An Inferential Commonsense-Driven Learning Framework for Enhancing Prediction of Political bias in News Headlines

CLEOPATRA

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INTRODUCTION & MOTIVATION

FDA chief apologizes for overstating plasma effect on virus — **Associated Press (Center)**

Trump's FDA chief apologizes for hyping unproven treatment on eve of Republican National Convention — **Salon (Left)**

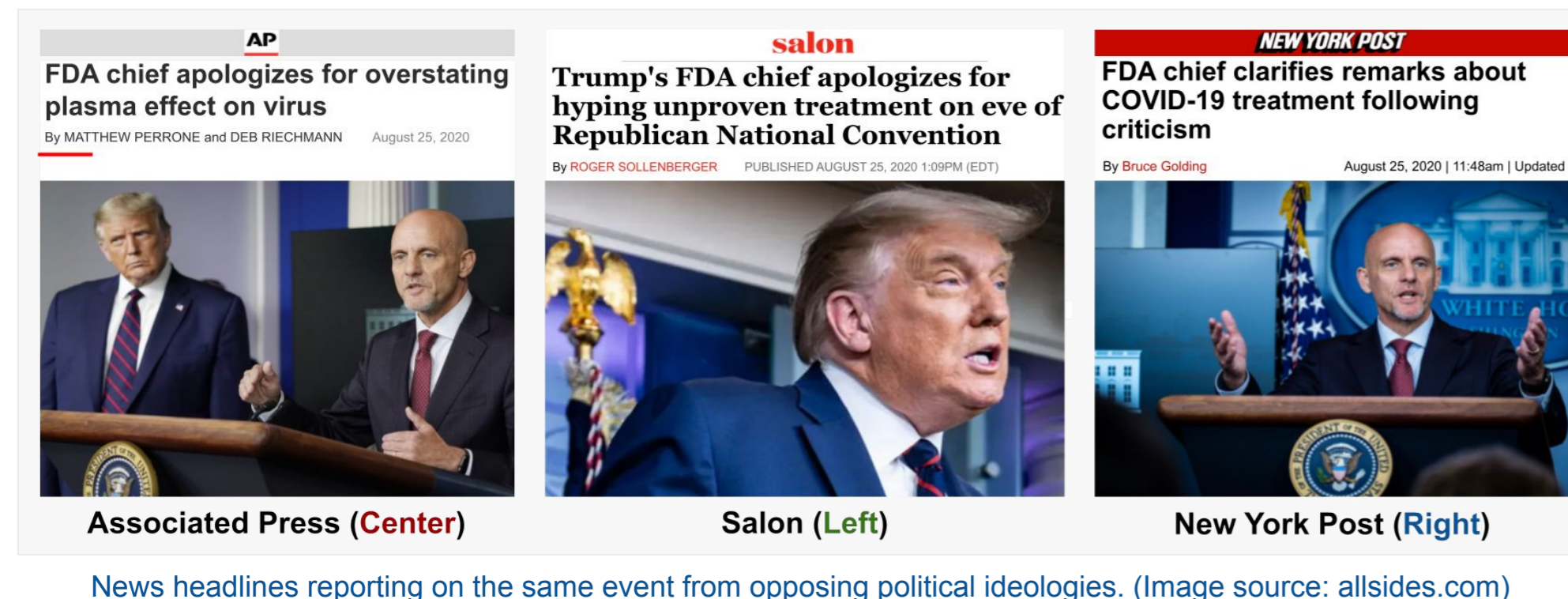FDA chief clarifies remarks about COVID-19 treatment following criticism — **New York Post (Right)**

News headlines reporting on the same event from opposing political ideologies. (Image source: allsides.com)

- Media outlets often publish news that benefit the political party they endorse. With rise of digital journalism and micro-blogging, headline is becoming the only part of a news item that people read.

Text with highlighted words
Before the double-dealing allegations there were red flags over $30-million DWP contract

- In the absence of adequate context, an automated bias predictor may perform poorly on short headlines.


