

Improving ASR output using a transformer-based Grammatical Error Correction approach

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DATASCI 266 Natural Language Processing with Deep Learning
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Motivation, Data and Challenges

ASR Challenges:

- Different styles, inflections,
- Diverse phonetics,
- Words are spelled phonetically without regard to context
- Emotion states,
- Regional Accents.

High cost associated with the use of common strategies.

- Grammatically Annotated Data is scarce, and hard to generate.
- Encoder-decoder is computationally expensive, and time consuming.

In this work:

- Experimented with Encoder only approach, considering :
 - Phonetics
 - Punctuation
 - NER
 - Spelling
 - Casing

I/O: I don't know why you're **hear** at all.

here

there

dear

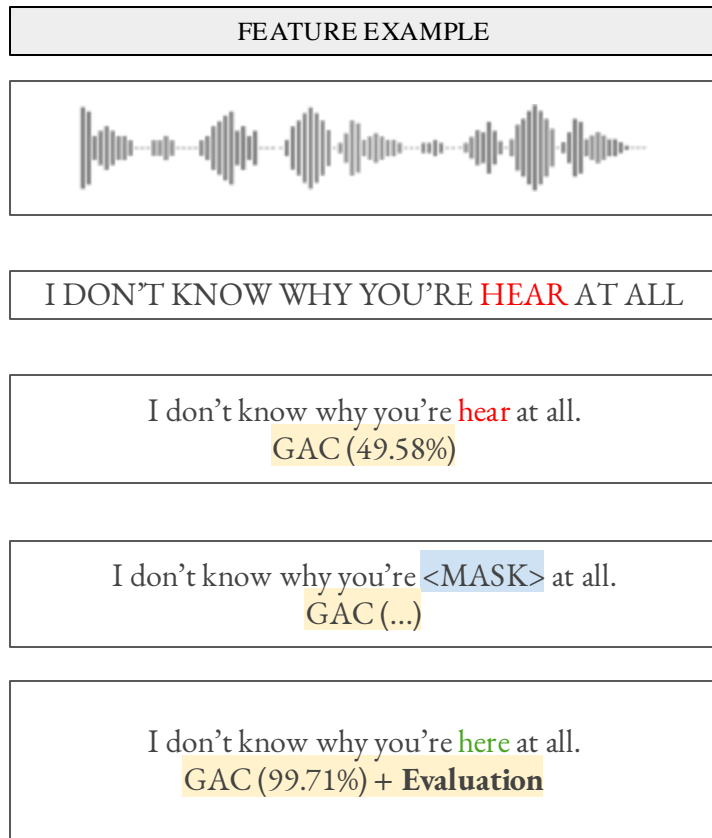
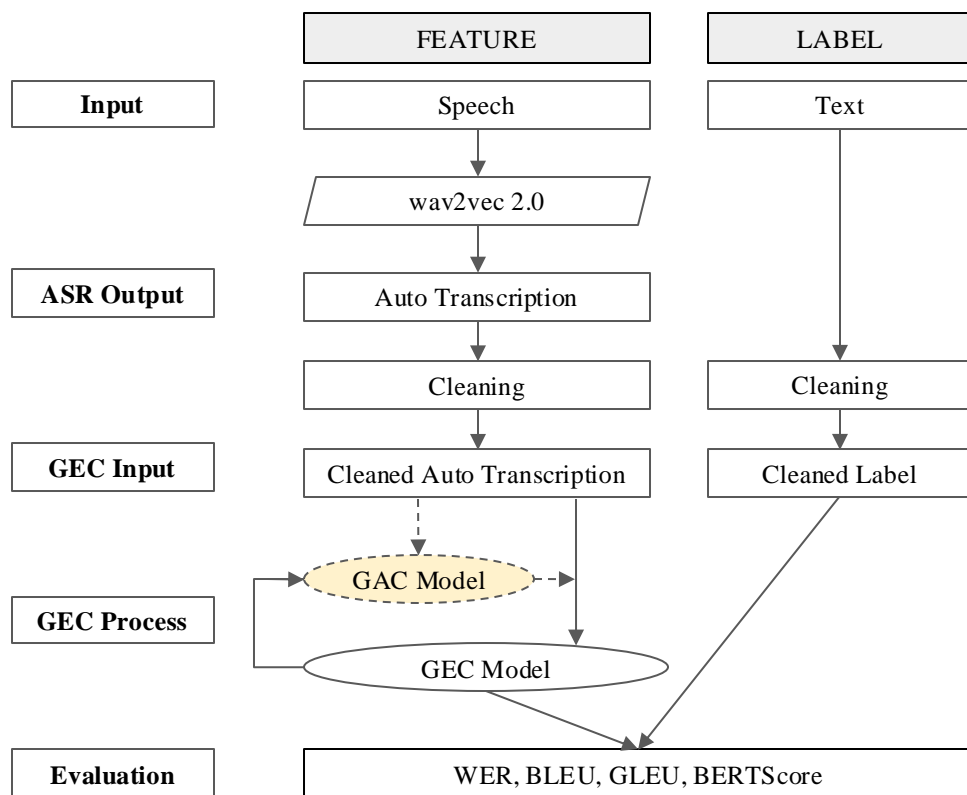
home

