Detection of Fake News Online

TEAM-HAHA

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Detection of Fake News Online

Introduction

Fabricated information

Political polarization
Confirmation bias
Post-truth politics

Intentions

Make revenue
Reputation of a person/ entity
Political interests

Platforms

Social media platforms
mostly on Facebook
News Feed, Twitter

Spreading speed

Fast spreading
sharing among large group of people (Vosoughi et al., 2018)

e.g. re-post, re-tweet, etc.

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 (Allcott & Gentzkow, 2017)

Traditional Method

- Manual, Expert-based
  - Scaling
  - Time consuming
  - Substantial human effort
  - (Zhou and Zafarani, 2020)
- New methods
  - Predictive models
  - (e.g. content analysis model)
- Many approaches
- Most common ones

Content Analysis

Knowledge-Based Method

Checks whether the content of the news is consistent with fact

Style-Based Method

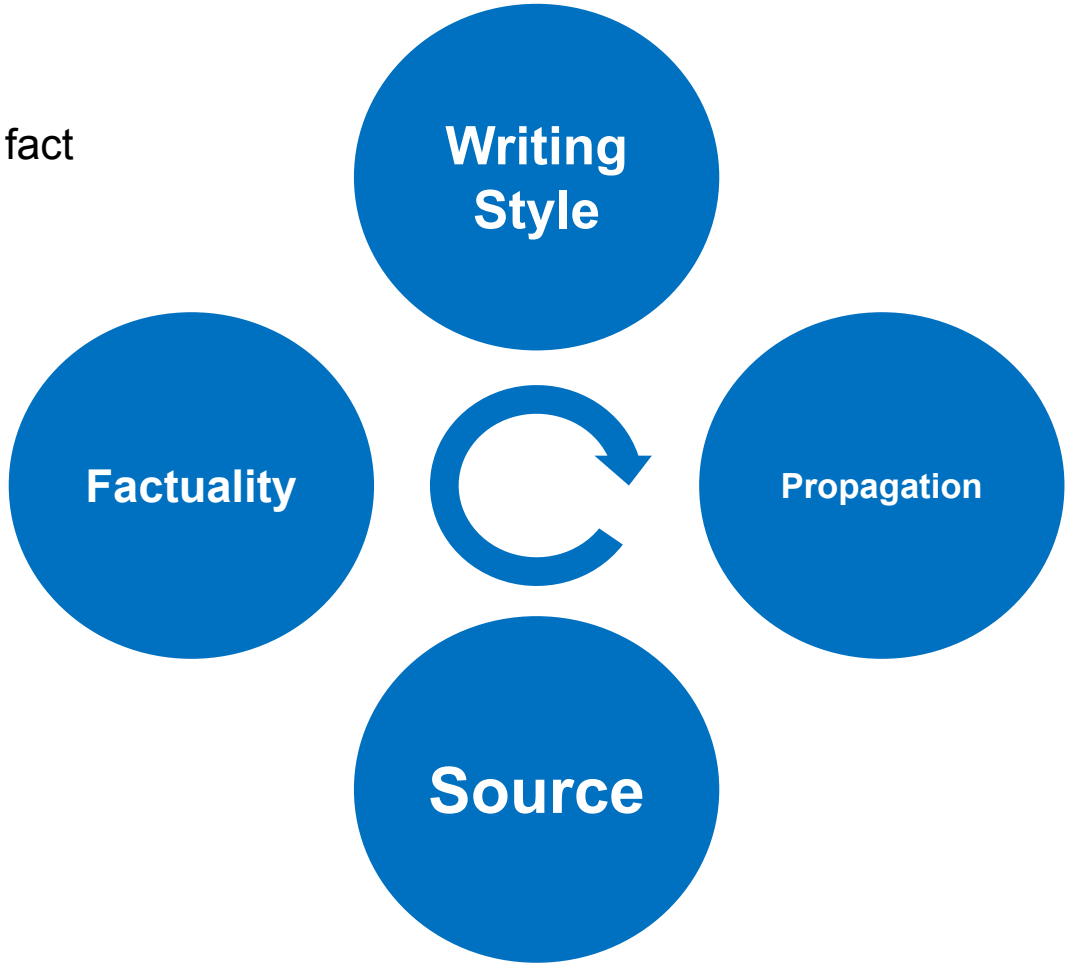
Based on whether there are extreme tone or emotions behind the content

