Trust-based Recommender System for Fake News Mitigation

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CONTEXT

- During a crisis, fake news can be harmful [1].

- Users turn to social media platforms for news, where fake news can easily propagate [2].

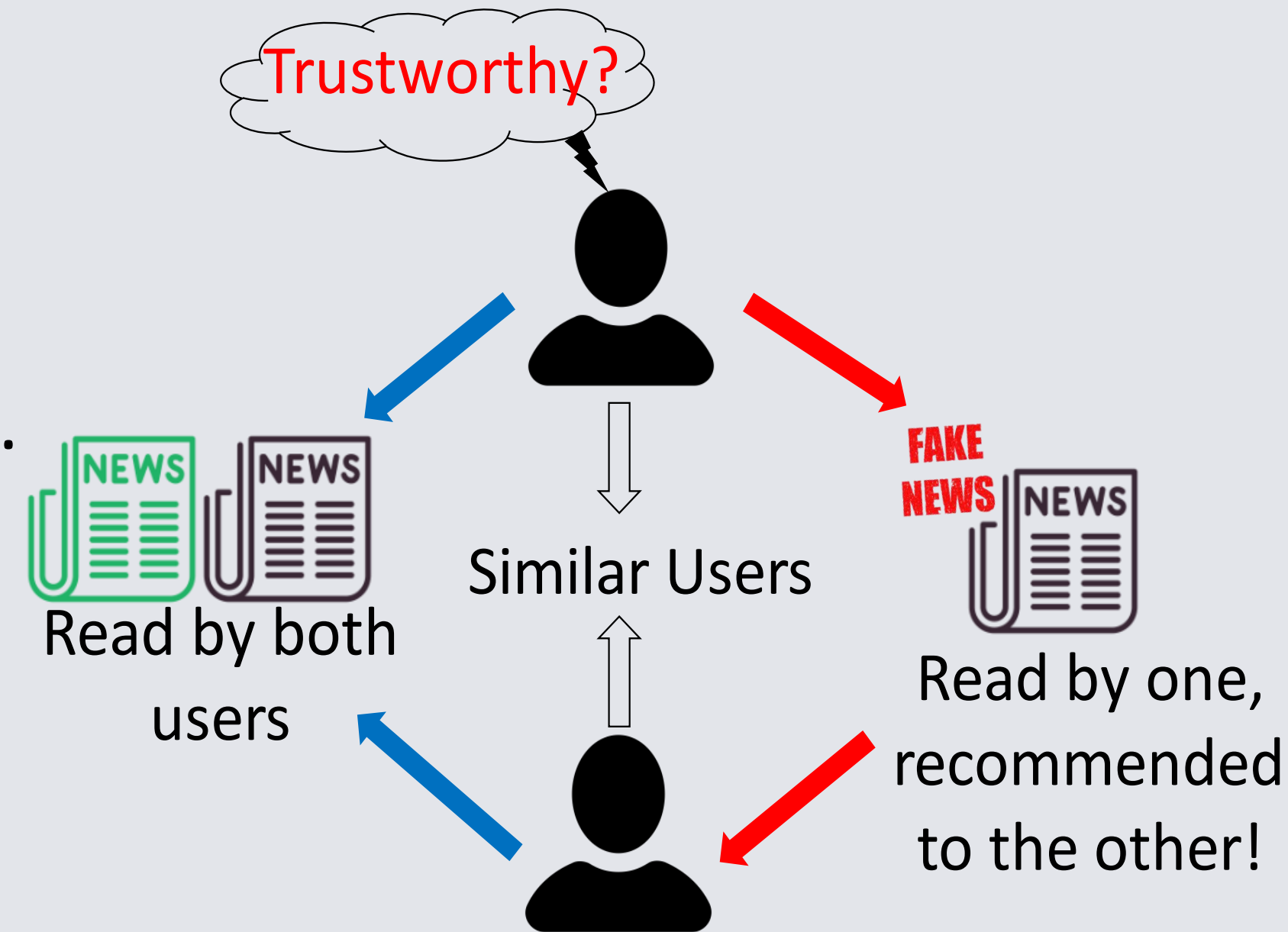- Recommender Systems can be an accomplice in fake news spreading [3].

Figure 1: General Context.