...

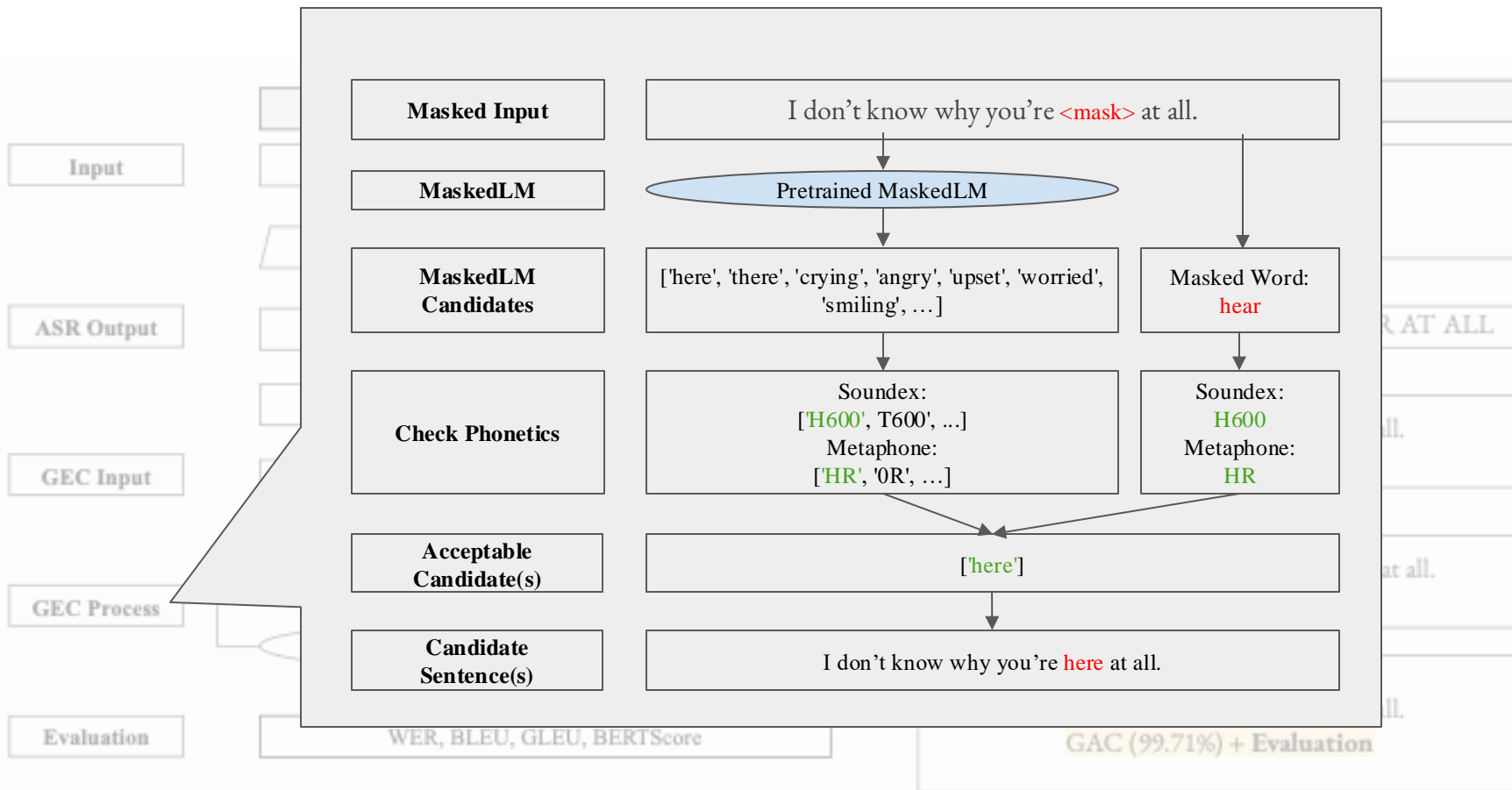
Datasets:

- CoLA
- EmoV_DB
- Arctic

Overall Process



RawGEC - Decision Process

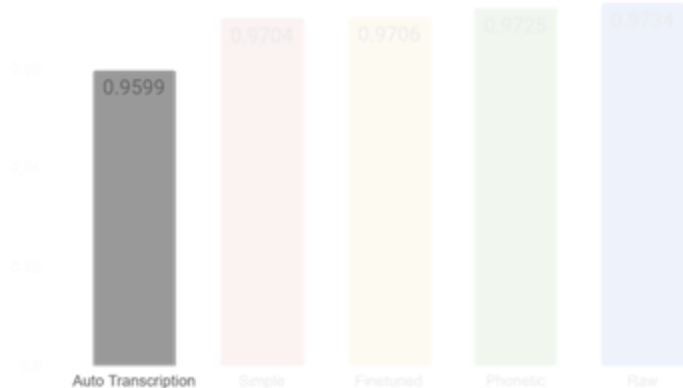


Autotranscription Example

WER



BERTScore F1



Input:

THE PRESIDENT IS AWAY IN
AUSTRALIA ATTENDED A
CONFERENCE<>

(GAC~ 0.3790)

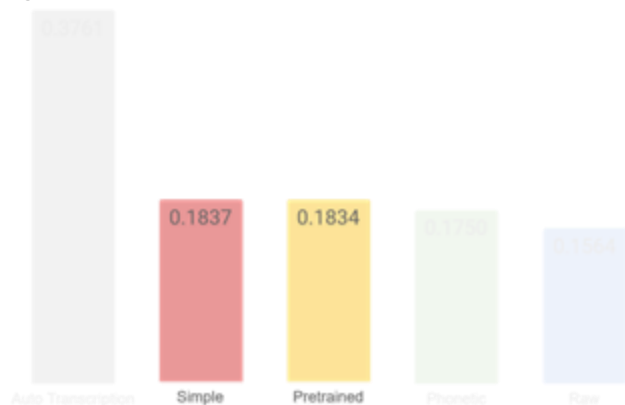
Label:

The President is away in Australia
attending a conference.

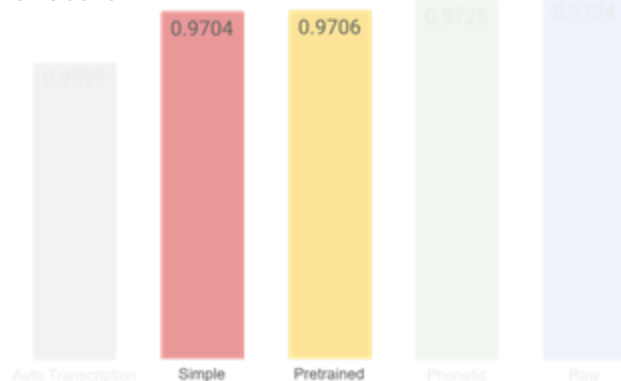
(GAC~ 0.9996)

SimpleGEC and PretrainedGEC

WER



BERTScore F1



PretrainedGEC:

The **president** is away in **australia** **RAL**
a conference<>

(GAC~ 0.7280)

Label:

The **President** is away in **Australia**
attending a conference.

