UNIVERSITÉ DE GENÈVE

UGA Université Grenoble Alpes

Simple, Simpler and Beyond:

A Fine-Tuning BERT-Based Approach to Enhance Sentence Complexity Assessment for Text Simplification

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Overview

1. Introduction
2. Corpora
3. Fine-grained simplicity assessment method
4. Conclusions and further work

1. Introduction

What is automatic text simplification (ATS)?

- **A**utomatic **T**ext **S**implification (**ATS**) is an area of NLP that aims at automatically converting texts into **simpler variants**, by **reducing their linguistic complexity**, albeit **preserving their original meaning** [Horn *et al.*, 2014; Stajner, 2021].

ORIGINAL	The second ***largest*** city of China ***~~and one of the world's major cities~~***, Beijing has played ***a vital*** role in Chinese history.
SIMPLIFIED	***Beijing*** is the second ***biggest*** city of China. Beijing has played ***an important*** role in Chinese history.

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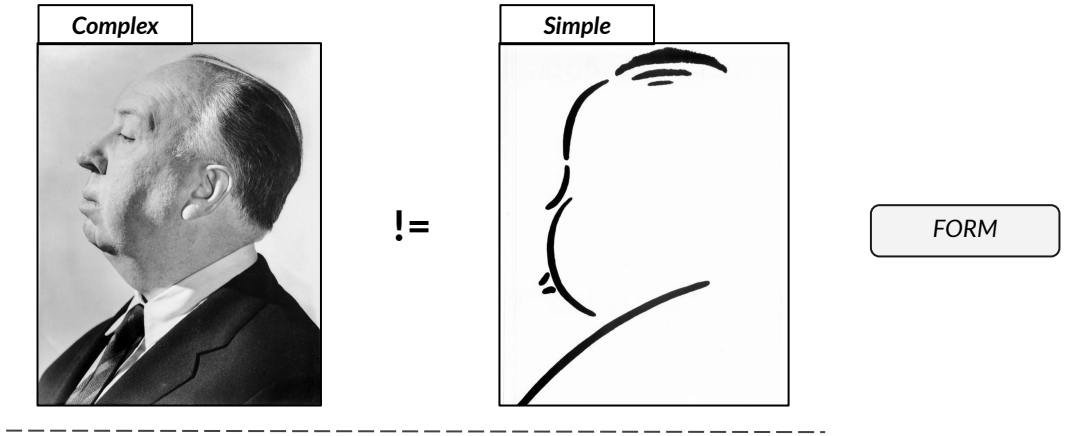

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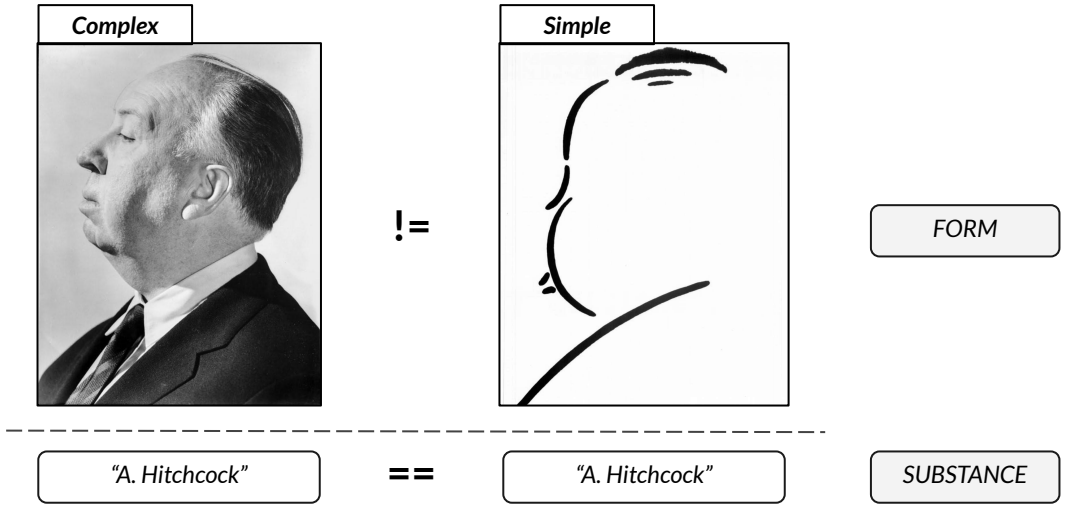

Sentence complexity assessment (SCA): an ancillary task to ATS

- **ATS**: interesting from a **text accessibility** and **comprehensibility aid perspective**. But the **scarcity of large-scale parallel monolingual data** prevents the advancement of the field, especially in **less resource-rich languages than English**.

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SIMPLER ! = SIMPLE

Simplification is **inherently** a **relative process** → A given text is transformed into a relatively **simpler** version, which does not necessarily equate to **simple**.

Bridging the gap: introducing a finer-grained method for SCA

Our proposed solution

- Contribute with a **BERT-based finer-grained method** to assess **SCA**.
- Help as a **preliminary step** in creating **labeled simplification data**.

