Data Quality Matters: Suicide Intention Detection on Social Media Posts Using RoBERTa-CNN

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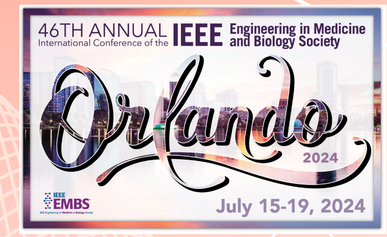

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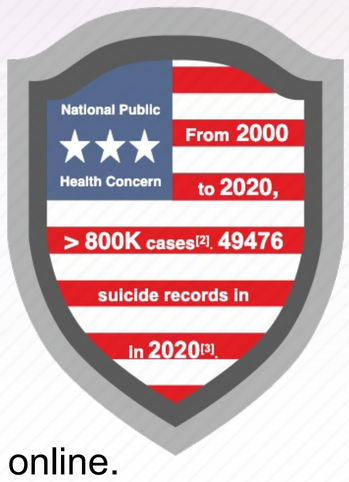
OBJECTIVES

Detect suicide intention at the early stage by using RoBERTa-CNN to analyze social media posts.

INTRODUCTION

Motivation: Suicide is public concern, intention detection is important. EX: Worldwide **1.53 million** cases in 2020[1].



Why RoBERTa backbone?

- It extracts semantics and contextual features well.
- It succeeds in various NLP tasks.
- It performs sentence analysis.
- It is faster and better than other versions of BERT.

Why analyzing social media posts?

- Today, everybody express themselves freely online.

Why RoBERTa-CNN?

- It improves the performance
- It overcomes the constraints of RoBERTa.

DATASET

Data source: Reddit SuicideWatch and Depression channel.

We use **35,270** suicides and **74,770** non-suicides.

We clean data by human labors and **OpenAI API**, which is powerfully and efficiently.

Data Processing:

- Removing all noise symbols;
- Removing all non-English characters;
- Deleting all sentence fragments.

Table 1. Data Samples of the Suicide and Depression Detection Dataset

Suicide	1.	I feel worthless and useless to everyone. I'm a burden what's the point of being here?
	2.	I feel like overdosing again. I can't live like this.
	3.	I feel bad. I just wanna stop existing.
Non-suicide	1.	Would you ever trust your school therapist? I myself wouldn't tbh, there doesn't seem to be a lot of confidentiality.
	2.	Is it just me or is apple cider really good? it is one of the best drinks I think.
	3.	Why is everyone talking about us? I'm genuinely confused what exactly did we do?