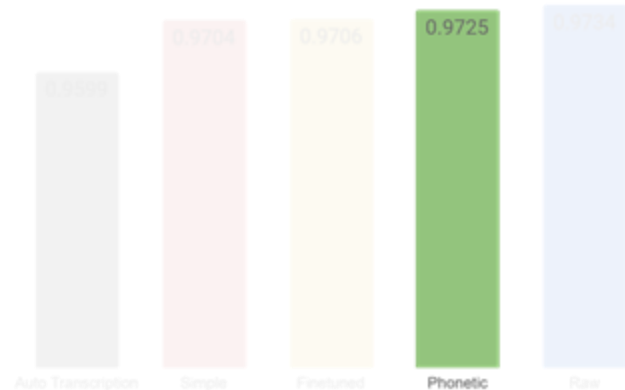
(GAC~ 0.9996)

PhoneticGEC

WER



BERTScore F1



PhoneticGEC:

The **president** is away in **australia**
attended a conference<>

(GAC~ 0.3790)

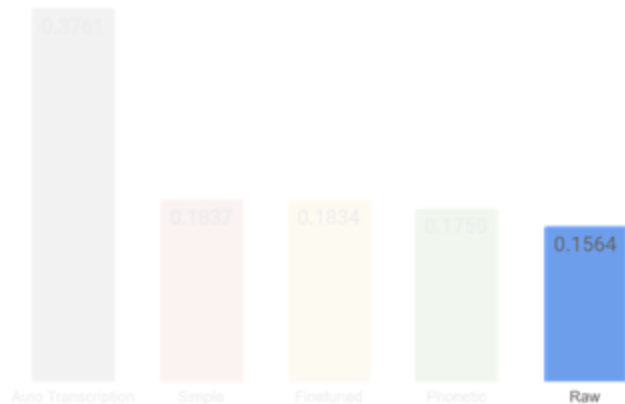
Label:

The **President** is away in **Australia**
attending a conference.

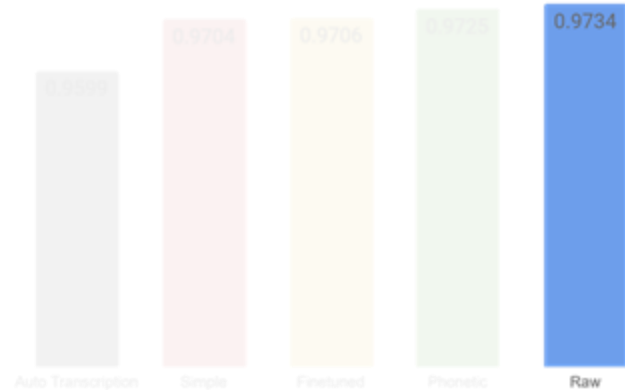
(GAC~ 0.9996)

RawGEC

WER



BERTScore F1



RawGEC:

The **president** is away in **Australia** attending a conference.

(GAC~ 0.9944)

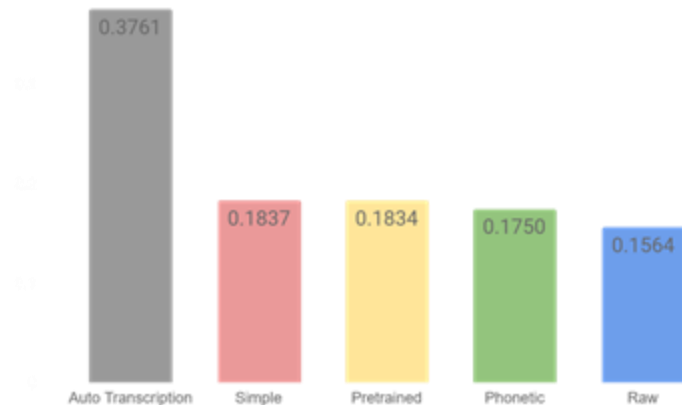
Label:

The **President** is away in **Australia** attending a conference.

