

Detection of Fake News Online



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Detection of Fake News Online

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02 Traditional Methods

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- Content Analysis
- Account Analysis
- Crowd-sourcing
- Mixed Method

04 Conclusion

Introduction



■ ■ ■ ■ Importance



Lower the credibility of real information

- > Spread of fake news is even faster than real news
- > Competing with real news



Alter individuals' belief and behaviors

- > E.g. affect the decisions of electorates in the elections



Disruption on the public fairness and rationality

- > E.g. 2016 US presidential election



Traditional Method

- Manual
 - Time consuming
 - Substantial Human effort
- New methods
 - Substitute human(Linguistic approach)
 - Predictive, probabilistic, black-box models
- Many approaches
- Most common and intuitive ones

Content Analysis

Knowledge-Based Method

Checks whether the content of the news is consistent with fact

Style-Based Method

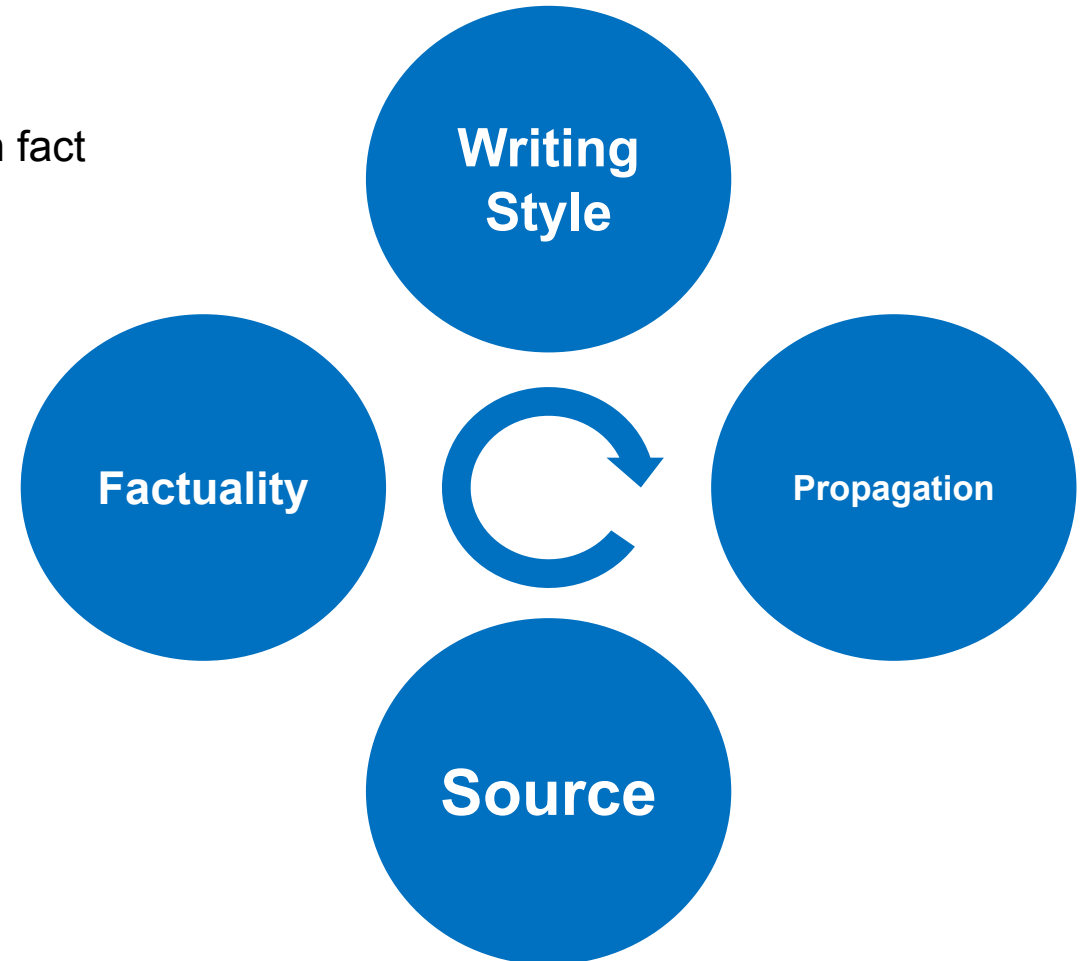
Based on whether there are extreme tone or emotions behind the content