Text with highlighted words
Before the double-dealing allegations there were red flags over $30-million DWP contract PersonX is suspicious, needed to know about the contract, intended get rid of a bad contract, get a job, wants to get rid of the contract, feels guilty. Others want to get rid of him, get a new contract, feel betrayed.

- IC_Knwl improves prediction performance by extracting inferential context.
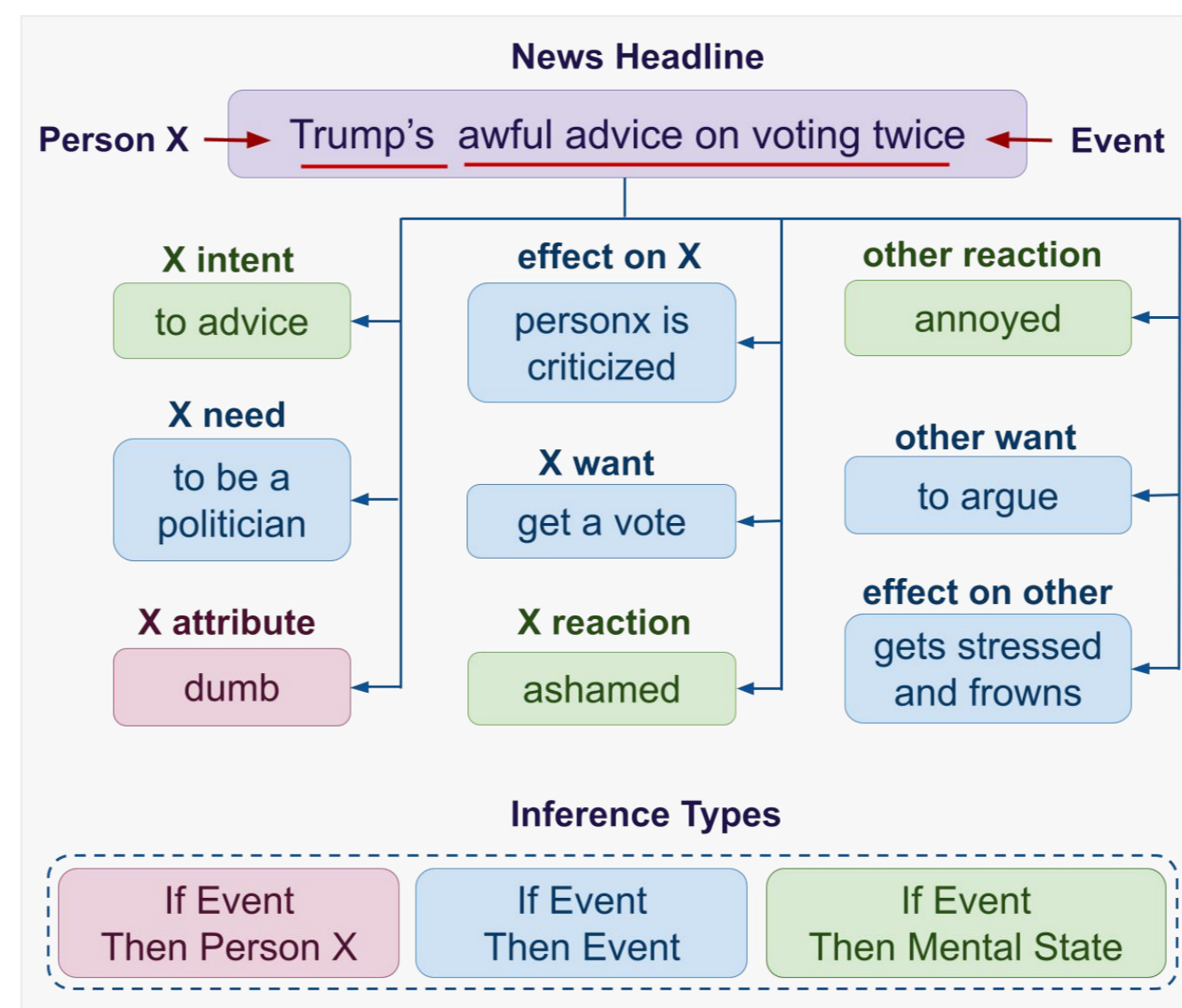
An illustration of IC_Knwl acquired using COMET for a sample news headline.