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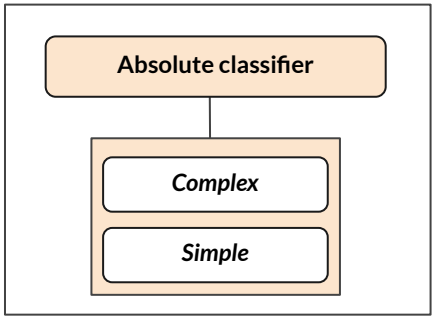

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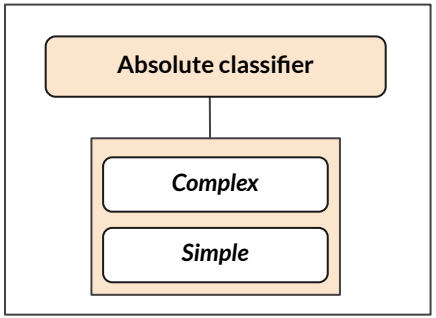
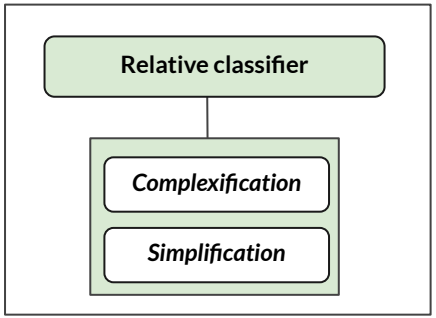


2) *Assess if the second sentence in a pair is simpler than the first.*



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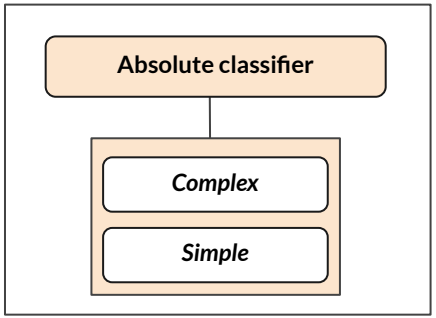

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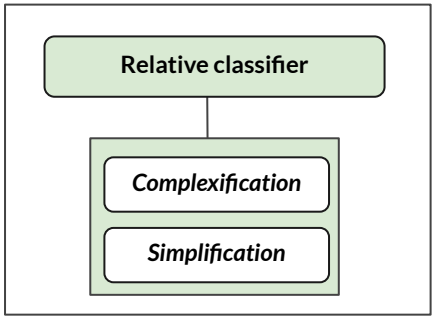
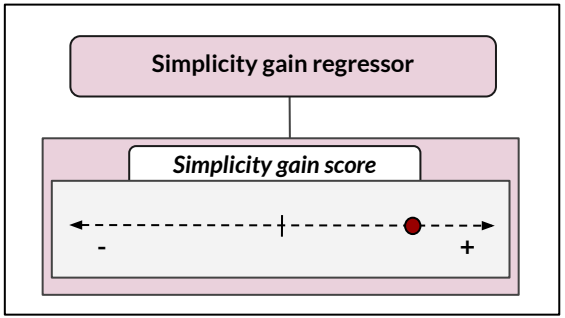


3) *Measure the simplification gain achieved by the second sentence.*



Increasingly fine-grained method for SCA

2. Corpora

2.1) Choosing a dataset to train SCA models

To assess **sentence complexity** in a **data-driven manner**:

- Relied on **WikiLarge** parallel simplification dataset [Zhang & Lapata, 2017].
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WikiLarge-Fr	
Train	105,420
Dev	13,177
Test	13,179

Overview of size (in sentence pairs).

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Data acquisition	Wiki-texts	Viki-texts
# documents	34,806	
# sentences	165,806	134,348
# tokens	4,030,148	2,373,045

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Meaning preservation pre-filtering step:

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  - Generate fixed-length sentence **embeddings**.
  - **Compute cosine similarity** between ***Wiki***:***Viki*** sentences.

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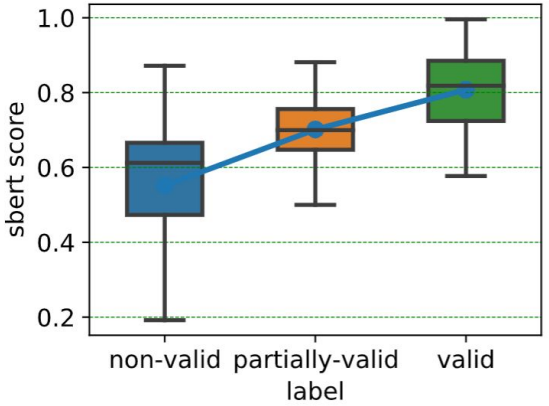
- **Manual annotation:**
  - Determine to which extent ***Wiki***:***Viki*** sentences conveyed the same meaning.
  - Definition of a **cutoff threshold** for the pairs that exhibit a **high semantic overlap**.



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3. Fine-grained simplicity assessment method

GOAL	Elicit relevant complex-simple pairs from Wikipedia-Vikidia compiled data.