Propagation-Based Method

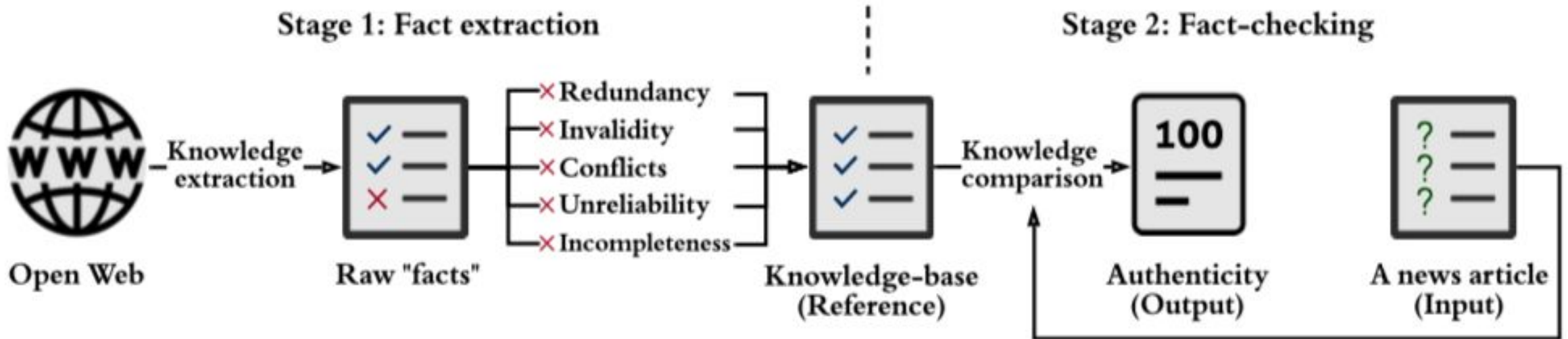
Depends on the way that the news spread online

Source-Based Method

Examines the trustworthiness of the sources where the news get information from



Fact-Checking System



Evaluation



	Knowledge-based	Style-based	Source-based
Advantage	Direct	High Accuracy	Easy Obvious
Limitations	Over-rely on external resources	Rely on the how the style can be captured	Credible news media may contain false information

Account Analysis

Detection of spammer/ bot accounts



Data extraction

- (1) API based approach
- (2) Artificial data generation
- (3) Bot-crawled
- (4) Existing dataset study