Propagation-Based Method

Depends on the way that the news spread online

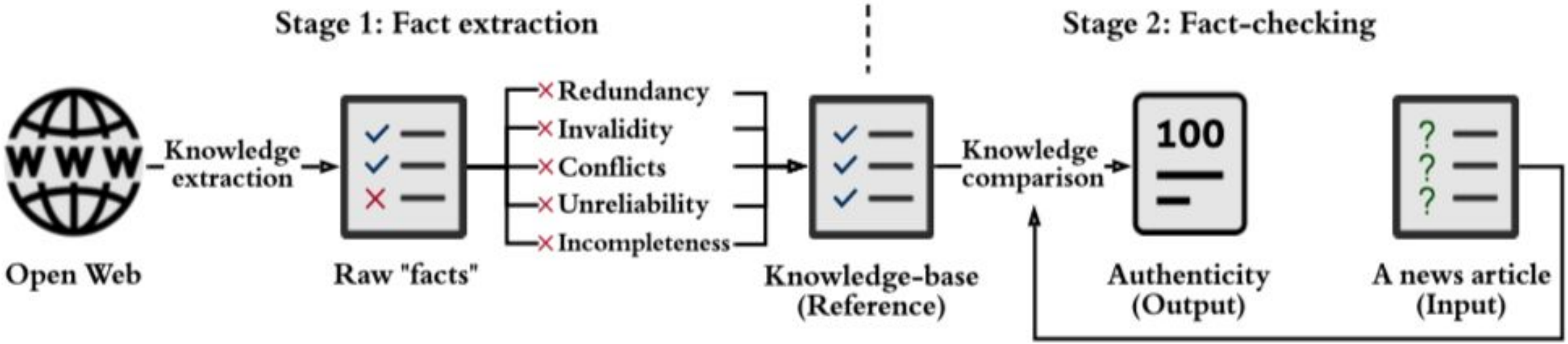
Source-Based Method

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



Zhou, X., & Zafarani, R. (2020). A survey of fake news: Fundamental theories, detection methods, and opportunities. *ACM Computing Surveys (CSUR)*, *53*(5), 1-40.

Fact-Checking System



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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

Zhou, X., & Zafarani, R. (2020). A survey of fake news: Fundamental theories, detection methods, and opportunities. *ACM Computing Surveys (CSUR)*, *53*(5), 1-40.

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 (Hakimi et al.'s, 2019)