- Short headlines may lack the necessary contextual information. ex : "*Brickbat: It's a Gas Gas Gas*" and "*Grit Won*"
- Inferential Commonsense Knowledge (IC_Knwl) acquired using the neural knowledge model COMET provides inferential context to the headlines.

Task outline.

Flowchart of Inferential Knowledge acquisition process.
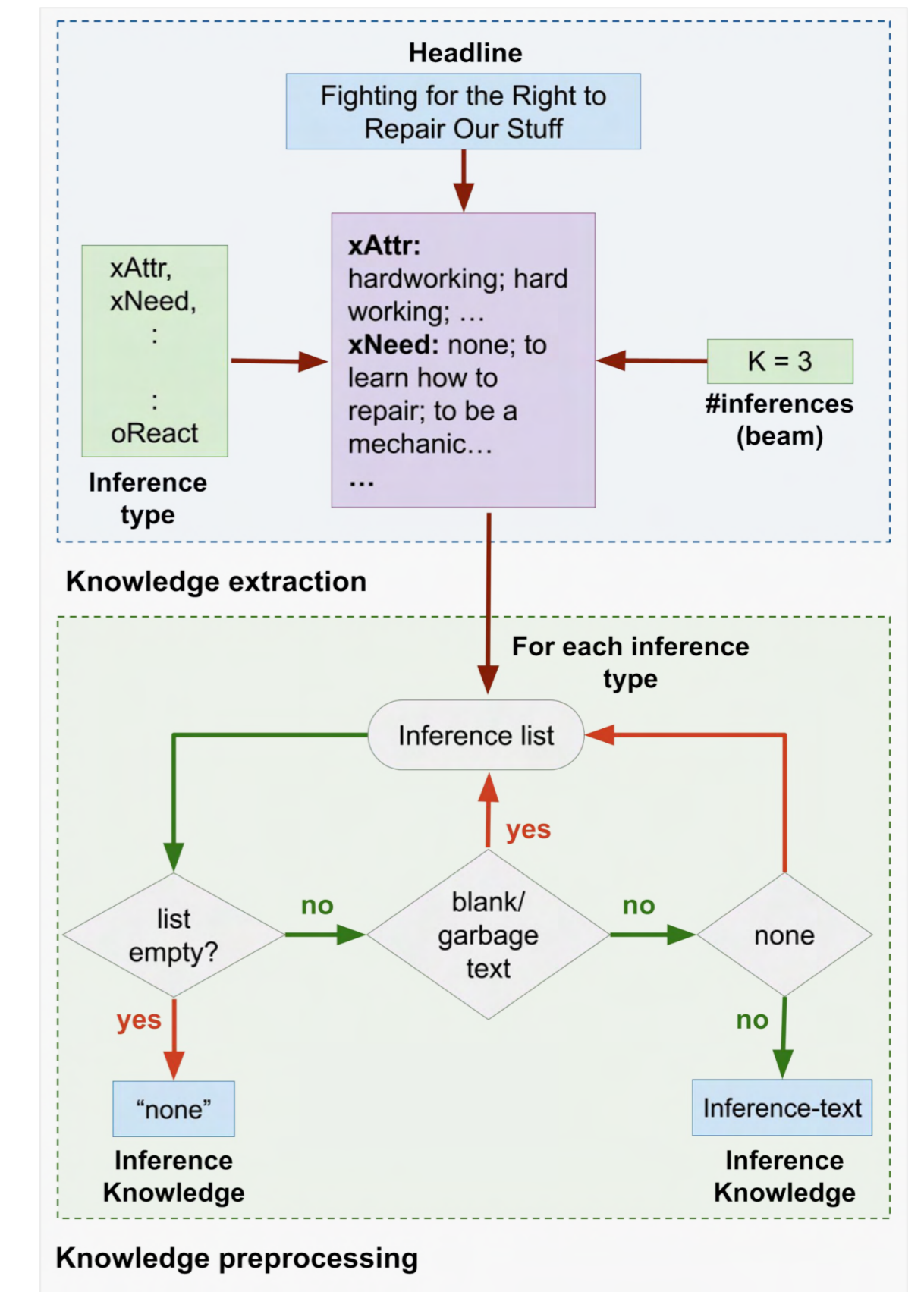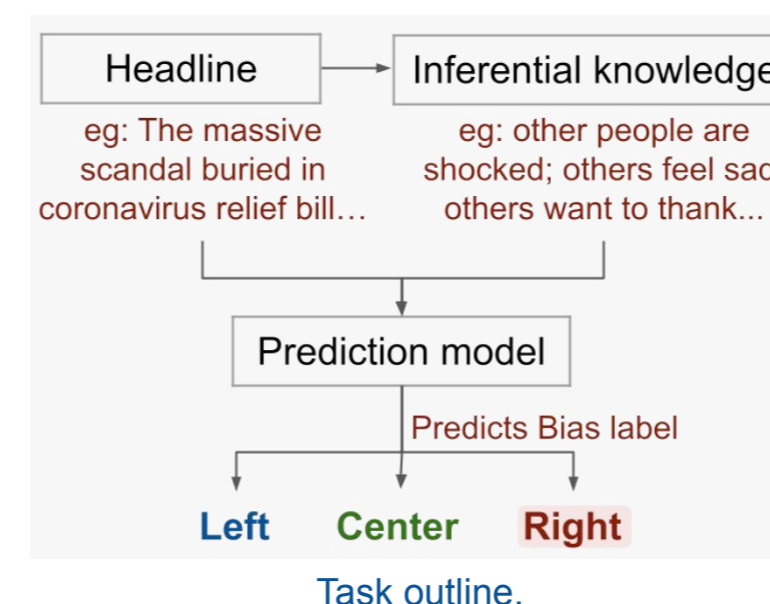
- Proposing to leverage IC_Knwl to aid in the comprehension of news headlines.
- Introducing IC-BAIT, a learning framework designed to enhance political bias prediction in news headlines through the selective injection of IC_Knwl.
- Presenting datasets with political bias annotations.
- Analyzing the impact of selective IC_Knwl augmentation.