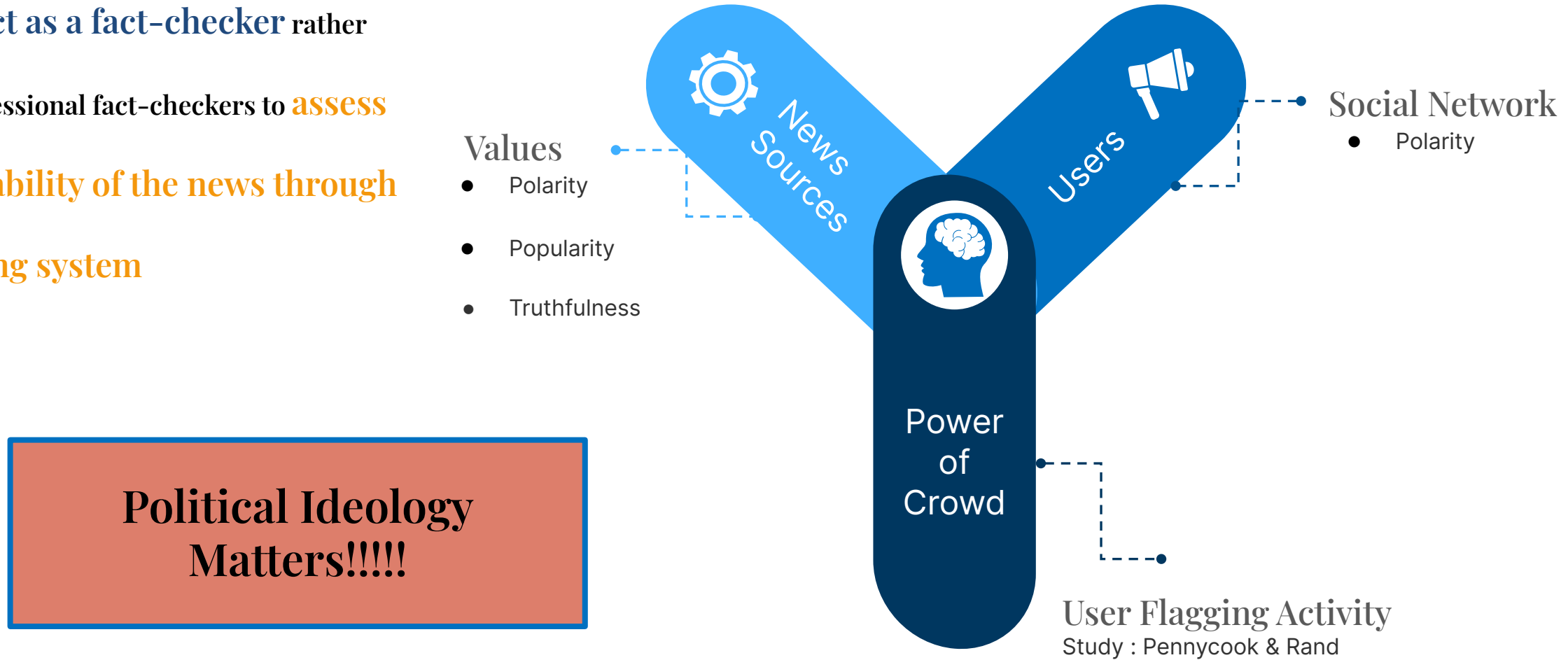


Build predictions models to distinguish spam and non-spam accounts
e.g.
crowded-sourced/decision tree



Crowd-Sourced

- Users act as a fact-checker rather than professional fact-checkers to **assess the reliability of the news through a flagging system**





Methodologies

Coscia & Rossi (2020)

Bipolar Models

◆ How polarization affects the flagging system

1. User-source network
 - ✓ Polarity and Popularity
2. Social network
 - ✓ Share nodes (common friends) via LFR benchmark

Monopolar Models

- without considering the user's polarisation

Sebastian et.al (2018)