Hakimi et al.'s (2019) study

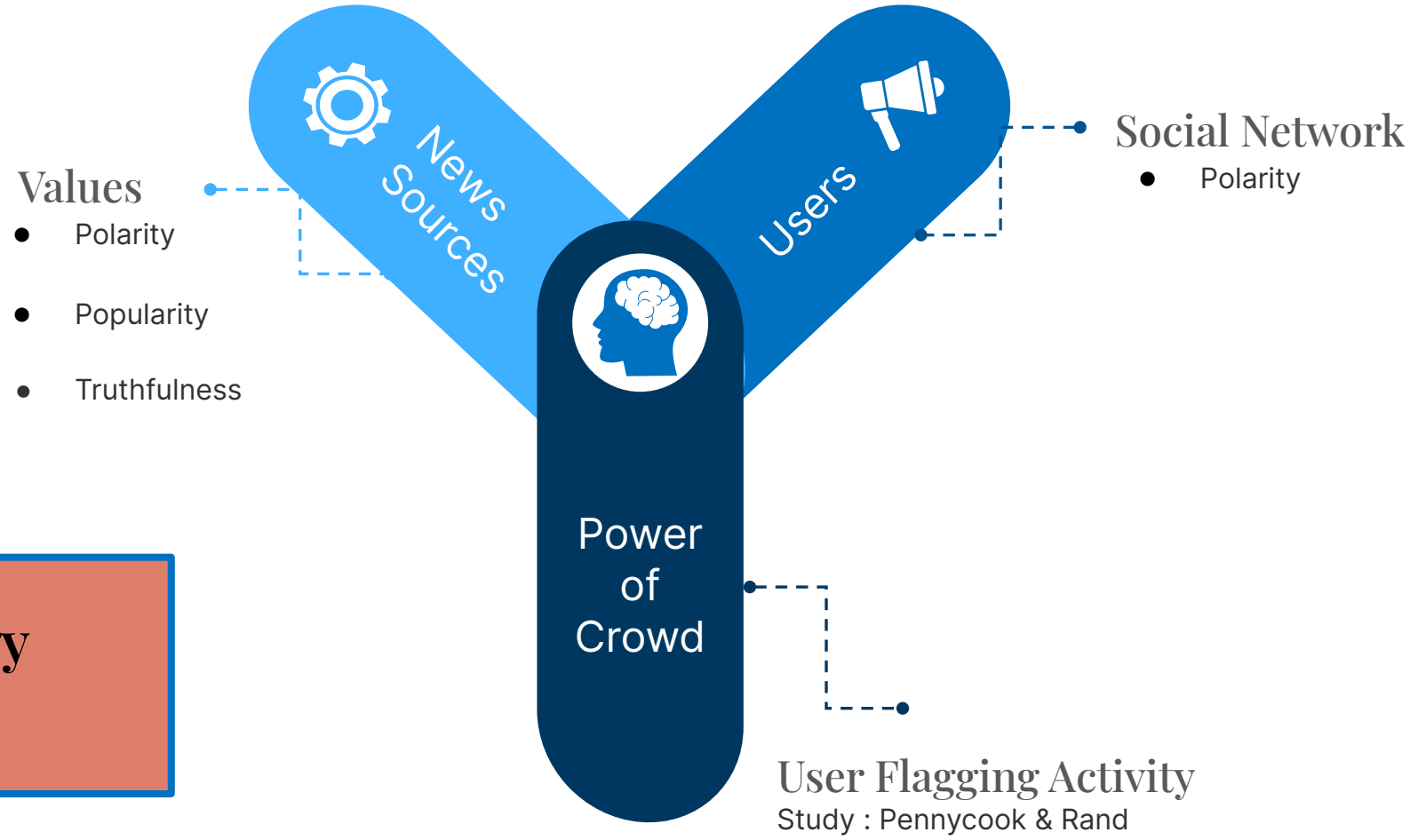
- artificial data generation approach
- referring to the network structure and features of existing data to fabricate sample data of Facebook
- Prediction models of K-Nearest Neighbor (KNN), Support Vector Machine (SVM), and Neural Network (NN) algorithms

Castillo et al.'s (2011) study

- set up datasets of tweets about some of the trending themes
- construed one by one using crowdsourced approach and decision tree model
- four groups of features: messages, users, topics, and propagations on Twitter accounts

Crowd-Sourced

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



Political Ideology Matters!!!!!