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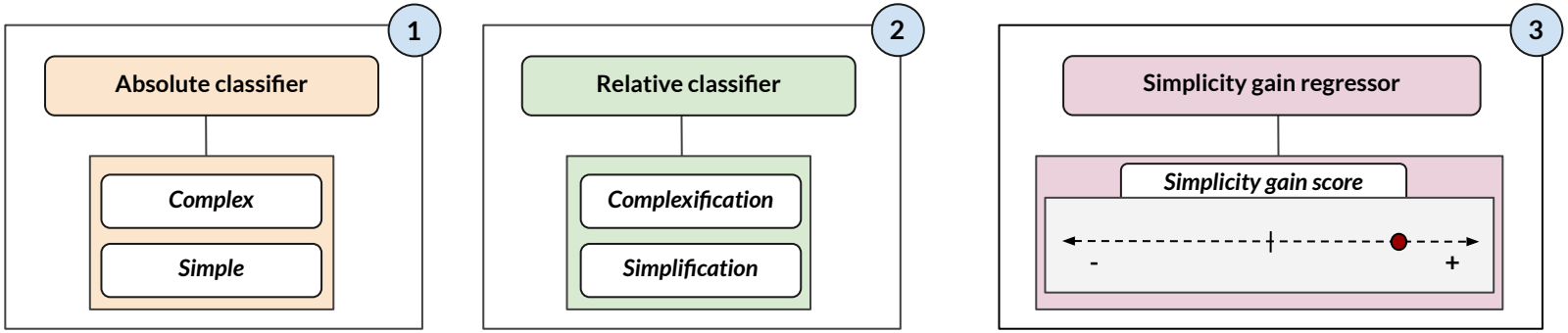

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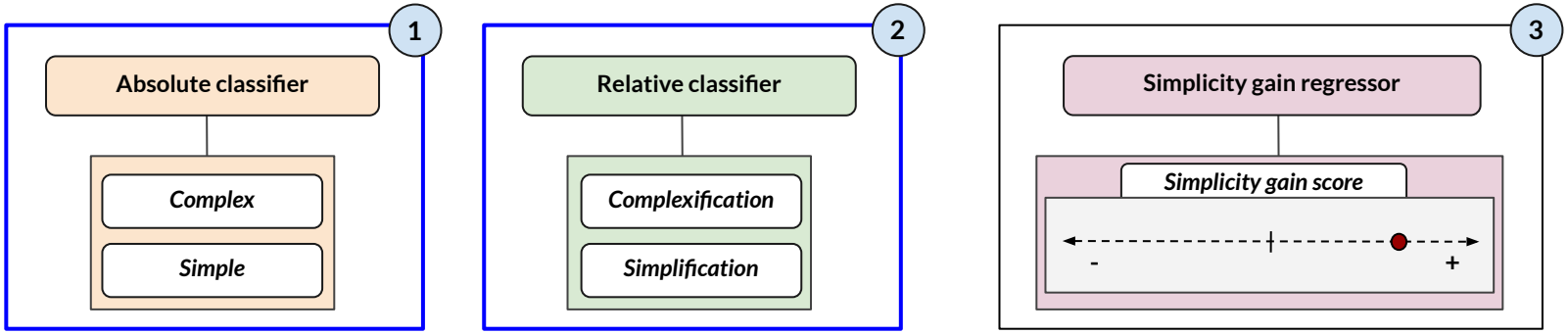

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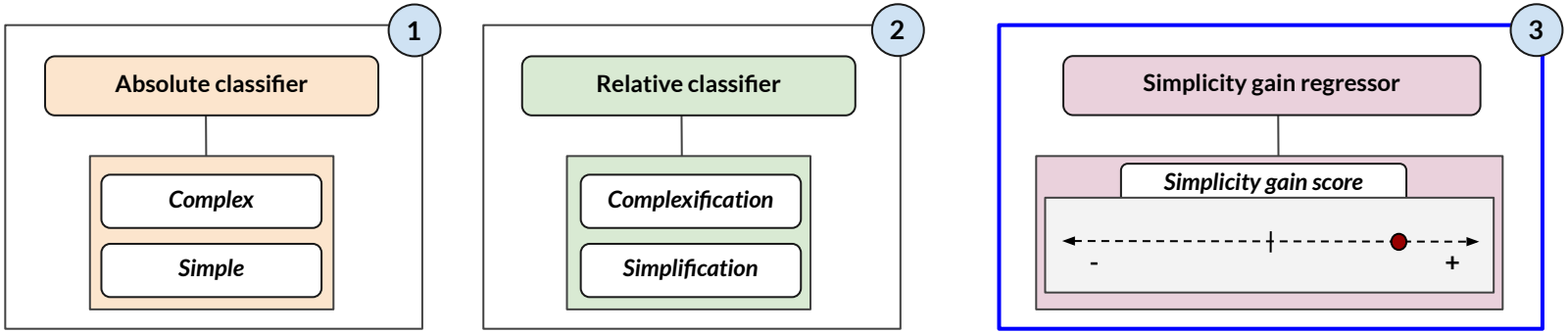

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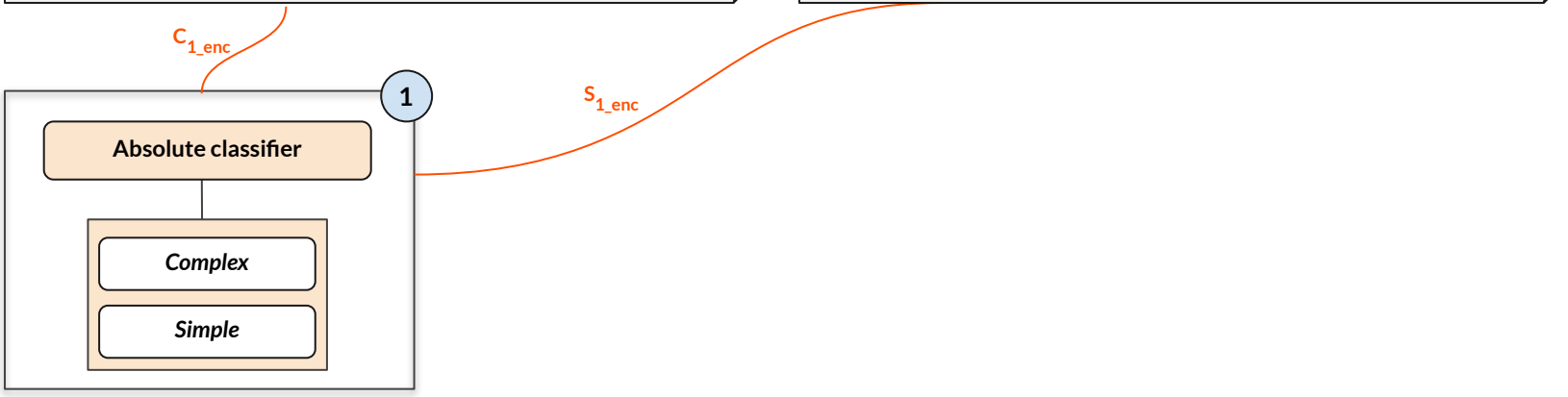
Complex sentence (c_1)