PROBLEM SETUP & PROPOSED SOLUTION
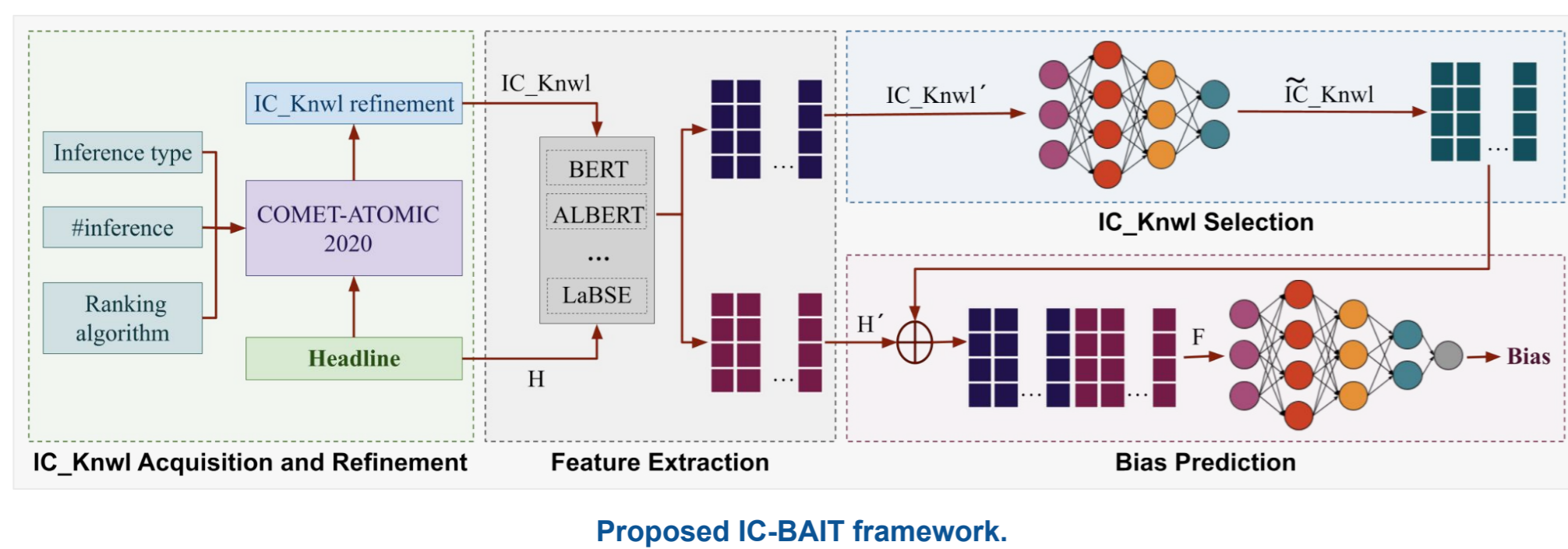

Proposed IC-BAIT framework.

- The primary components of the proposed framework are IC_Knwl acquisition and refinement, feature extraction, IC_Knwl selection, and bias prediction.

| Dataset	Raw data source	Dataset size	Train	Valid	Test	Avg. length	Language
MediaBias	allsides	11,031	8,825	1,102	1,104	13	English
GoodNews	adfontesmedia	3,058	2,446	306	306	13	English
ERNewsBias	ER + MBFC	62,689	50,157	6,269	6,263	10.2	Multilingual

Dataset Statistics.

(a) Novinky.cz (Czech): Hackeři vyhlásili Rusku válku, vyřazují z provozu jeden cíl za druhým (*Hackers have declared war on Russia, decommissioning one target after another*)
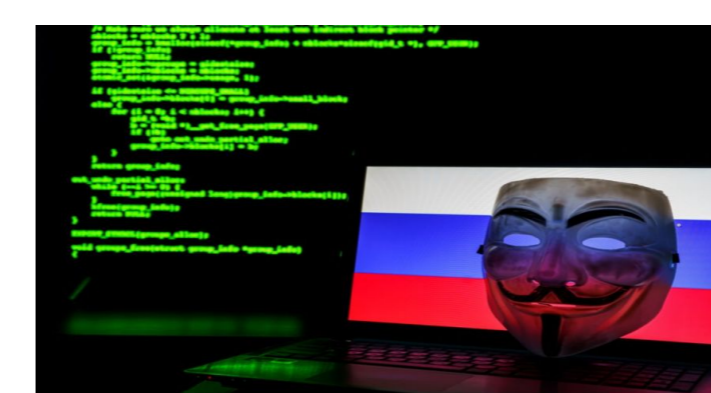
(b) 24ur.com (Slovenian): Hekerska skupina Anonymous trdi, da je vdrla v rusko centralno banko (*The hacker group Anonymous claims to have hacked into Russia's central bank*)

Multilingual news headlines. Headlines in (a) Czech and (b) Slovenian reporting on the same event from opposing political ideologies. (Image source: 24ur.com, novinky.cz)