METHODOLOGY

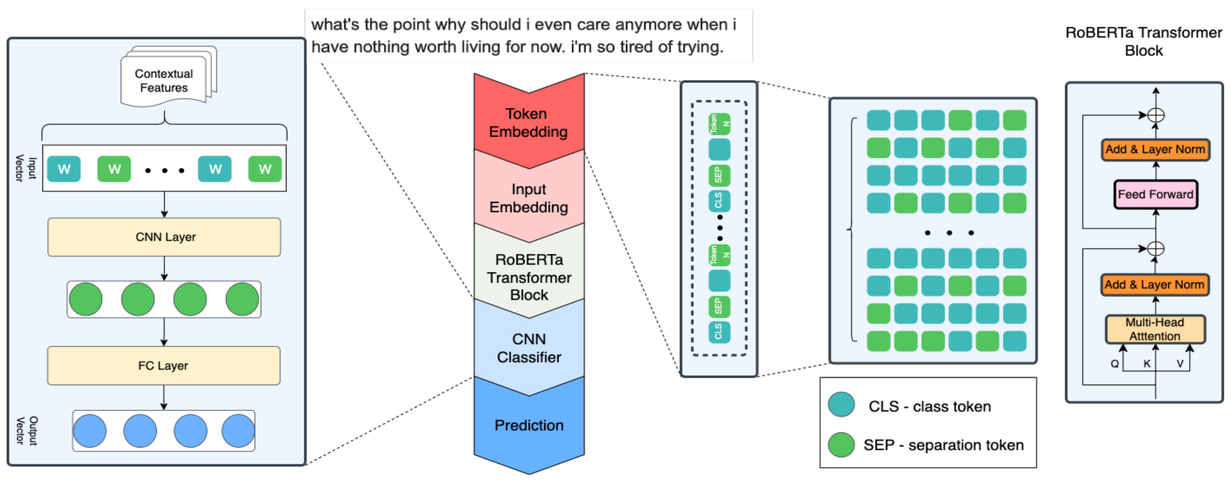


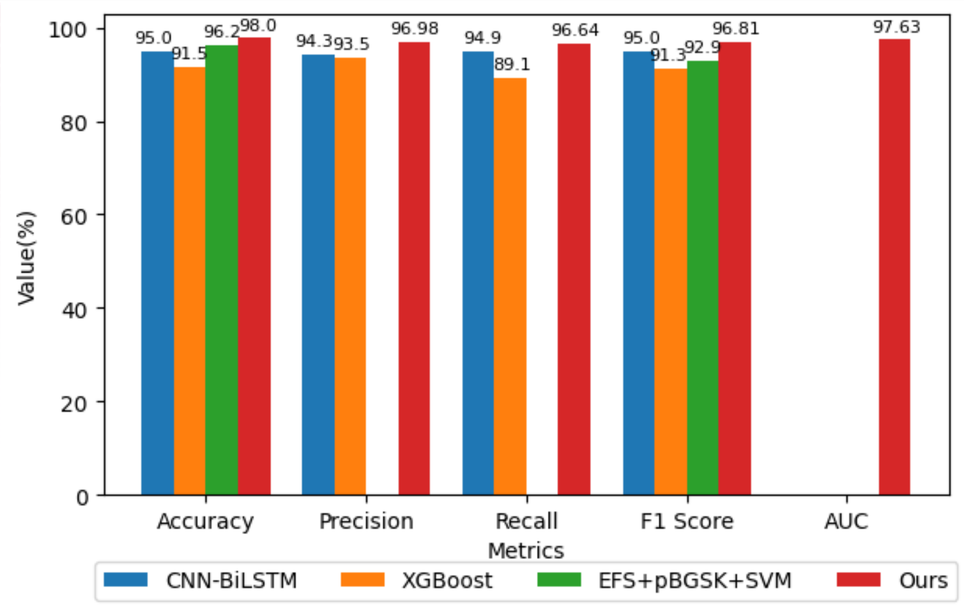
Fig. 1. shows that RoBERTa-CNN contains the RoBERTa backbone and CNN head. RoBERTa gets global features, while CNN focuses on the local ones.

- RoBERTa extracts textual features (complex contextual information + sophisticated linguistic patterns).
- CNN head empowers the model to obtain linguistic patterns and extract speech-related features better.

EXPERIMENT & RESULTS

THE EXPERIMENTAL RESULTS ON SDD DATASET.

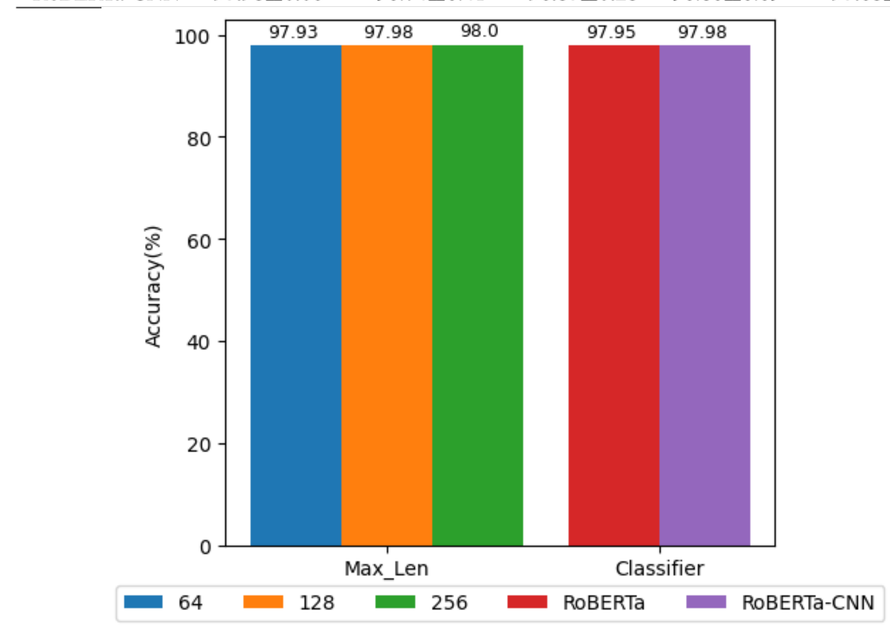
Models	Accuracy(%)	Precision(%)	Recall(%)	F1 Score(%)	AUC (%)
CNN-BiLSTM [25]	95.00	94.30	94.90	95.00	-
XGBoost [25]	91.50	93.50	89.10	91.30	-
EFS + pBGSK + SVM [26]	96.20	-	-	92.90	-
Ours	**98.00±0.09**	**96.98±0.22**	**96.64±0.30**	**96.81±0.14**	**97.63±0.13**



EXPERIMENT & RESULTS

THE ABLATION STUDY RESULTS. THE UPPER TABLE IS TO TUNE MAX_LEN, AND THE BOTTOM ONE IS TO COMPARE WITH THE ORIGIN ROBERTA. THE VALUE FORMAT IS MEAN±STD.

Max_Len	Accuracy (%)	Precision(%)	Recall (%)	F1 Score (%)	AUC(%)
64	97.93±0.10	**96.99±0.45**	96.46±0.63	96.72±0.15	97.54±0.22
128	97.98±0.06	96.74±0.41	**96.87±0.28**	96.80±0.09	**97.68±0.06**
256	**98.00±0.09**	96.98±0.22	96.64±0.30	**96.81±0.14**	97.63±0.13
Classifier	Accuracy (%)	Precision(%)	Recall (%)	F1 Score (%)	AUC(%)
RoBERTa	97.95±0.06	**97.03±0.39**	96.70±0.39	**96.86±0.05**	97.66±0.11
RoBERTa-CNN	**97.98±0.06**	96.74±0.41	**96.87±0.28**	96.80±0.09	**97.68±0.06**



CONCLUSION

- RoBERTa-CNN can detect suicide intention accurately by analyzing social media posts.
- Removing the noise from the dataset improves the data quality significantly.
- High-quality data empowers the neural network to get high accuracy simply.
- Longer text embedding benefits in the model.

REFERENCES

[1] Jose Manoel Bertolote and Alexandra Fleischmann. Suicide and psychiatric diagnosis: a worldwide perspective. *World psychiatry*, 1(3):181, 2002.

[2] "*NCHS Data Brief, Number 433, March 2022*". CDC. Retrieved March 3, 2022.

[3] "*Suicides in the U.S. reached all-time high in 2022, CDC data shows*". NBC News. August 10, 2023. Retrieved August 11, 2023.

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