Juno est la patronne du mariage, et beaucoup de gens croient que le moment le plus favorable pour se marier est juin, le mois qui porte le nom de la déesse.

Simple sentence (s_1)

Beaucoup de gens considèrent le mois de juin, qui porte le nom de la déesse qui est la patronne du mariage, comme le moment le plus favorable pour se marier.



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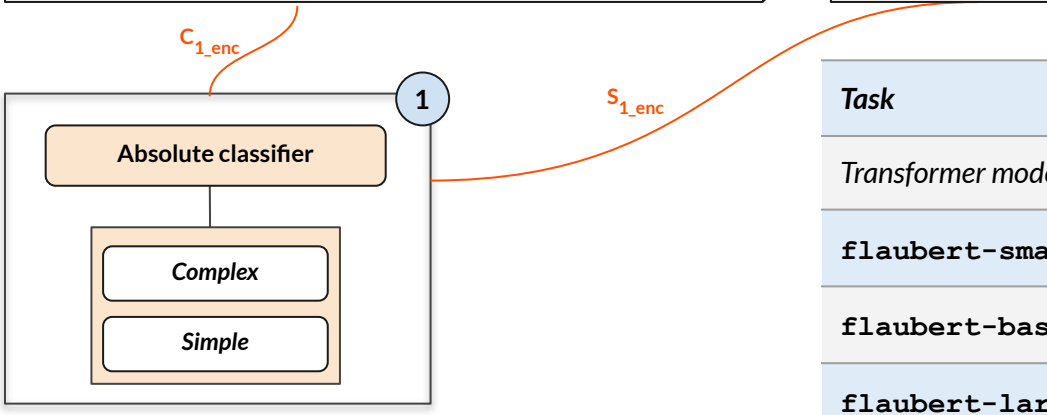

Task	Absolute classification	
Transformer model	*untuned*	*tuned*
`flaubert-small`	49.54	**70.11**
`flaubert-base`	50.97	**69.82**
`flaubert-large`	52.29	**69.19**

Accuracy results in % obtained for the absolute complexity classifier on the test set.

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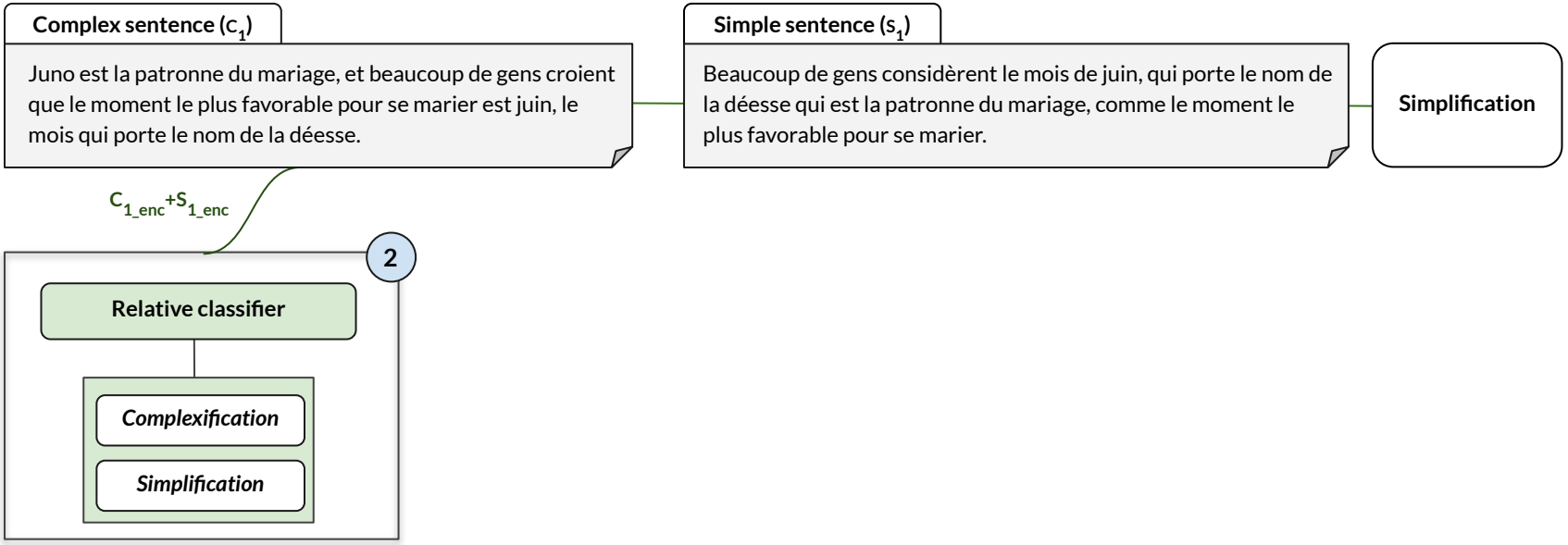