- Political bias is also common in multilingual news.
- Commonsense knowledge bases are typically written in English, which creates a language barrier.
- We propose to use the Translate-Retrieve-Translate (TRT) approach to overcome the language barrier.
- We present a multilingual dataset and two datasets in English language.
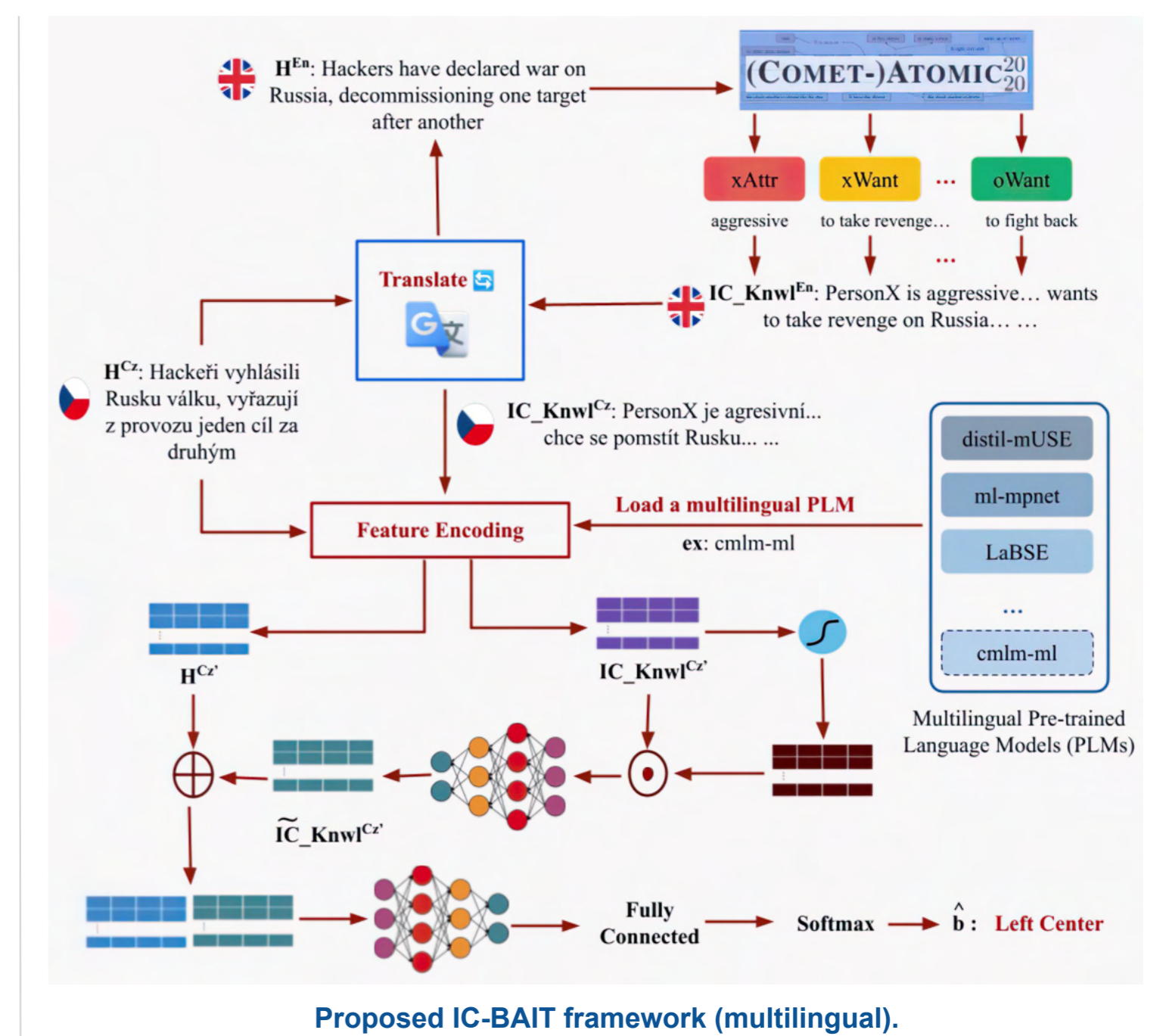
Proposed IC-BAIT framework (multilingual).