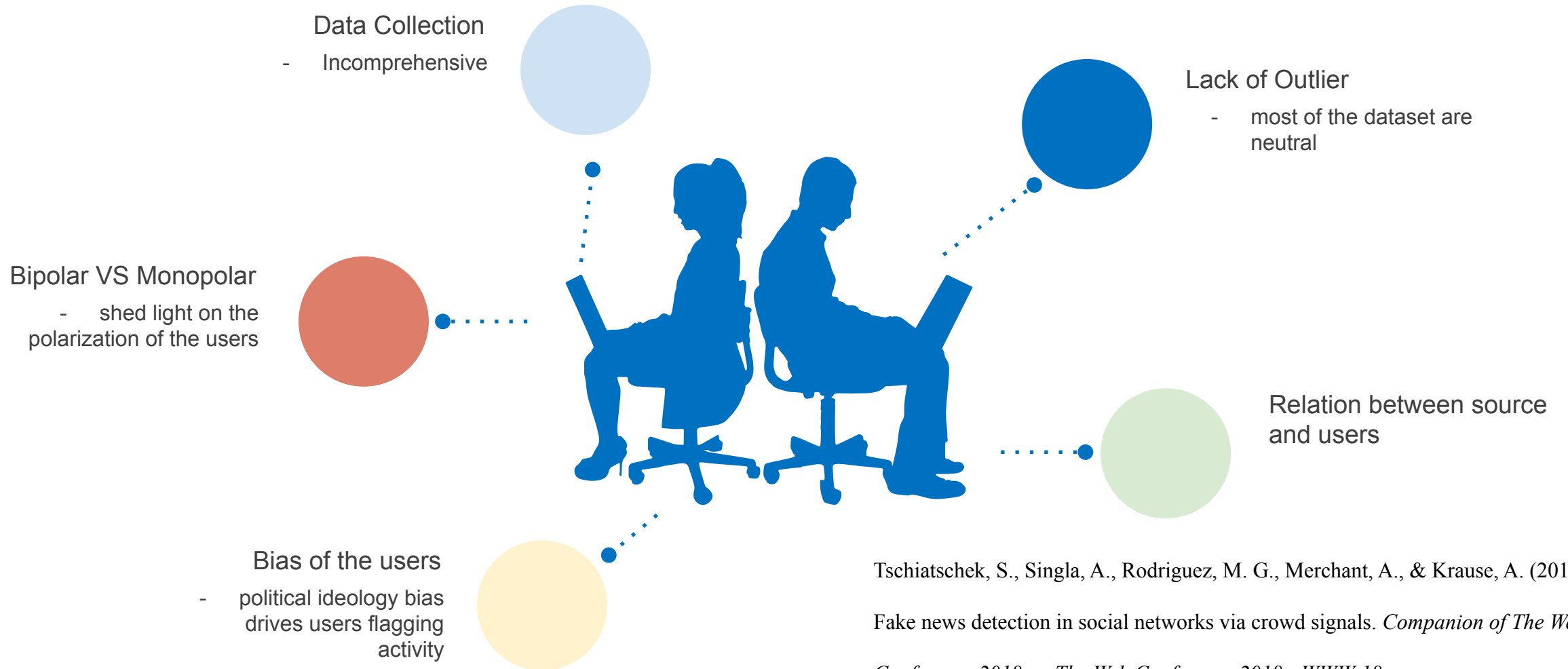
Bayesian Inference

◆ User Flaging Activity

1. News Spreading
2. Social network Graph and New Generation
3. Users' Parameter
4. Algorithms



Evaluation



Tschiatschek, S., Singla, A., Rodriguez, M. G., Merchant, A., & Krause, A. (2018).

Fake news detection in social networks via crowd signals. *Companion of The Web Conference 2018 on The Web Conference 2018 - WWW 18*.