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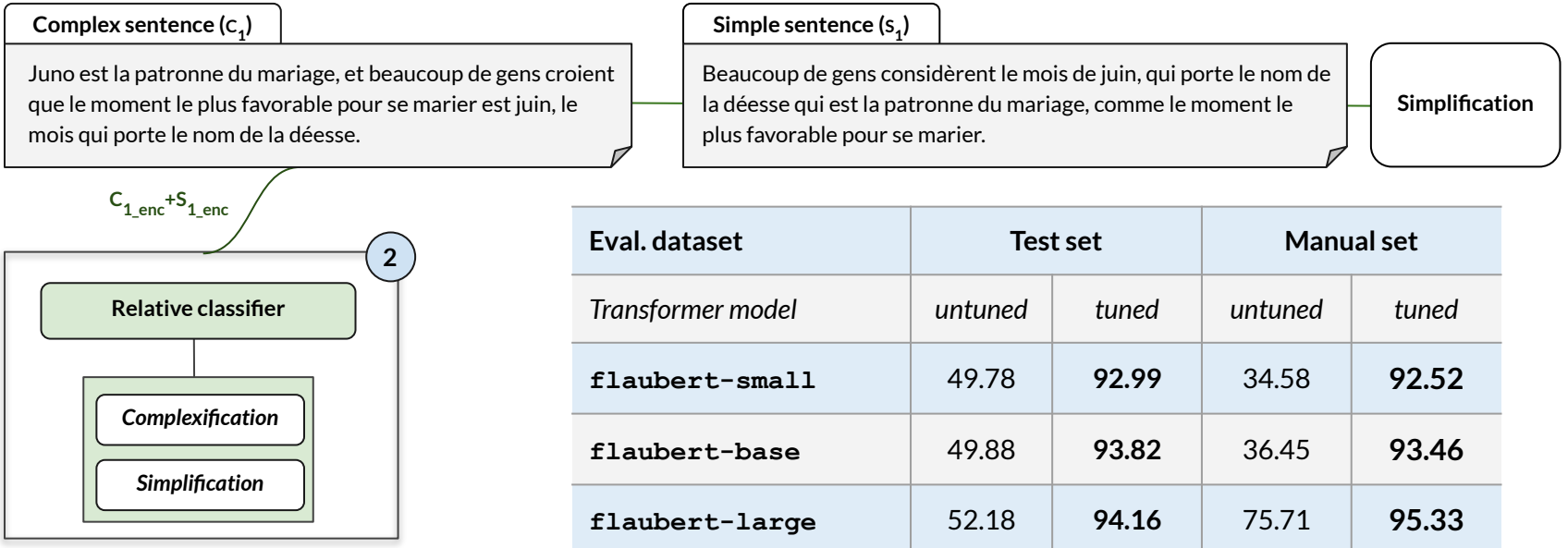

Eval. dataset	Test set		Manual set	
Transformer model	*untuned*	*tuned*	*untuned*	*tuned*
`flaubert-small`	49.78	**92.99**	34.58	**92.52**
`flaubert-base`	49.88	**93.82**	36.45	**93.46**
`flaubert-large`	52.18	**94.16**	75.71	**95.33**

Accuracy results in % obtained for the relative complexity classifier on the test and manual sets.

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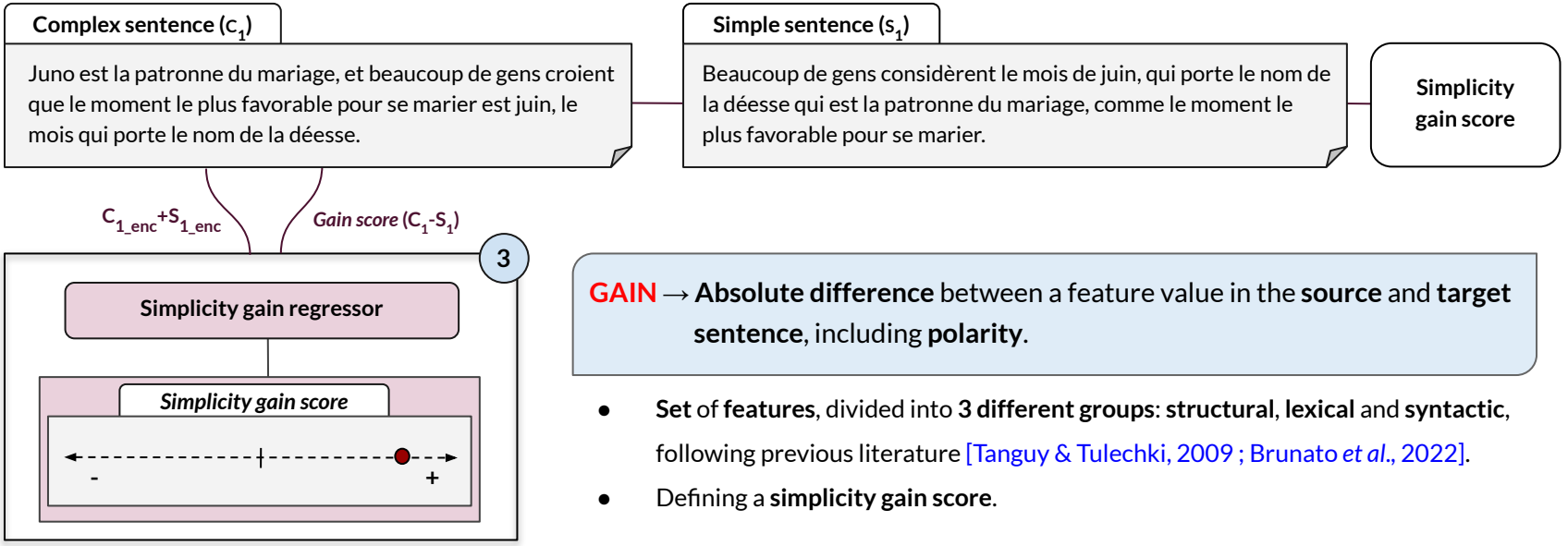

