Slides for the 2-minute presentation

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

What to Fact-Check

Guiding Check-Worthy Information Detection in News Articles through Argumentative Discourse Structure

Tariq Alhindi

Brennan Xavier McManus

Smaranda Muresan

SIGDIAL 2021

The 22nd Annual Meeting of the Special Interest Group on Discourse and Dialogue, 29-31 July 2021, Singapore

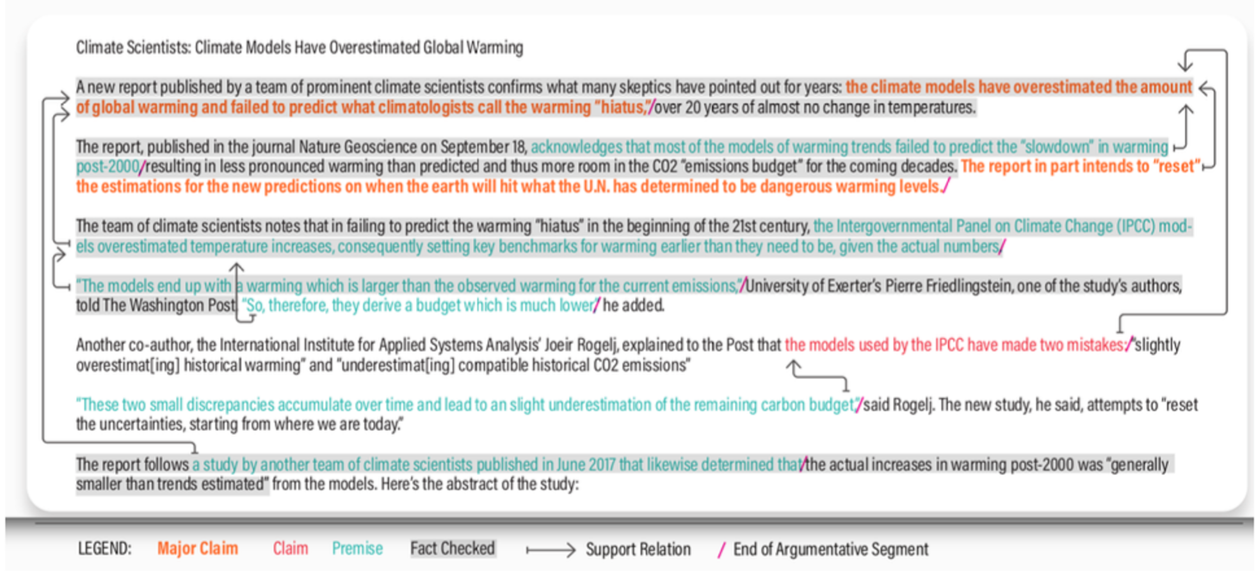
Information Check-worthiness

Most work on fact-checking start with a list of claims to fact-check (Throne et al., 2018, Wang 2017)

Previous work on check-worthiness

- Political text (mostly debates) using handcrafted features (Hassan et al., 2017, Jaradat et al., 2018)
- The notion of check-worthiness greatly varies across genre (Wright and Augenstein, 2020).

Is check-worthiness related to argument structure?



Climate Scientists: Climate Models Have Overestimated Global Warming

A new report published by a team of prominent climate scientists confirms what many skeptics have pointed out for years: the climate models have overestimated the amount of global warming and failed to predict what climatologists call the warming "hiatus,"/over 20 years of almost no change in temperatures.

The report, published in the journal Nature Geoscience on September 18, acknowledges that most of the models of warming trends failed to predict the "slowdown" in warming post-2000/resulting in less pronounced warming than predicted and thus more room in the CO2 "emissions budget" for the coming decades. The report in part intends to "reset" the estimations for the new predictions on when the earth will hit what the U.N. has determined to be dangerous warming levels./

The team of climate scientists notes that in failing to predict the warming "hiatus" in the beginning of the 21st century, the Intergovernmental Panel on Climate Change (IPCC) models overestimated temperature increases, consequently setting key benchmarks for warming earlier than they need to be, given the actual numbers/

"The models end up with a warming which is larger than the observed warming for the current emissions,"/University of Exerter's Pierre Friedlingstein, one of the study's authors, told The Washington Post. "So, therefore, they derive a budget which is much lower"/ he added.