CONTRIBUTIONS

- **FANAR**
  - **FA**ke **N**ews **A**ware **R**ecommender system
  - A novel collaborative filtering strategy

- **Trust Model**
  - Adaptation of the Beta Trust Model
  - Assess user trustworthiness

- **FNEWR**
  - **F**ake **N**ews a**W**are **R**ecommendation dataset

Figure 2: Contributions.

METHODOLOGY

The proposed method as illustrated in **Figure 3**, is divided into three parts:

- *News Modeling*: Utilizes LXMERT to encode news text and images and capture their crossmodal relatedness.

- *User Modeling*: (1) News Aggregation: Uses the mean operator to learn factors from the user-news graph. (2) Neighbor Aggregation: Considers only the most reliable neighbors based on user reliability (**Algorithm 1**).

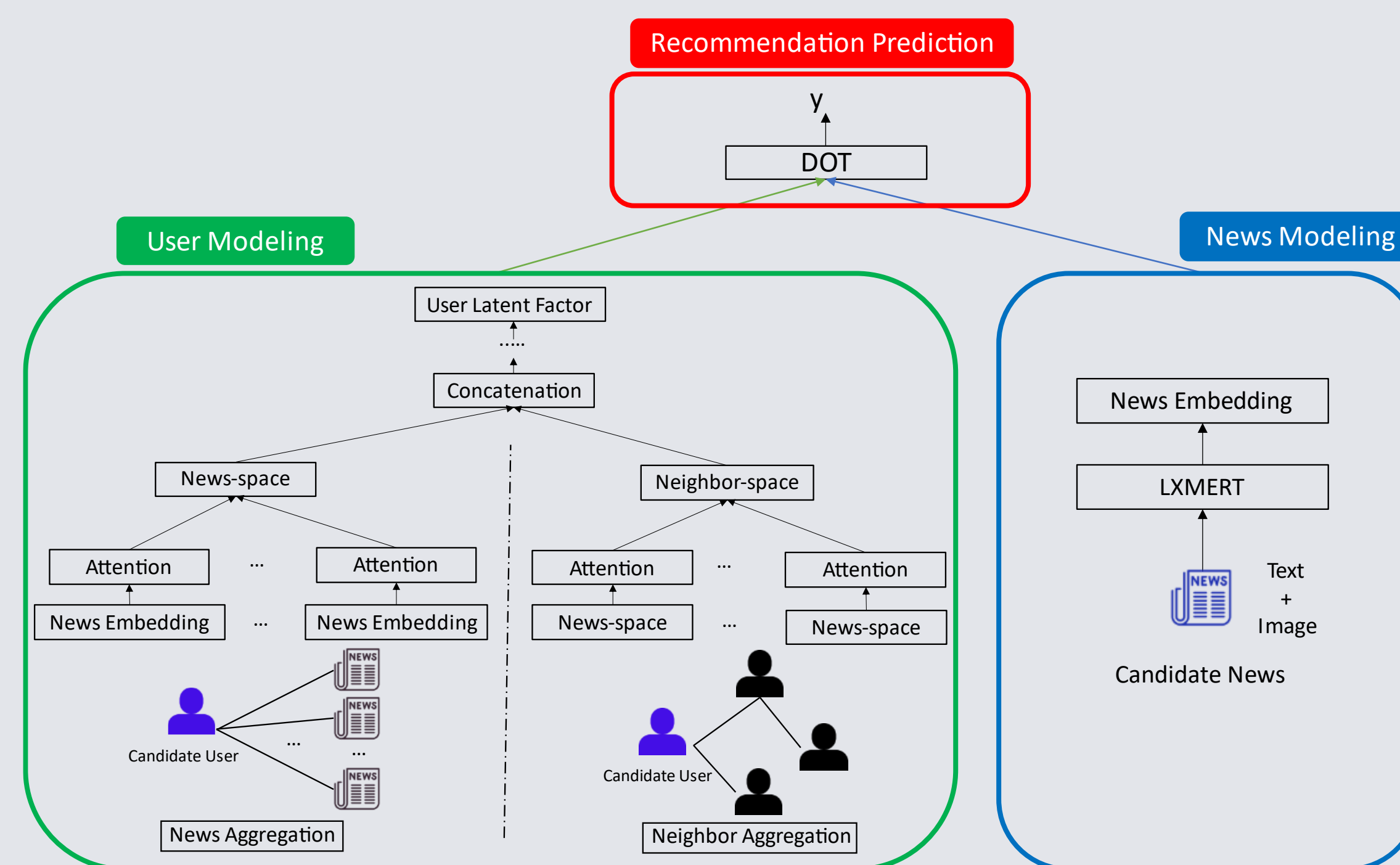- *Recommendation Prediction*: Calculates the recommendation probability score.