GAIN → **Absolute difference** between a feature value in the **source** and **target sentence**, including **polarity**.

- **Set** of **features**, divided into **3 different groups**: **structural**, **lexical** and **syntactic**, following previous literature [Tanguy & Tulechki, 2009 ; Brunato *et al.*, 2022].
- Defining a **simplicity gain score**.

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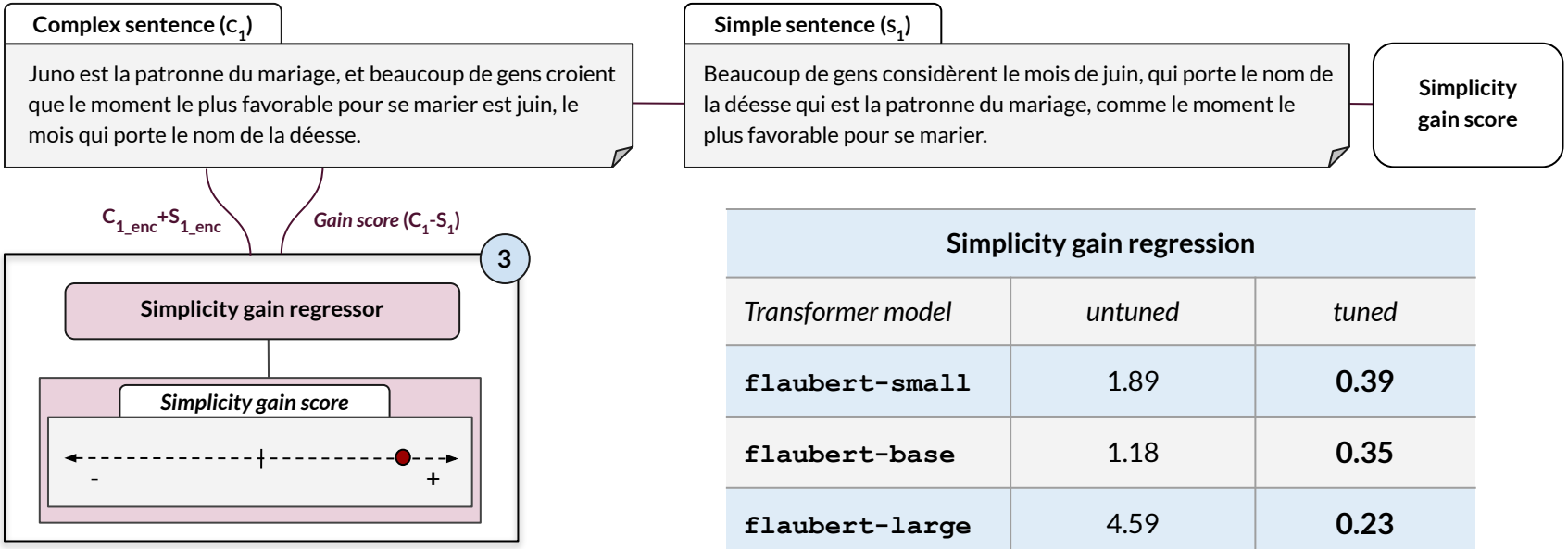
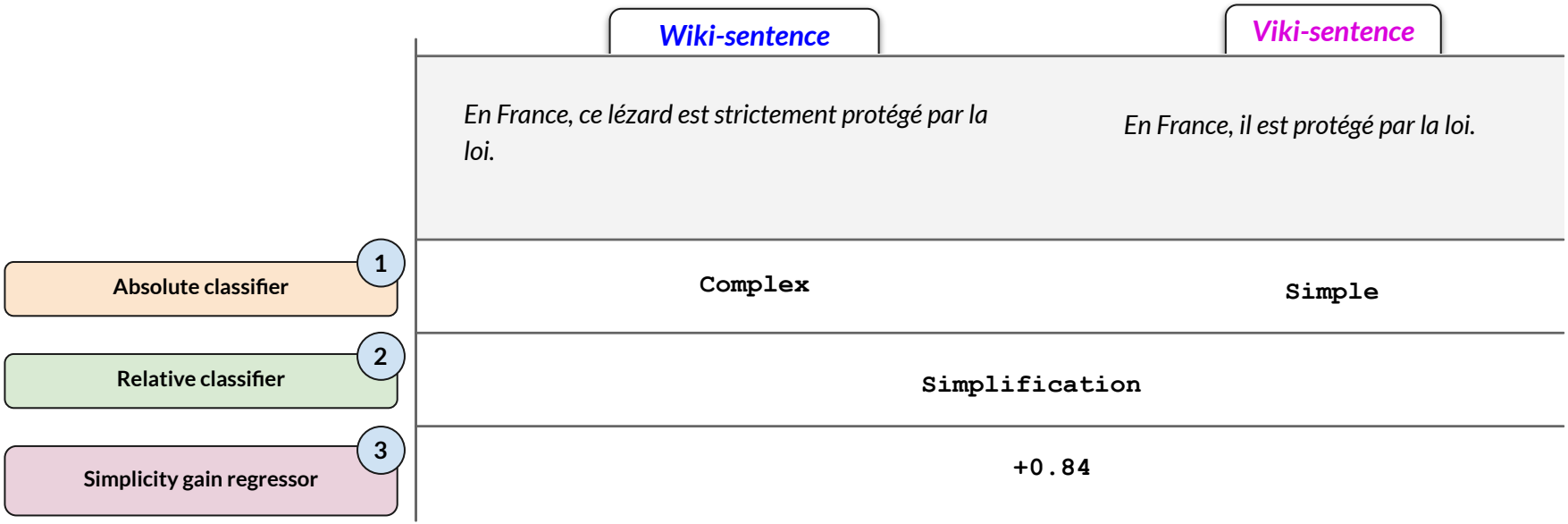