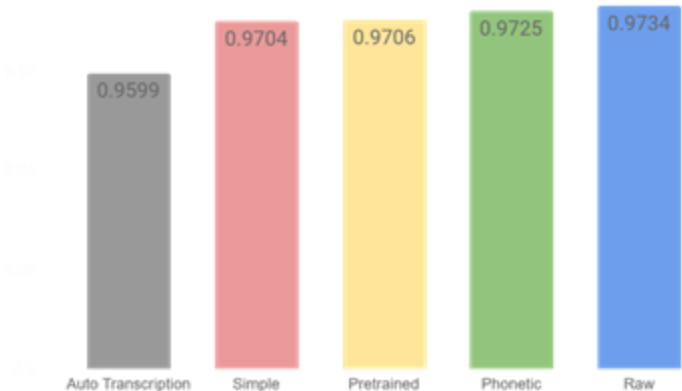
(GAC~ 0.9996)

Overall

WER



BERTScore F1



Best Performing GEC:

The **president** is away in Australia attending a conference.

(GAC~ 0.9944)

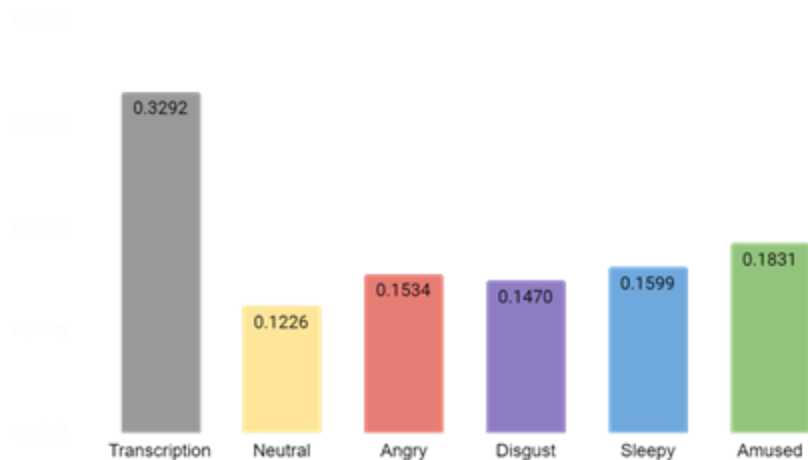
Label:

The **President** is away in **Australia** attending a conference.

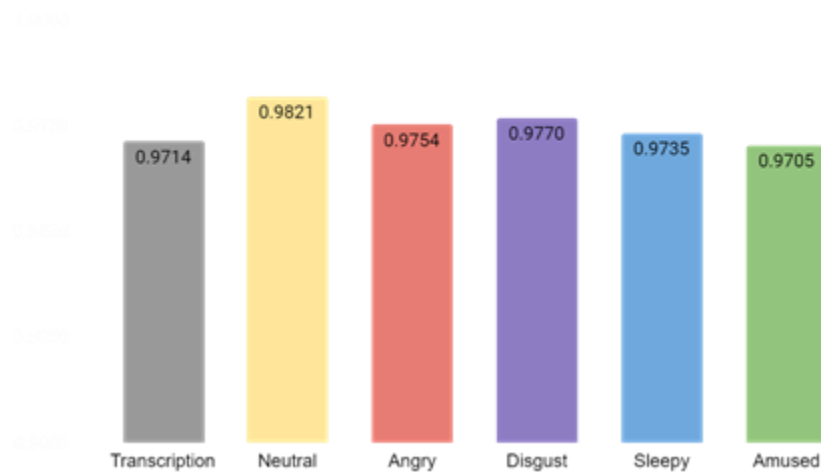
(GAC~ 0.9996)