Figure 3: FANAR Architecture.

Algorithm 1 Neighbors Selection

1: **Input:** $P(i)$: set of neighbors of the user u_i.
2: $\gamma_t = \theta, \gamma_{t+1} = 1 - \theta, \theta = 0.1$
3: **Output:** $T(i)$: User u_i's reliable neighbors.
4: **for** user in $P(i)$ **do**
5:     $N_f = 0$: number of fake news
6:     $N_s = 0$: number of genuine news
7:     $r = 0$: reliability
8:     **for** item in items(user) **do**
9:         **if** item is fake **then**
10:            $N_f = N_f + 1$
11:        **else**
12:            $N_s = N_s + 1$
13:        **end if**
14:    **end for**
15:    $r = \gamma_t \frac{N_s+1}{N_s+N_f+2}(t) + \gamma_{t+1}\frac{N_s+1}{N_s+N_f+2}(t+1)$
16:    **if** r > 0.5 **then**
17:        $T(i) = T(i) + $ user
18:    **end if**
19: **end for**

Adapted Beta Trust Model

EXPERIMENTS AND RESULTS

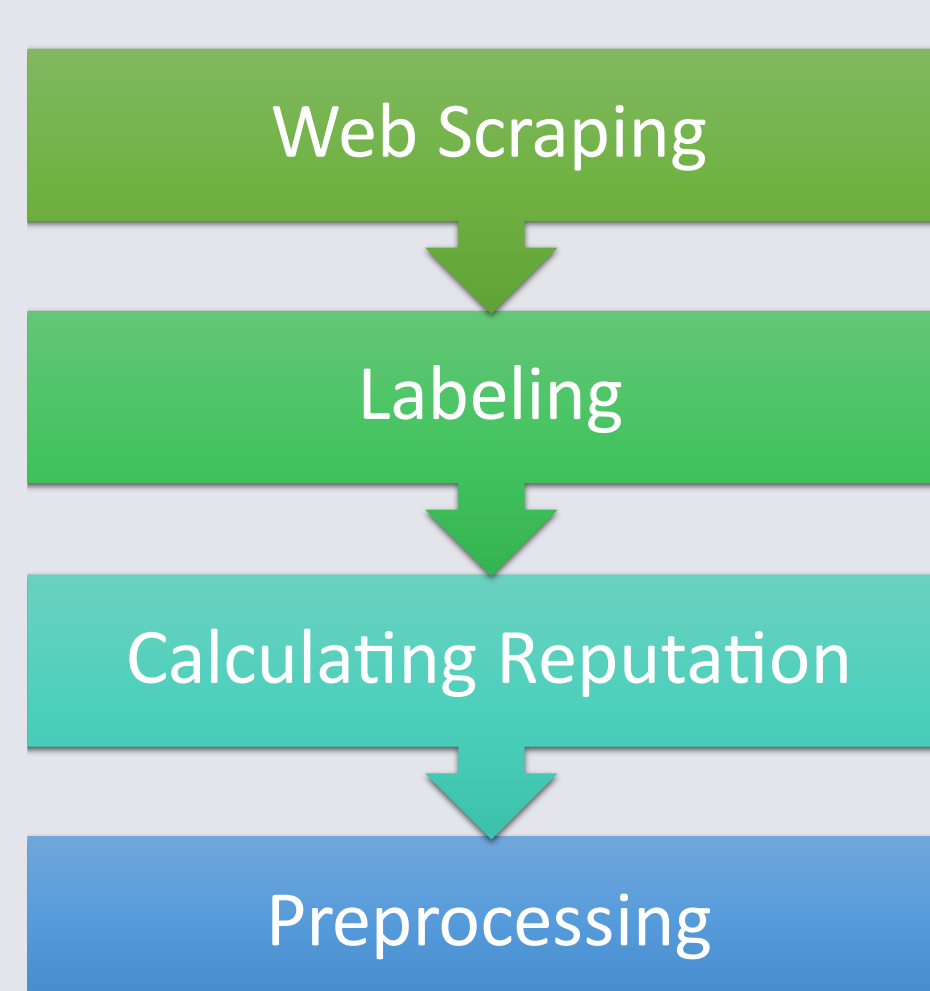### FNEWR Dataset

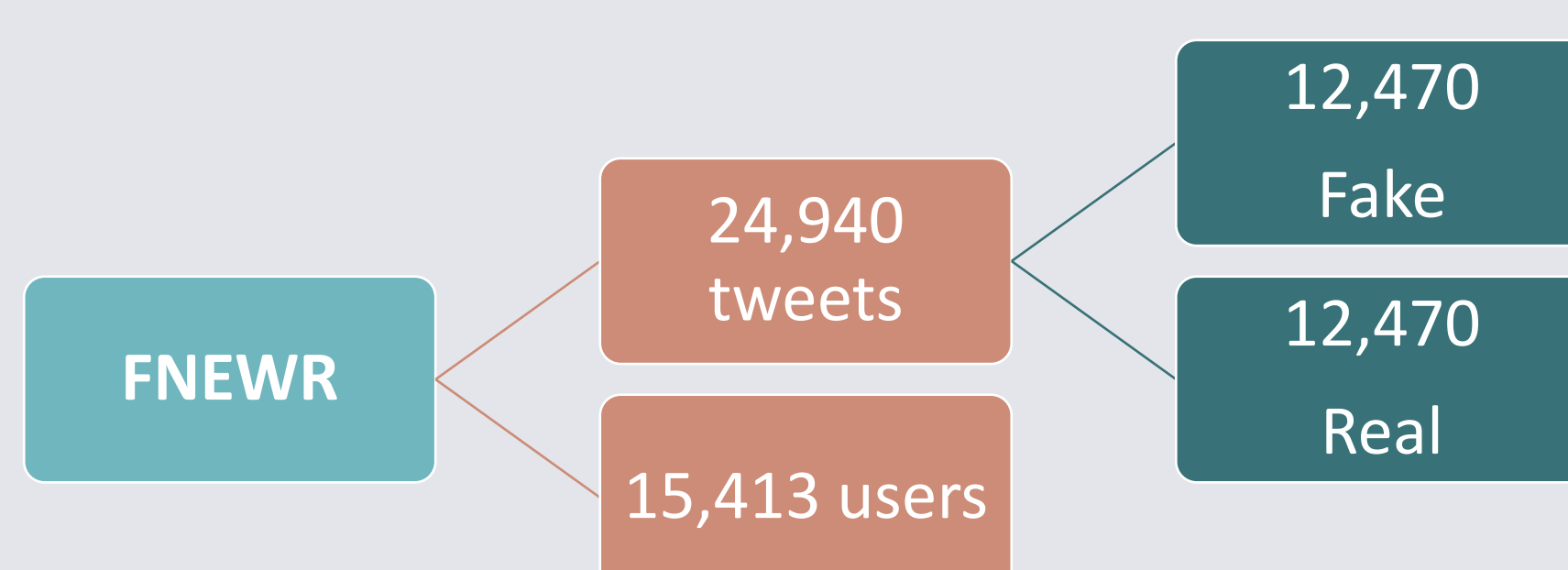**Figure 4:** Dataset Creation Process.

Figure 5: Dataset Statistics.

Accuracy in Recommendation

Table 1: Performance comparison of different methods.

Model	AUC	MRR@5	MRR@10	nGCG@5	nDCG@10
DKN	59.33	19.03	19.95	20.61	21.77
NAML	59.53	21.15	21.98	22.63	23.77
EBNR	59.54	19.72	20.54	21.52	22.16
Wide&Deep	58.66	18.66	19.24	20.95	21.13
DeepFM	57.74	23.64	24.02	24.02	26.78
DFM	58.60	24.01	24.91	25.97	26.05
Rec4Mit	59.57	24.62	26.09	25.88	26.93
MRNT	59.61	24.87	25.16	24.66	25.89
MM-Rec	60.32	25.22	25.57	26.67	27.23
FANAR	**61.74**	**29.72**	**30.42**	**30.56**	**31.62**

- FANAR approach, which incorporates visual information, outperforms the methods that rely only on textual content.
- T-test results further confirm the significance of the improvement (**p<0.01**).