Simplicity gain regression		
Transformer model	*untuned*	*tuned*
`flaubert-small`	1.89	**0.39**
`flaubert-base`	1.18	**0.35**
`flaubert-large`	4.59	**0.23**

MSE scores obtained by the regressor on the test set.

Implementing trained SCA models on Wikipedia-Vikidia data



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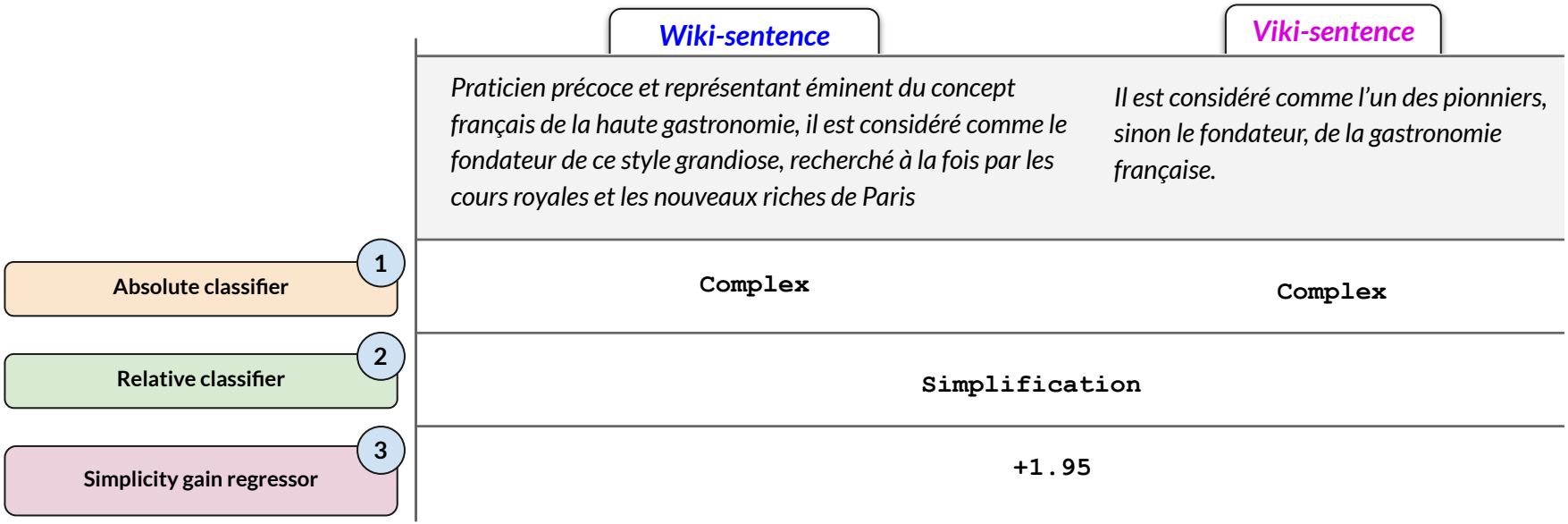