Inspiration for Future Research

WER - Emotion

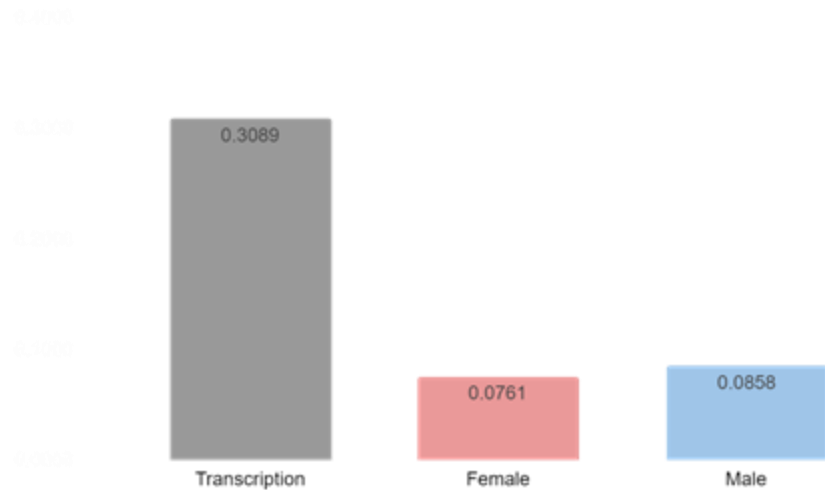


BertF1 Score - Emotion

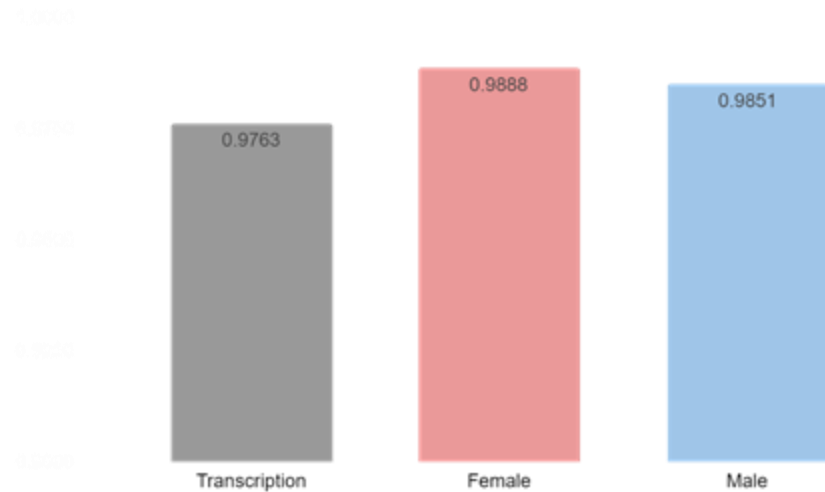


Inspiration for Future Research

WER - Gender



Bert F1 Score - Gender



Thank you! Questions?

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Sentence Examples

AutoTranscription	THE RESIDENT COMMISSIONERS AWAY IN AUSTRALIA	PHILIP STOOD UNDECIDED HIS EARS STRAINED TO CATCH THE SLATEST SOUND
Label	The Resident Commissioner is away in Australia.	Philip stood undecided, his ears strained to catch the slightest sound.
Best Model	RawGEC 0.25	RawGEC 0.25
BM Prediction	The resident commissioners away in Australia.	Philip stood undecided his ears strained to catch the slightest sound.
Alternative Model	SimpleGEC / FinetunedGEC	SimpleGEC
Other Prediction	The resident is away in australia. / The resident commissioners are in australia.	Philip stood, undecided. His ears strained to catch the slatest sound.
Obs	<ul style="list-style-type: none">- None recognized <i>Resident Comissioner</i> as an Named Entity,- misaligned : needed one token position added for full correction,- BM recognized and capitalized Australia.	<ul style="list-style-type: none">- Noise introduced from “cleaning model”, wrong punctuation.- Phonetic approach working with slightest vs. SLATEST.