Beyond Accuracy Evaluation
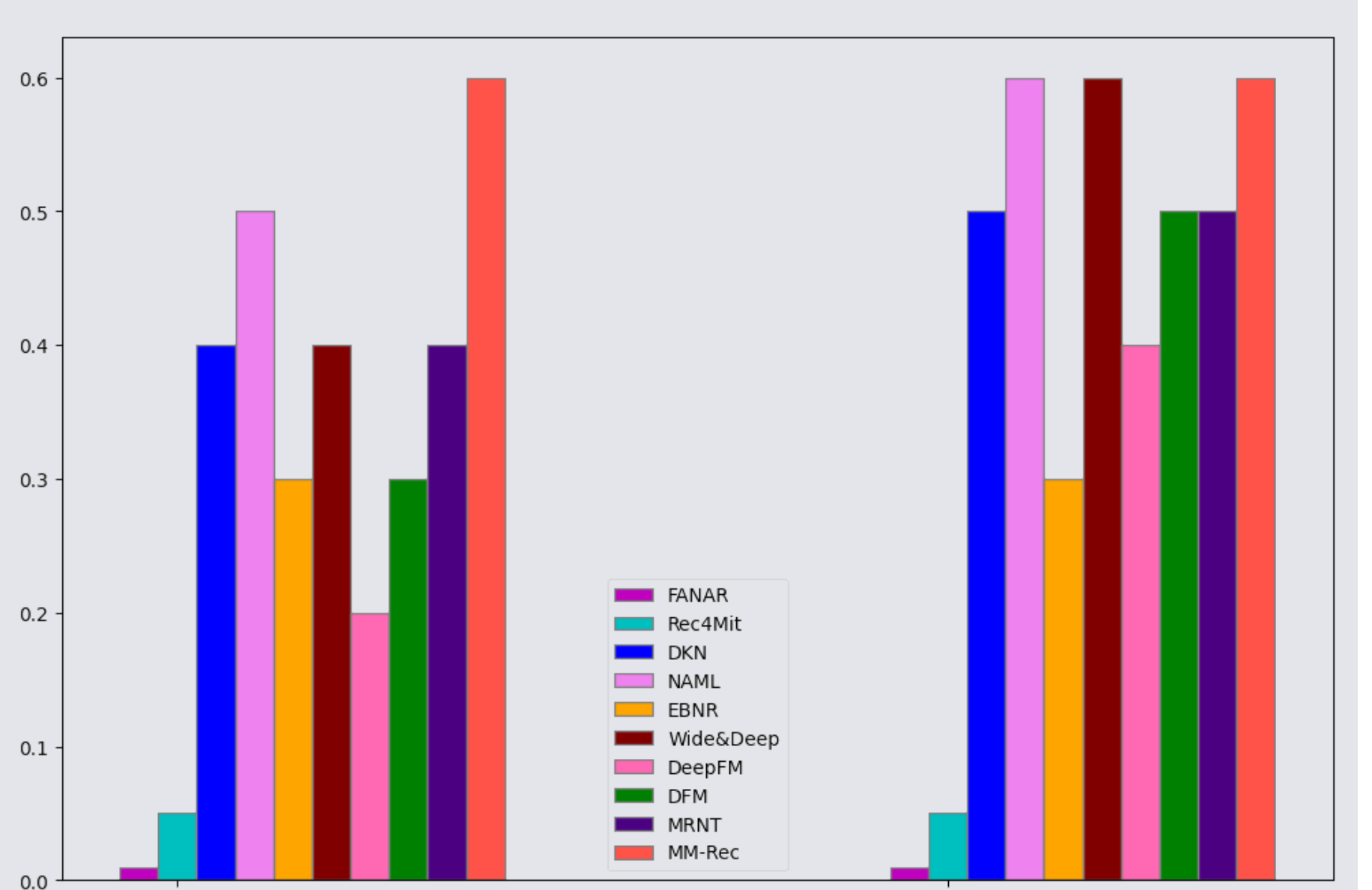
$T\ F@K$ = total of recommended fake news / K

Figure 6: Ratio of fake news (TF) in recommendation lists.

CONCLUSION

- FANAR outperforms baselines and effectively reduces fake news recommendations.
- Future research should explore larger datasets, different algorithms, sophisticated trust models, and news categories for improved performance.

REFERENCES

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2. Silvio Waisbord. 2018. Truth is what happens to news: On journalism, fake news, and post-truth. Journalism studies 19, 13 (2018), 1866–1878.
3. Miriam Fernandez and Alejandro Bellogín. 2020. Recommender systems and misinformation: the problem or the solution? (2020).