doi:10.1145/3184558.3188722



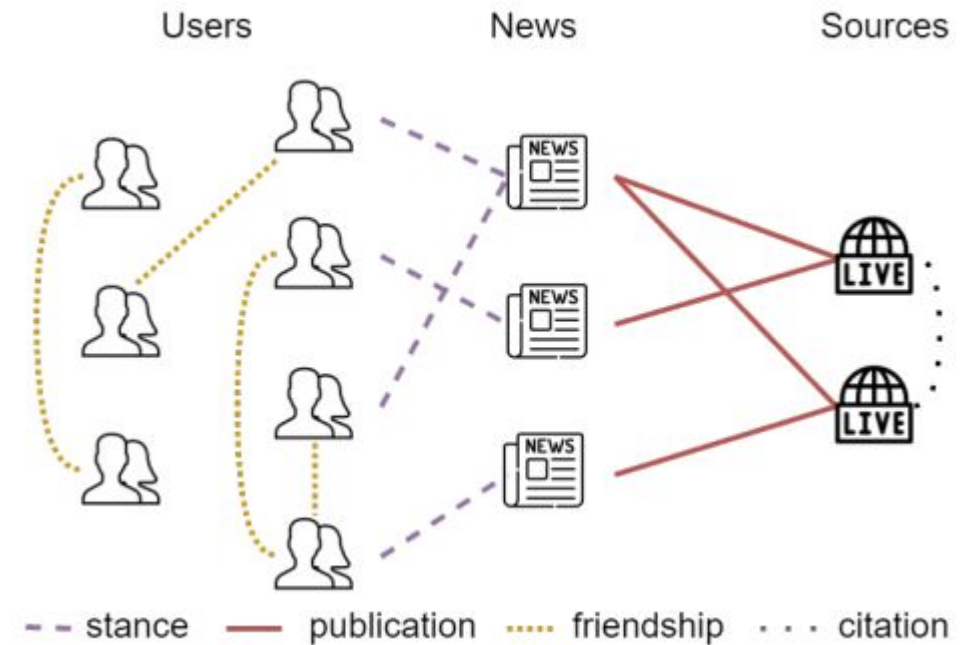
Mixed-Method

- Each has own weakness
- Major computational methods
 - Linguistic analysis - Traits of news content
 - Account analysis - Trustworthy account
 - Crowd-sourced - Scale, costs
- Combine ALL
 - content, account, automation
 - MORE: network, behavioral

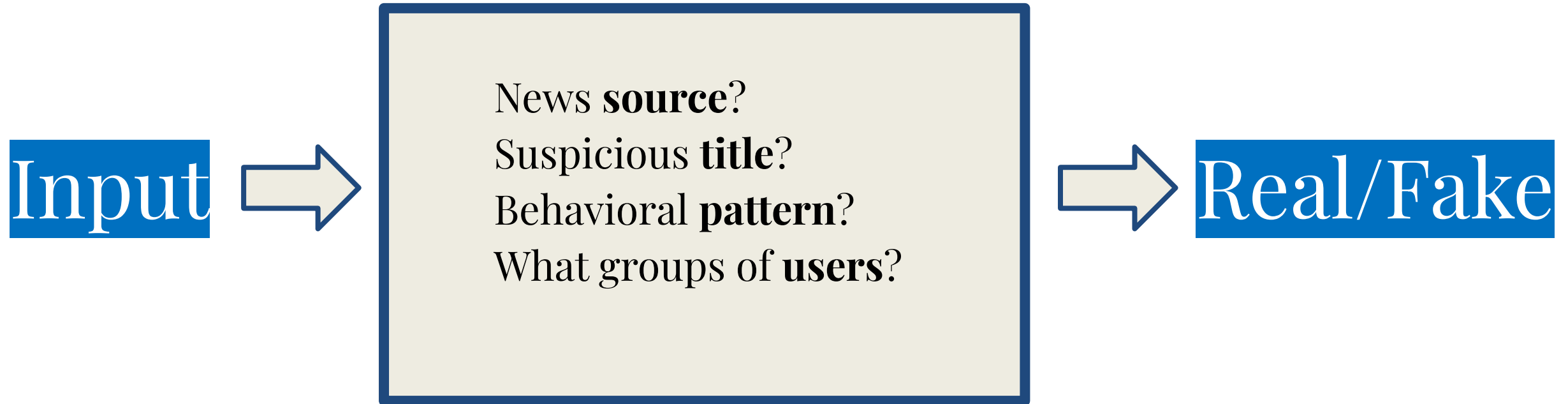


Mixed-Method: Nakov, Nguyen, Kan and Sugitama (2020)

