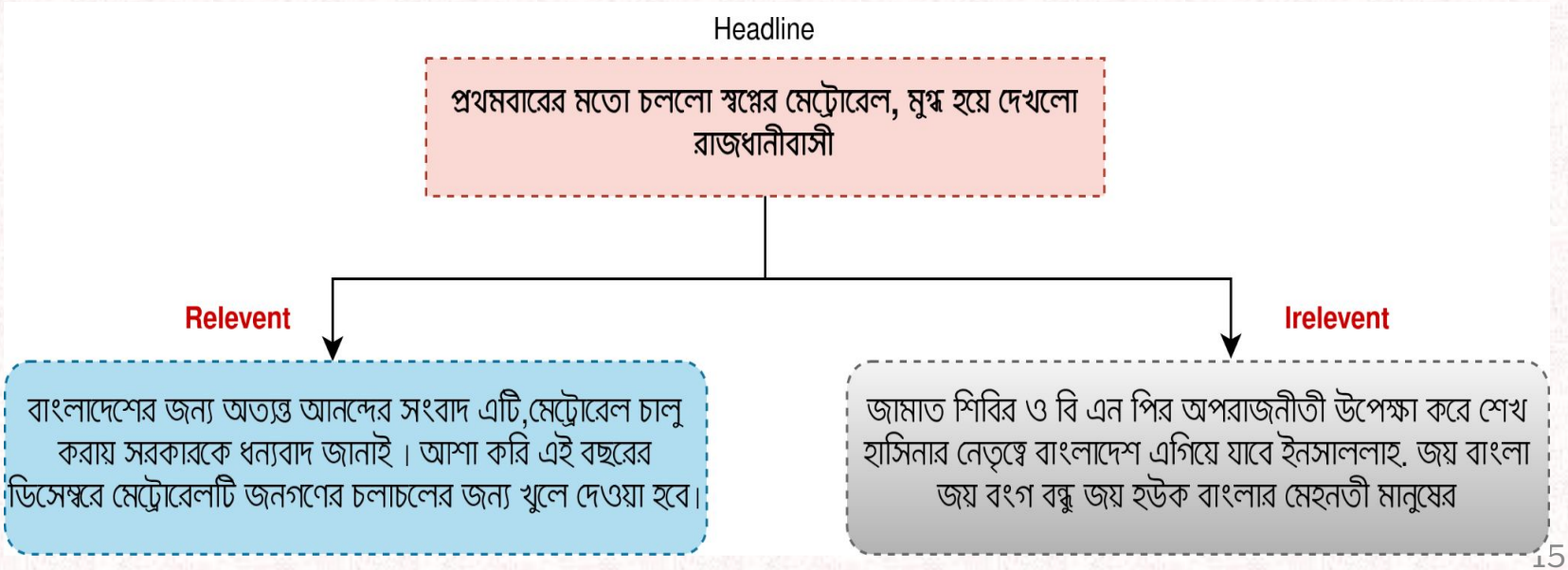
Evaluation

- We've tested our model on various bengali news dataset and achieve promising performance on synthetic dataset.
- Our evaluated dataset contains both Bangladeshi and Indian Bangla news article.

Dataset	Size	Acc(para)	Acc(doc)	Evaluation			
				Precision	Recall	F1 Scr	Support
Prothom alo	6000	0.9658	0.9918	0.98.80	0.9956	0.9918	[3000 3000]
bdnews24	2000	0.9175	0.94.50	0.7554	0.913	0.9431	[1000 1000]
Ananda bazar	1000	0.9175	0.9450	0.9623	0.97	0.9431	[500 500]
ebela	5000	0.9192	0.9702	0.970	0.9704	0.9702	[2500 2500]
zeenews	5000	0.9026	0.9542	0.9511	0.9576	0.9543	[2500 2500]
Ittefaq	8000	0.9445	0.9866	0.9812	0.9922	0.9866	[4000 4000]
Jugantor	6999	0.9494	0.9862	0.9830	0.9893	0.9861	[3458 3477]

Evaluation on Comments data

- We've tested our model on detecting Relevant and irrelevant comments from social networking sites like Facebook and YouTube.
- We achieved an accuracy of 0.73 on the Bangla comments dataset.



Future work

- Although our model gives promising results on synthetic data evaluation but does not get better results on real world data compare to that.
- We plan to improve the model performance by taking several steps-
  - Collecting more Bangla dataset.
  - Manually annotations.
  - Use headline similarity between the sample and target news while injecting paragraphs in the data generation process.
  - Try more better architecture.

Conclusion

We've addressed the problem of incongruent headline detection for Bangla language for the first time.

- Release and proposed synthetic bangla dataset and generation technique for detecting ambiguous and misleading news headlines.
- Proposed a graph based neural network for detecting headline incongruity.
- Evaluated model performance both in synthetic and real world dataset.

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Thank You!

We are open to all relevant queries.