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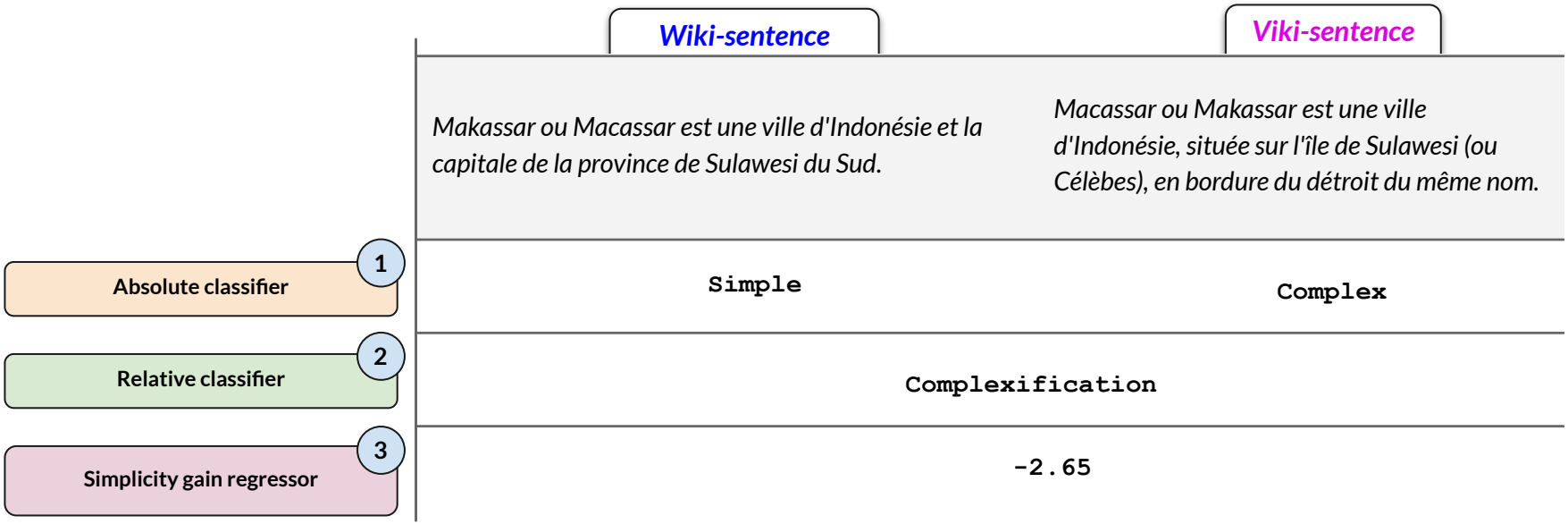
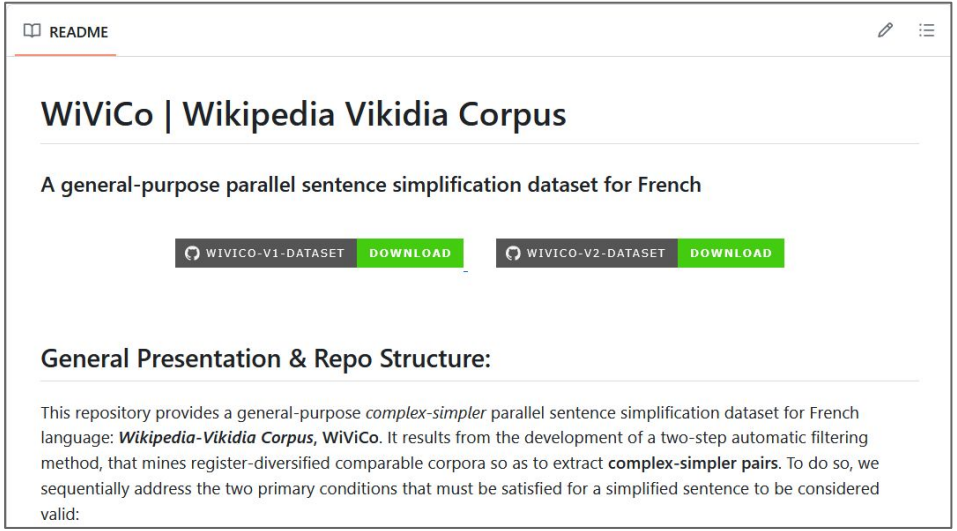


Wikipedia-Vikidia Corpus (WiViCo)

After the implementation of the triad of SCA models…



https://github.com/lormaechea/wivico

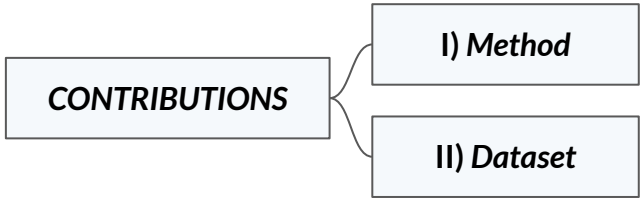
- General-purpose **parallel sentence simplification** dataset for **French language**.
- Current version (v.2): **~45*k* parallel complex-simple sentences.**
- Including **complex-simple standard** examples and:
  - `Complex-Complex → Simplification`
  - `Simple-Simple → Simplification`

4. Conclusions and further work

CONTRIBUTIONS

I) *Method*

- Introduction of a finer-grained approach for SCA.
- Suitable for ATS → Inherently a relative operation.



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II) *Dataset*

- General-purpose parallel sentence simplification dataset → WiViCo

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LIMITATIONS

- Use of Google Translate to obtain WikiLarge-Fr.
- Need to manually assess the correctness of the produced translations.

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LIMITATIONS

- Use of Google Translate to obtain WikiLarge-Fr.
- Need to manually assess the correctness of the produced translations.

FURTHER WORK

I) ATS *Ranking*

- Embed SCA models into a larger pipeline for ATS.
- Rank candidate simplified sentences: most simplified with best meaning preservation.

CONTRIBUTIONS

I) *Method*

- Introduction of a finer-grained approach for SCA.
- Suitable for ATS → Inherently a relative operation.

II) *Dataset*

- General-purpose parallel sentence simplification dataset → WiViCo

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LIMITATIONS

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FURTHER WORK

I) ATS *Ranking*

- Embed SCA models into a larger pipeline for ATS.
- Rank candidate simplified sentences: most simplified with best meaning preservation.

II) *Interpretability*

- Better interpretability of the simplicity gain score.
- Examine the correlation: linguistic features and human judgments.

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Thank you for your attention!

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