Another co-author, the International Institute for Applied Systems Analysis' Joeir Rogelj, explained to the Post that the models used by the IPCC have made two mistakes:/"slightly overestimat[ing] historical warming" and "underestimat[ing] compatible historical CO2 emissions"

"These two small discrepancies accumulate over time and lead to an slight underestimation of the remaining carbon budget,"/said Rogelj. The new study, he said, attempts to "reset the uncertainties, starting from where we are today."

The report follows a study by another team of climate scientists published in June 2017 that likewise determined that/the actual increases in warming post-2000 was "generally smaller than trends estimated" from the models. Here's the abstract of the study:

LEGEND: Major Claim Claim Premise Fact Checked ⟶ Support Relation / End of Argumentative Segment

Hypothesis

Fact-checking a premise when it supports a claim

Fact-checking a claim when it is not supported or only supported by other claims

(Evading the Burden of Proof)

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Corpus

Multilayer annotated corpus of 95 articles from climatefeedback.org.

- fact-checked text segments by climate scientist at climatefeedback.org
- argument structure (major claim, claim, premises and support, attack relations) by 6 expert annotators

Following previous work, we approach this as:

• sentence classification task	Macro F1
• sentence ranking task	MAP

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Approach

We take advantage of BERT next sentence capabilities to add context to the target sentence:

- Local discourse context (prev+sent, sent+next)

- Argumentation context by pairing the target sentence with another sentence that has an argumentative relation (support, attack, joint, restate) with the target sentence.

  □ if the target sentence has an argumentative component (major-claim, claim, premise)
  otherwise we revert back to discourse context

  □ additionally, we prepend the Argumentative component Type (AT)

e.g.	CLAIM	*the model used by the IPCC has two mistakes*	Not-Checked
	ArgType	target sentence	label

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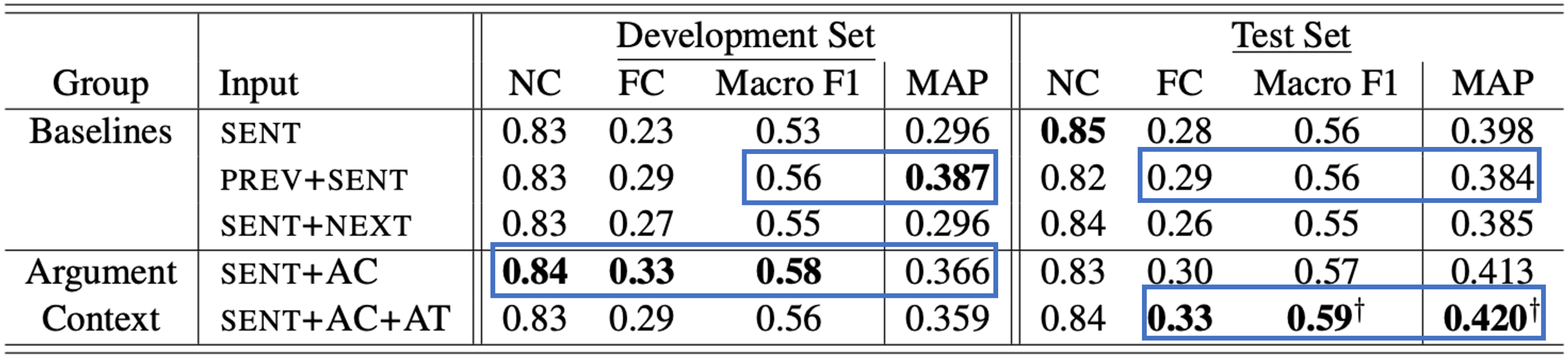
Results



Group	Input	Development Set NC	Development Set FC	Development Set Macro F1	Development Set MAP	Test Set NC	Test Set FC	Test Set Macro F1	Test Set MAP
Baselines	SENT	0.83	0.23	0.53	0.296	**0.85**	0.28	0.56	0.398
	PREV+SENT	0.83	0.29	0.56	**0.387**	0.82	0.29	0.56	0.384
	SENT+NEXT	0.83	0.27	0.55	0.296	0.84	0.26	0.55	0.385
Argument Context	SENT+AC	**0.84**	**0.33**	**0.58**	0.366	0.83	0.30	0.57	0.413
	SENT+AC+AT	0.83	0.29	0.56	0.359	0.84	**0.33**	**0.59**†	**0.420**†

Per-class F1 (**NC**: Not-Checked class, **FC**: Fact-Checked class), Macro F1 and Mean Average Precision (**MAP**) on the development and test sets.