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

Data Collection

- Incomprehensive

Lack of Outlier

- most of the dataset are neutral

Bipolar VS Monopolar

- shed light on the polarization of the users

Relation between source and users

Bias of the users

- political ideology bias drives users flagging activity

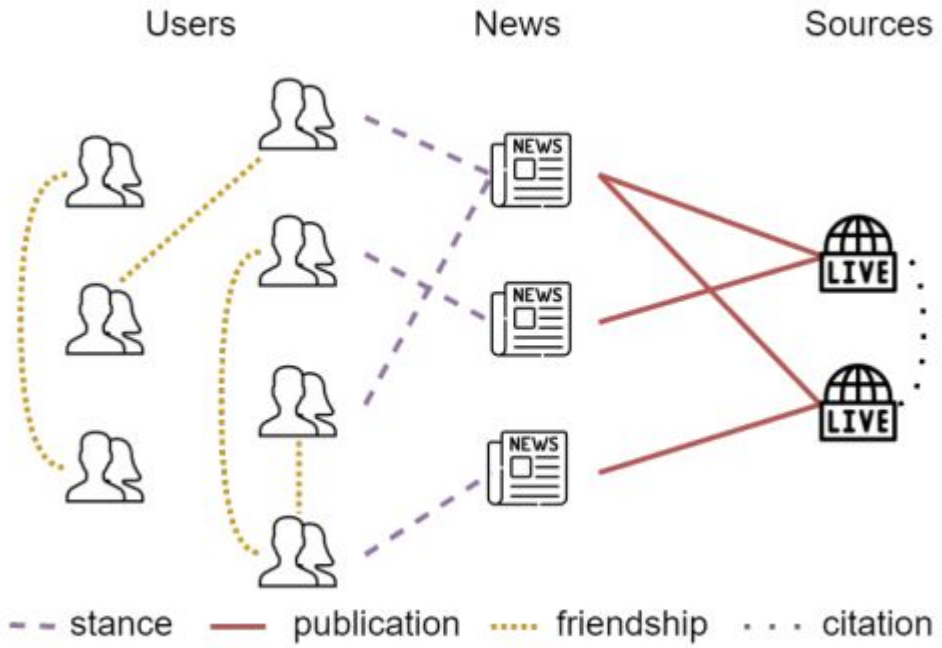
Tschiatschek, S., Singla, A., Rodriguez, M. G., Merchant, A., & Krause, A. (2018). Fake news detection in social networks via crowd signals. *Companion of The Web Conference 2018 on The Web Conference 2018 - WWW 18*. doi:10.1145/3184558.3188722

Mixed-Method

- Each has own merits and weakness
- As summarized:
  - Linguistic analysis - Traits of news content
  - Account analysis - Trustworthy account
  - Crowd-sourced - Scale, costs
- Combine
  - 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(GNN)
  - good in modeling graphs
  - graphs - realistic



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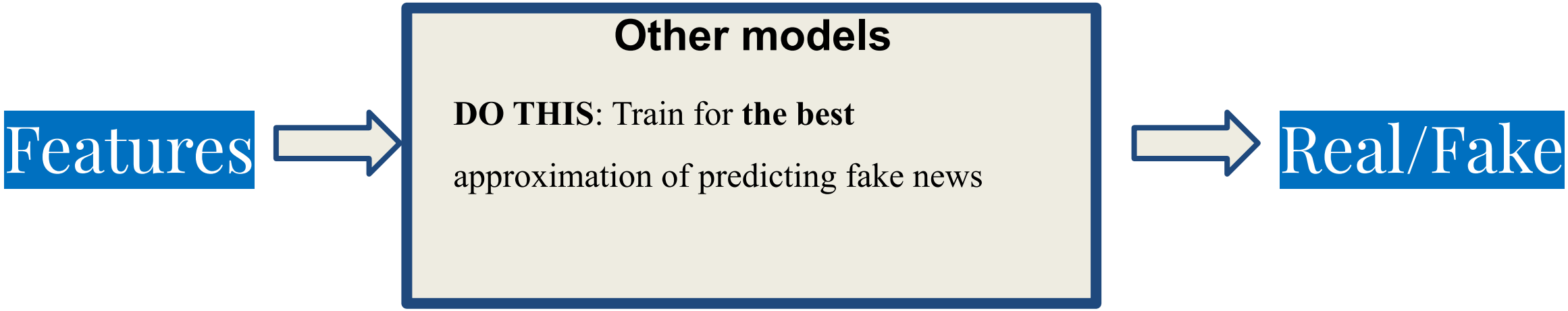
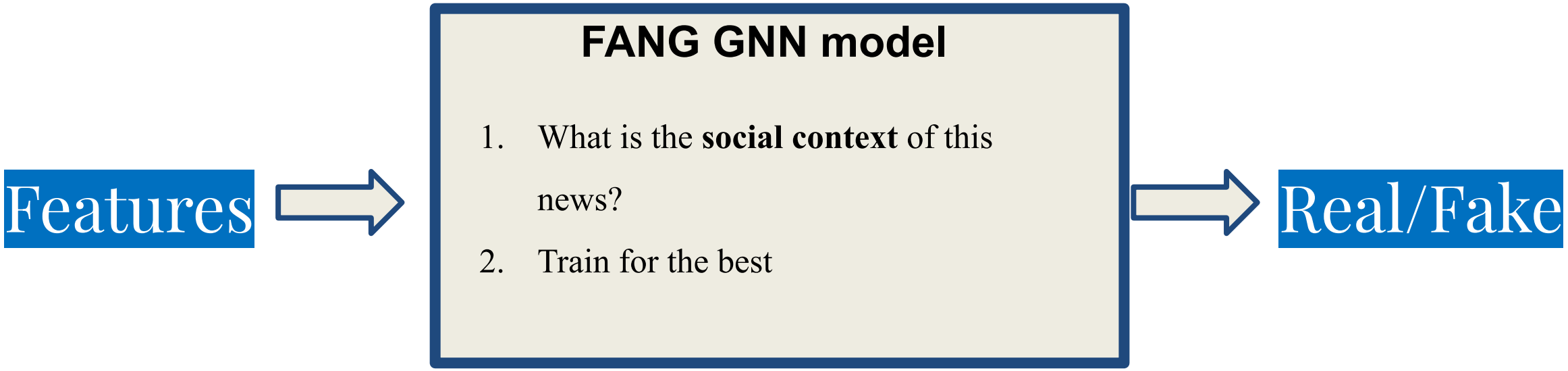