RESULTS & CONCLUSION

Dataset	Acc.	Acc.^{ours}	%↑	F$_1$	F$_1^{ours}$	%↑	J$_\mu$	J$_\mu^{ours}$	%↑	F$_{1\mu}$	F$_{1\mu}^{ours}$	%↑
MediaBias	0.46	0.47	**2.2**	0.43	0.45	**4.6**	0.30	0.31	**3.3**	0.45	0.46	**2.2**
GoodNews	0.47	0.50	**6.4**	0.40	0.45	**12.5**	0.31	0.33	**6.4**	0.42	0.47	**11.9**

Distribution of overall performance for the datasets in English language.

- Using IC_knwl, our proposed framework has been shown to improve the average performance of baselines across various metrics.
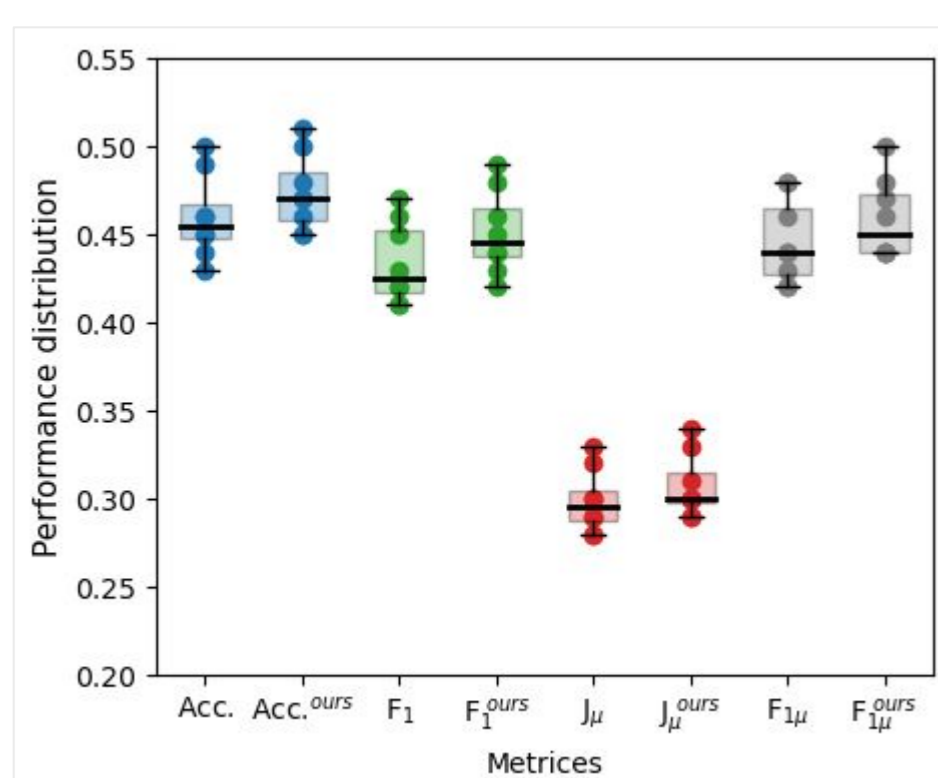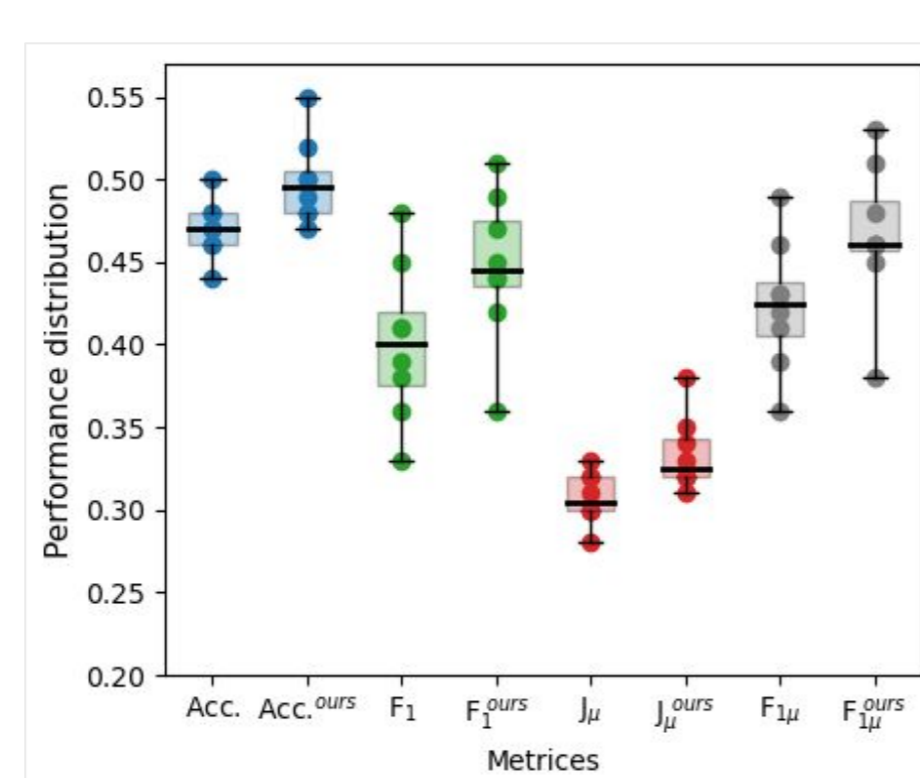
(a) MediaBias
(b) GoodNews