AC: Argumentation Context, **AT**: Argumentative component Type

† Statistically significant over baselines

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Contributions

A novel corpus with multi-layer annotations for
check-worthiness and argument structure

Model check-worthiness in news articles
as sentence classification and a sentence ranking tasks

Using argument structure as context yields better results than using
local discourse context for the task of check-worthiness detection

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Thank You

www.cs.columbia.edu/~tariq
www.github.com/tariq60/whatToFactCheck

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Motivation

Most work on fact-checking start with a list of claims to fact-check (Throne et al., 2018, Wang 2017)

Previous work on check-worthiness

- Political text (mostly debates) using handcrafted features (Hassan et al., 2017, Jaradat et al., 2018)
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What about check-worthiness in news articles from different topics (e.g. climate change)?

Is check-worthiness related to argument structure?

Hypothesis

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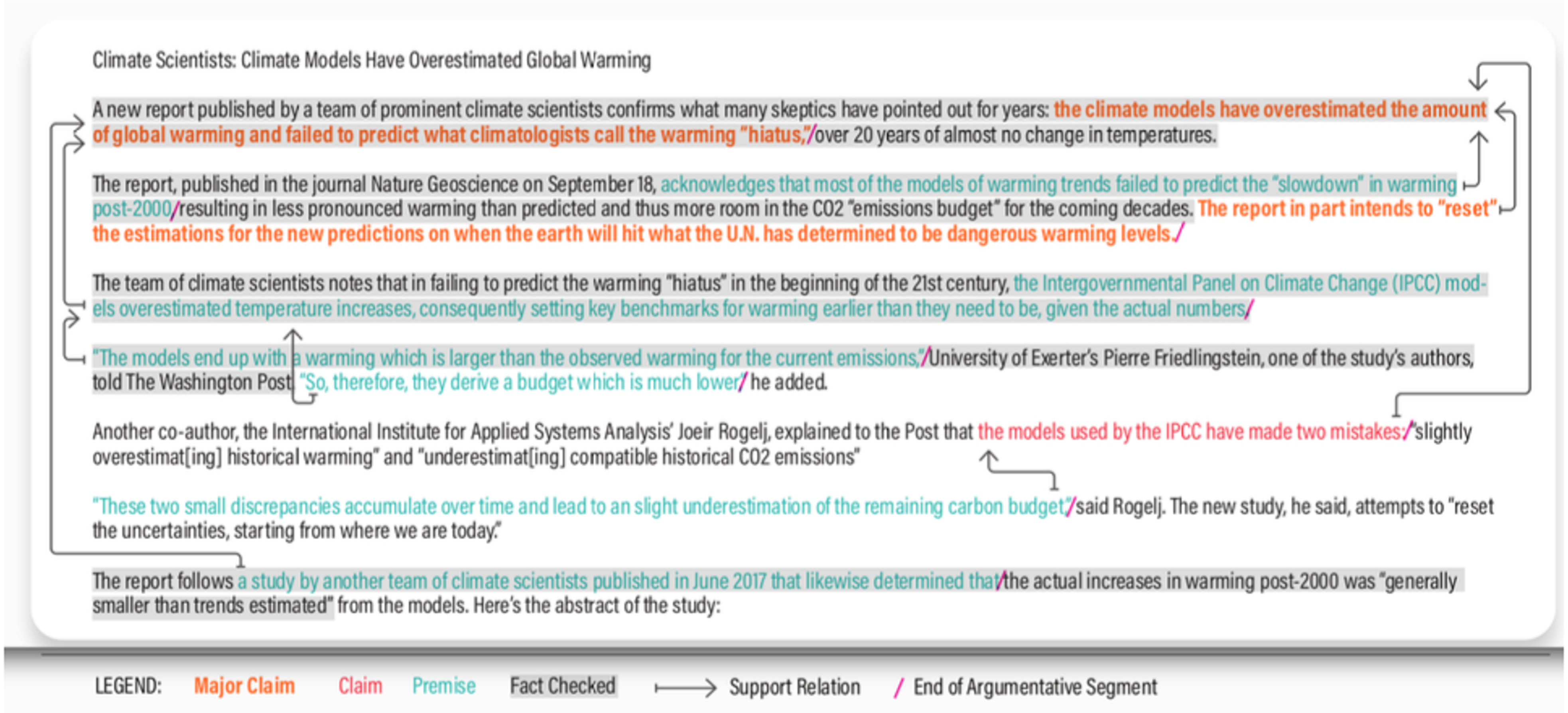
Example