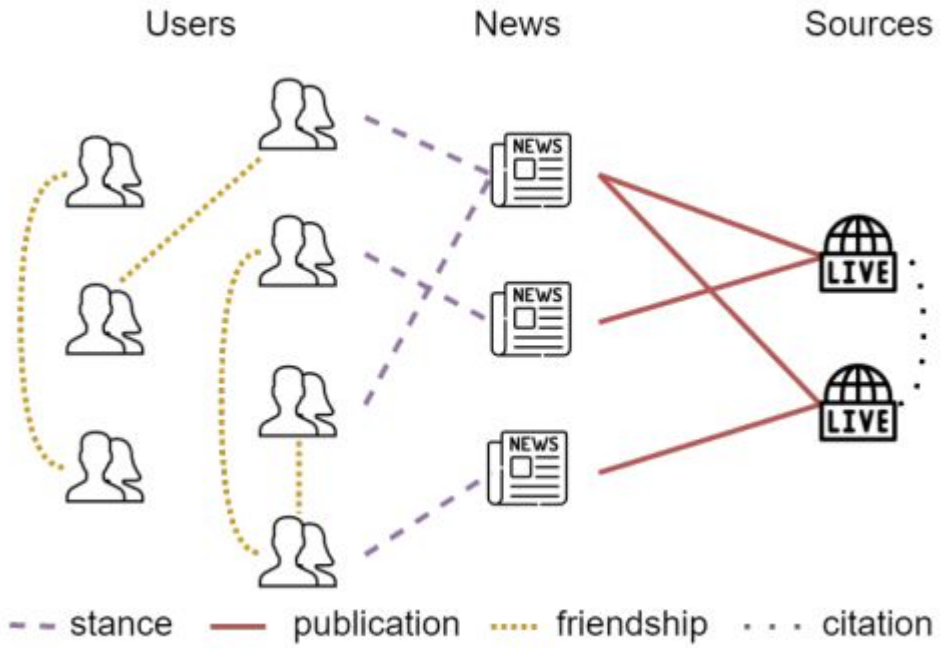
Mixed-Method: Nakov, Nguyen, Kan and Sugitama (2020)

- Outperform
  - Text only model
  - Network model - no social context
  - etc.
- Efficient
  - limited data
  - temporal feature
    - pattern: 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**

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

- Application
  - Well-structured platforms (e.g. Twitter)
  - Data availability



Conclusion

- Each has limitations
  - Textual/linguistic approach
    - cannot: video, pictures
  - Crowd-sourced
    - biased, inaccurate
  - Account approach
    - larger datasets

- Future
  - machine learning & deep learning
    - e.g.: NLP, audio analysis, image processing; GNN
  - solutions
    - new, better
    - methods, system
      - FANG
      - Platform, format of information

Q&A Section


THANKYOU