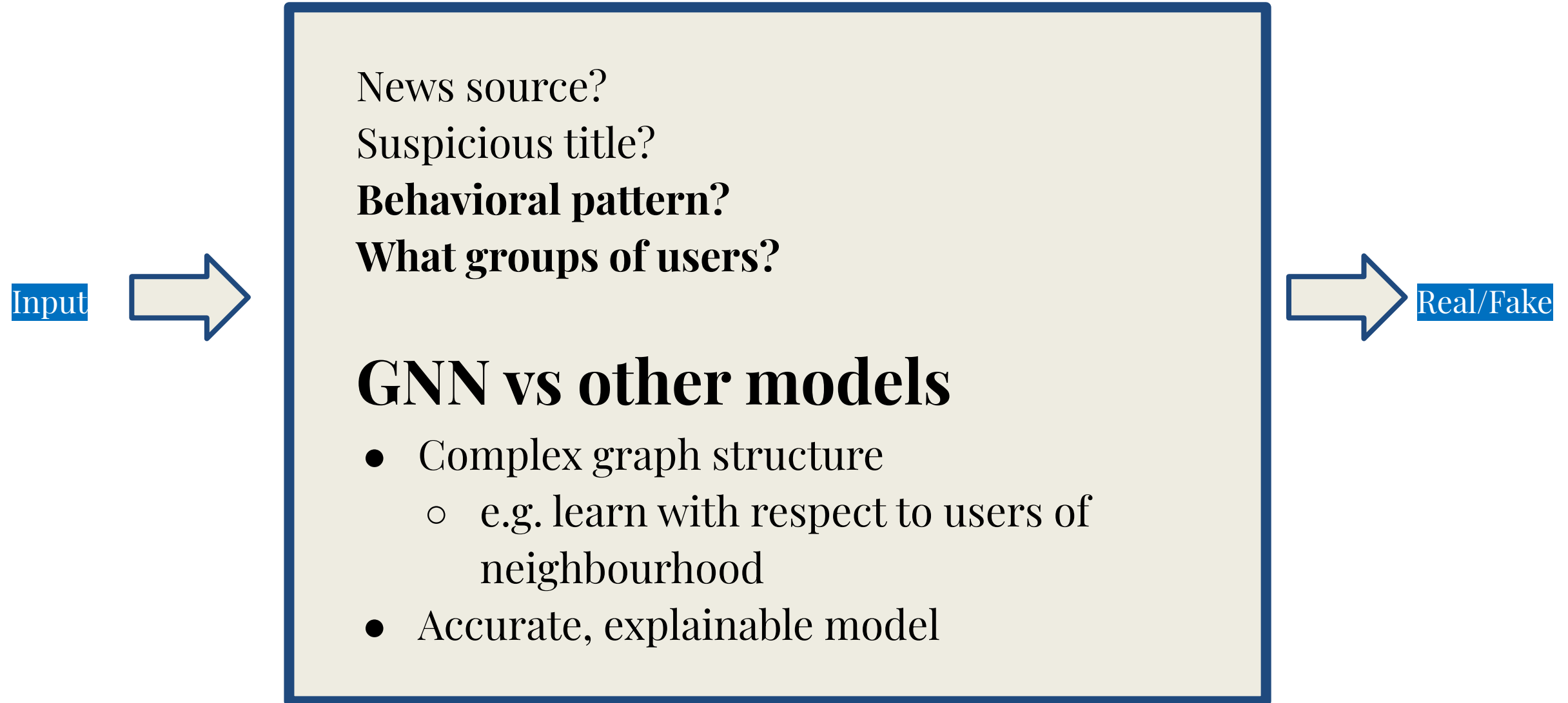
- Mixed approach
 - Input important features
 - Output: Real vs. Fake
- One of the latest published work in the area
- Factual News Graph (FANG)
 - Features of nodes
 - Capture relationships - Heterogeneous ties
- Implemented with Graph Neural Network



Mixed-Method: Nakov, Nguyen, Kan and Sugitama (2020)



Mixed-Method: Nakov, Nguyen, Kan and Sugitama (2020)





Mixed-Method: Nakov, Nguyen, Kan and Sugitama (2020)

- Outperform
 - Text only model
 - Network model - no social context
 - etc.

- Efficient
 - limited data
 - temporal feature
 - fake vs real news

Model	Contextual	Temporal	Graphical	AUC
Feature SVM				0.5525
CSI(- t) (without $time(e)$)	✓			0.6678
CSI	✓	✓		0.6911
GCN	✓		✓	0.7064
FANG(- t) (without $time(e)$)	✓		✓	0.7179
FANG	✓	✓	✓	0.7518





Conclusion

- Each has limitations
 - Textual/linguistic
 - cannot: video, pictures
 - Crowd-sourced
 - biased, inaccurate
 - Account
 - larger datasets
- Future: Two main areas
 - machine learning & deep learning
 - e.g.: NLP, audio analysis, image processing; GNN
 - solutions
 - new, better
 - methods, system
 - FANG, Human-in-the-loop
 - Platform, format of information





Q&A Section



THANKYOU