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Outline

Related Work

Data

Model

Results

Conclusion

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Related Work

ClaimBuster (Hassan et al., 2017) and ClaimRank (Jaradat et al., 2018)

CLEF check that lab
(Nakov et al., 2018; Elsayed et al., 2019; Barron-Cedeno et al. , 2020)

Argumentation and check-worthiness

- Type of statements (Freeman, 2000)
- Type of evidence (Park and Cardie, 2014; Addawood and Bashir, 2016)

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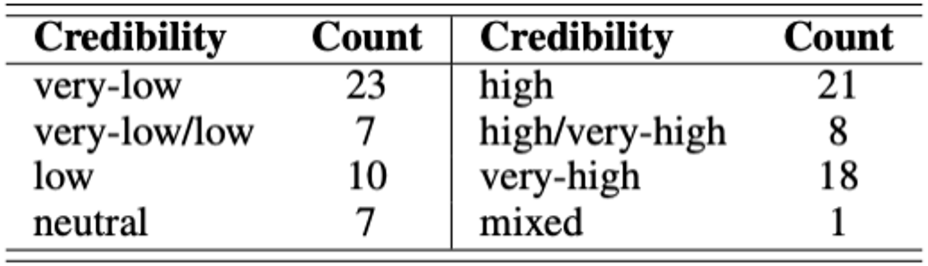
Data

95 climate change news articles
fact-checked text segments by climate scientists at *climatefeedback.org*

from 40 publishers mainly in the U.S., UK and Australia

e.g., The New York Times, The Guardian, The Washington Post, The Wall Street Journal, The Australian, The Telegraph, Forbes, USA today, Breitbart, and Mashable

Articles are given an article-level credibility rating and sentence-level fact-checking annotations



Credibility	Count	Credibility	Count
very-low	23	high	21
very-low/low	7	high/very-high	8
low	10	very-high	18
neutral	7	mixed	1

Each Article is tagged by 3 to 5 climate scientists

evaluate scientific reasoning
add relevant information missed by the article
check for: factual accuracy, scientific understanding, logical reasoning
precision/clarity, sources quality, and fairness/objectivity

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Data – Factchecked Segments

Fact-checked segments vary in length

from a fragment of a sentence to multiple sentences.

We thus map this to binary labels at the sentence-level: factchecked (FC) or not-checked (NC).

A sentence is labeled as ‘fact-checked’ if:

it is fact-checked

has a fact-checked segment

part of multi-sentence fact-checked segment

We split the the 95 articles to

68 articles in the ***training*** set	4,353 sentences in total	824 are fact-checked
7 articles in the ***development*** set	249 sentences in total	55 are fact-checked
20 articles in the ***test*** set	970 sentences in total	220 are fact-checked

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Data – Argument Structure Annotation

Annotation Scheme

Argument Components	Major-Claim, Claim, Premise
Argument Relations	Support, Attack, Restate, Joint

Six Annotators

Undergrads in Linguistics, English, and Comparative Literature

Each annotators was assigned a 32-article batch; Each article annotated by at least 3 annotators