Boxplots of overall performance distributions for the datasets (a) MediaBias and (b) GoodNews.

- We use boxplots for comparison, where the optimal result for all metrics is a median close to the third quartile (Q3) with a high Q3. Our framework's impressive performance is readily apparent in the plots.

Headline	**Donald Trump gets ripped to pieces over LGBT tweet**
IC_Knwl	PersonX is intolerant, needed to write a homophobic tweet, intended to be liked, gets yelled at, wants to make amends, feels upset. Others want to defend themselves, gets hurt, feel angry.
Bias Label	True: **Left**, Predicted (without IC_Knwl): **Right**, Predicted (with IC_Knwl): **Left**
Comment	Due to data bias, news related to the named entity "Trump" is heavily skewed to Right-wing media. Furthermore, idioms such as "ripped to pieces" are typically associated with the Right ideology. The model without IC_Knwl tends to learn this unjust correlation and thus ends up predicting it as "Right". However, with the additional commonsense inference, important information such as "personX is seen as intolerant" and "Others get hurt" was passed to the model, allowing it to learn the prediction correctly.
Headline	**Time to Kick the Islamizing Turkey Out of NATO**
IC_Knwl	PersonX is aggressive, needed to be a member of NATO, intended to get rid of terrorism, gets yelled at, wants to to get rid of the Islamists, feels angry. Others want to fight back, gets hurt, feel angry.
Bias Label	True: **Right**, Predicted (without IC_Knwl): **Left**, Predicted (with IC_Knwl): **Right**
Comment	An incorrect correlation between "Islam" and Left-wing media in the collected data causes the model without IC_Knwl to incorrectly predict the label as "Left". However, the acquired commonsense inferences such as, "personX is seen as aggressive and gets yelled at" provide a critical understanding of the statement, allowing the model with IC_Knwl to correctly learn the prediction.

An example of bias label predictions by IC-BAIT (with and without IC_Knwl).

- Our framework helps the underlying models focus not only on important entities and events in the headlines but also on explanations for unstated events, resulting in better predictions.
- Even the models evaluated for individual languages yield plausible results.
- Case studies and error analysis reveal that, while IC_Knwl can be extremely beneficial in some cases, it can also be counterproductive in others.

Dataset and scripts available at: https://github.com/Swati17293/KG-Multi-Bias and https://github.com/Swati17293/IC-BAIT

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HORIZON 2020

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