Gold Annotations

Minimum common span of overlapping components from the three annotations

Relations between gold components only

- adherence to guidelines
- annotator quality

IAA using Krippendorff's alpha

overall IAA is .4368

using the coding version, which uses only the labels assigned to each component

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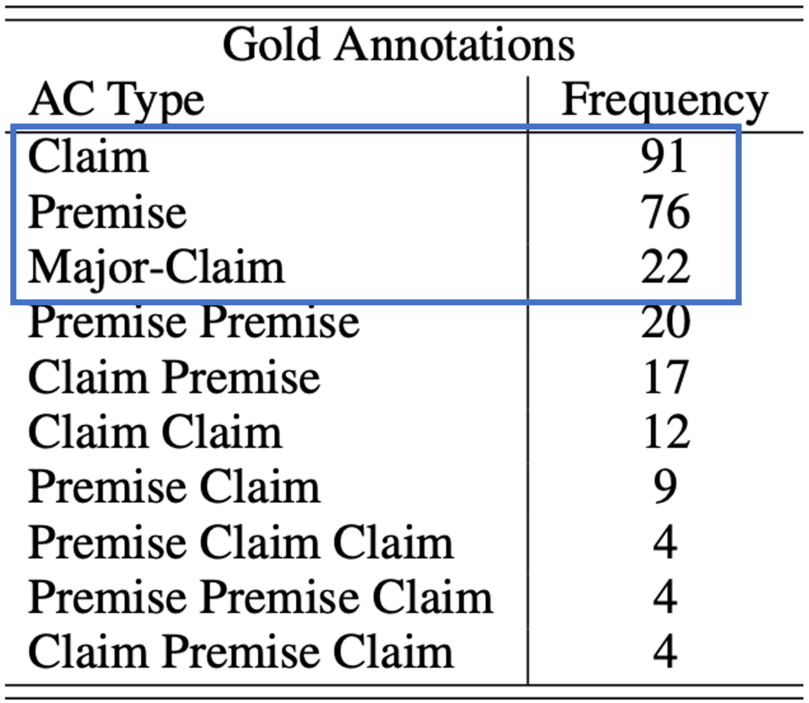
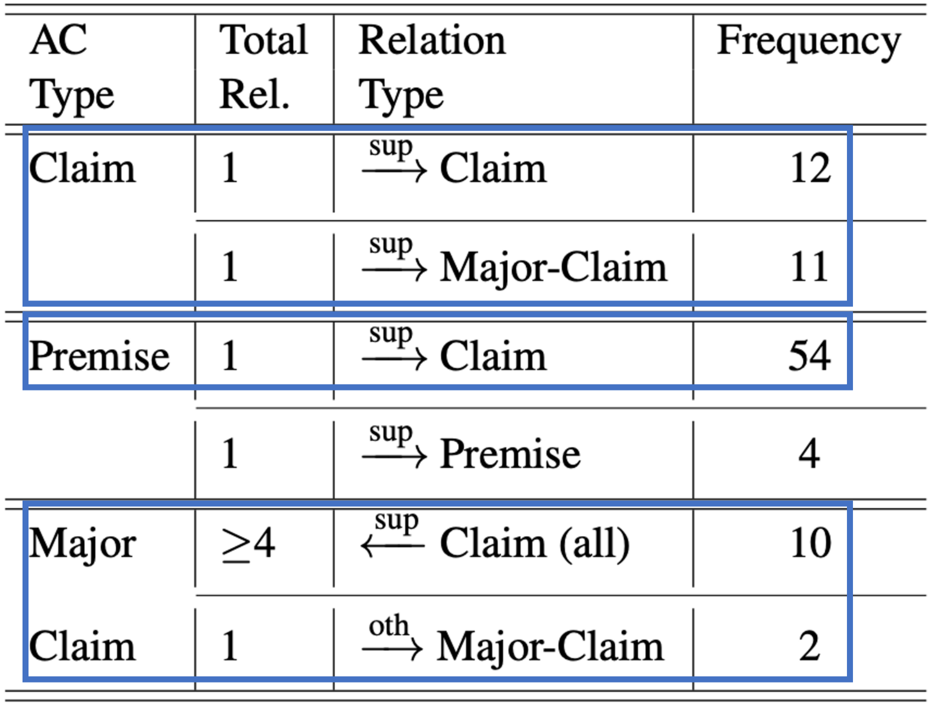
Analysis – Argumentation w.r.t Fact-Checked Segments



Gold Annotations	
AC Type	Frequency
Claim	91
Premise	76
Major-Claim	22
Premise Premise	20
Claim Premise	17
Claim Claim	12
Premise Claim	9
Premise Claim Claim	4
Premise Premise Claim	4
Claim Premise Claim	4



AC Type	Total Rel.	Relation Type	Frequency
Claim	1	$\xrightarrow{sup}$ Claim	12
	1	$\xrightarrow{sup}$ Major-Claim	11
Premise	1	$\xrightarrow{sup}$ Claim	54
	1	$\xrightarrow{sup}$ Premise	4
Major	≥4	$\xleftarrow{sup}$ Claim (all)	10
Claim	1	$\xrightarrow{oth}$ Major-Claim	2

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Model

Following previous work, we approach check-worthiness detection as a:

- sentence classification task Macro F1
- sentence ranking task MAP

We take advantage of BERT next sentence capabilities to add context to the target sentence:

- Local discourse context (prev+sent, sent+next)
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otherwise we revert back to discourse context

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e.g.	CLAIM	*the model used by the IPCC has two mistakes*	Not-Checked
	ArgType	target sentence	label

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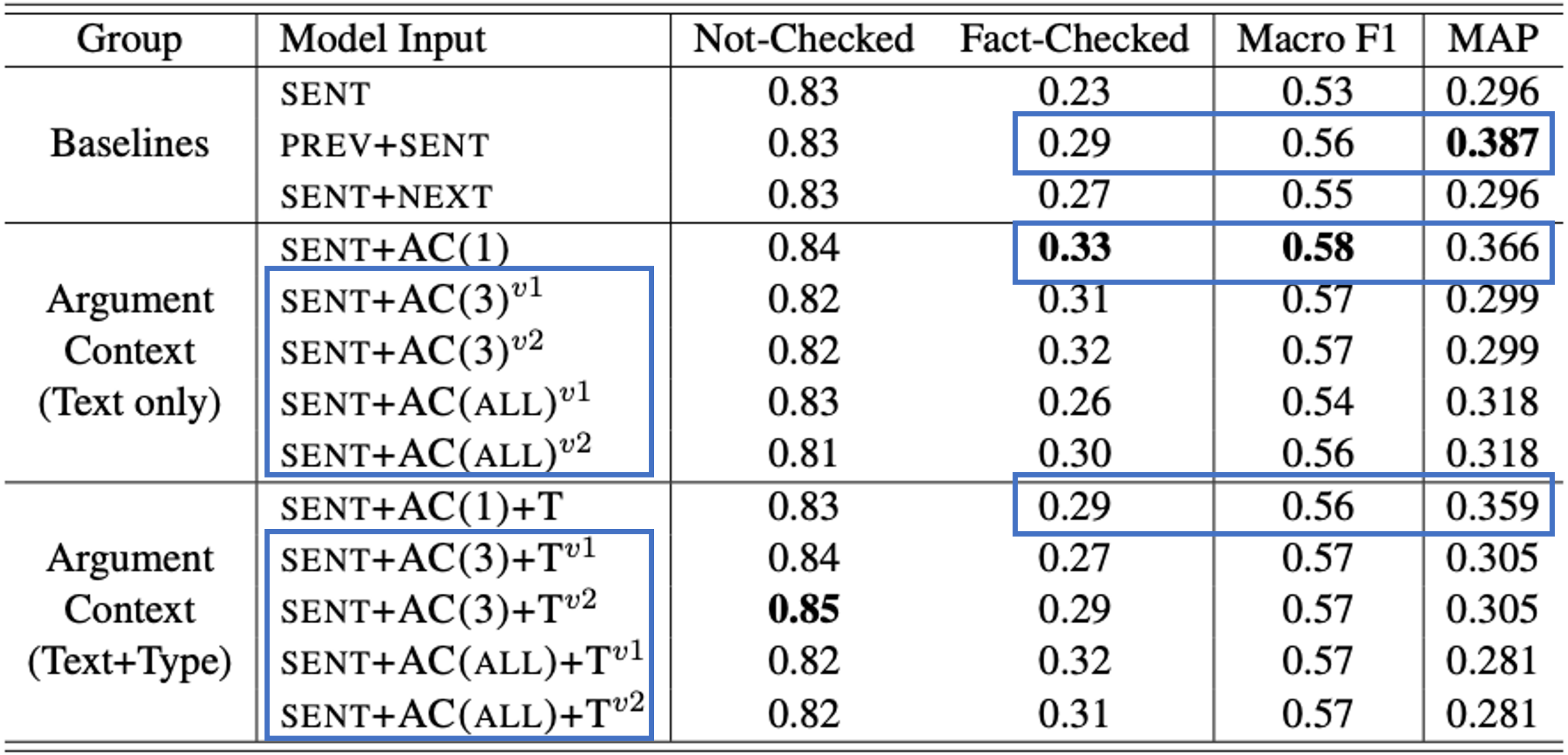
Results – Development Set



Group	Model Input	Not-Checked	Fact-Checked	Macro F1	MAP
Baselines	SENT	0.83	0.23	0.53	0.296
	PREV+SENT	0.83	0.29	0.56	**0.387**
	SENT+NEXT	0.83	0.27	0.55	0.296
Argument Context (Text only)	SENT+AC(1)	0.84	**0.33**	**0.58**	0.366
	SENT+AC(3)^{v1}	0.82	0.31	0.57	0.299
	SENT+AC(3)^{v2}	0.82	0.32	0.57	0.299
	SENT+AC(ALL)^{v1}	0.83	0.26	0.54	0.318
	SENT+AC(ALL)^{v2}	0.81	0.30	0.56	0.318
Argument Context (Text+Type)	SENT+AC(1)+T	0.83	0.29	0.56	0.359
	SENT+AC(3)+T^{v1}	0.84	0.27	0.57	0.305
	SENT+AC(3)+T^{v2}	**0.85**	0.29	0.57	0.305
	SENT+AC(ALL)+T^{v1}	0.82	0.32	0.57	0.281
	SENT+AC(ALL)+T^{v2}	0.82	0.31	0.57	0.281

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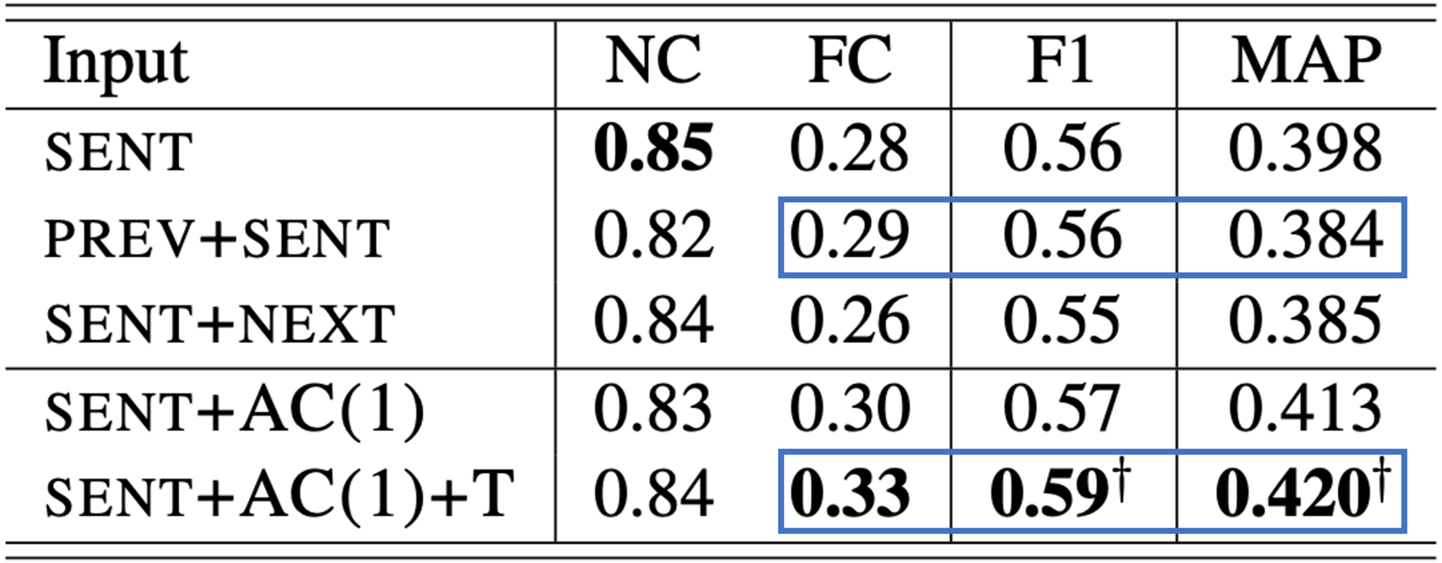
Results – Test Set



Input	NC	FC	F1	MAP
SENT	**0.85**	0.28	0.56	0.398
PREV+SENT	0.82	0.29	0.56	0.384
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SENT+AC(1)+T	0.84	**0.33**	**0.59**†	**0.420**†

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Conclusion

A novel corpus with multi-layer annotations for check-worthiness and argument structure

Modeling check-worthiness in news articles both as sentence classification and a sentence ranking tasks

Using argument structure as context yields better results than using local discourse context for the task of check-worthiness detection

Future Work:

1. Predict argument components and relations and compare with using gold annotations
2. Investigate other reasons for check-worthiness not related to argument structure
   other argument fallacies: e.g. cherry-picking and strawman argument

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