

Natural Language Processing in Personality Traits and Basic Human Values Estimation of Social Media Users

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Examination Board:

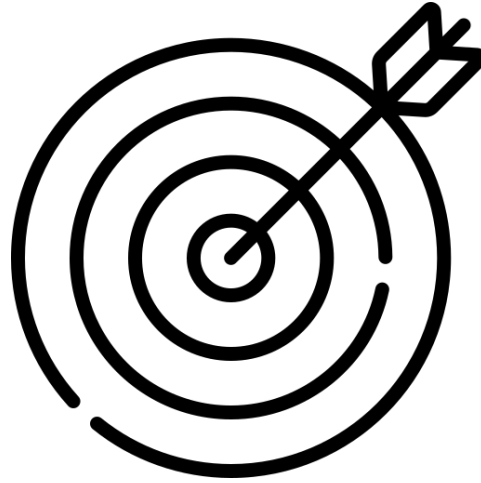
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Viviana Patti, Università di Torino

Derwin Suhartono, BINUS University of Jakarta



What is the main goal of the thesis?

Natural Language Processing models assess
psychometrics from language

Social media links these scores to influence
mechanisms

Presentation Outline



Introduction to NLP and traits assessment



Lexical hypothesis and personality in written language



Influencing mechanism through language in social media



Conclusions and future research directions



NLP and traits assessment

Natural Language Processing

Natural language processing (NLP) is a branch of computer science, **artificial intelligence** and **linguistics** that deals with the interaction between computers and human (natural) language.

In recent years there has been a shift in NLP **towards deep learning methods**. They are effective for many NLP tasks and have become the standard approach.

Supervised and **semi-supervised learning** can be used to **learn representations** from data that could be **transferred** to many different tasks.

Arrays to encode words

The cat sat on the mat

The: [0 1 0 0 0 0 0]

cat: [0 0 1 0 0 0 0]

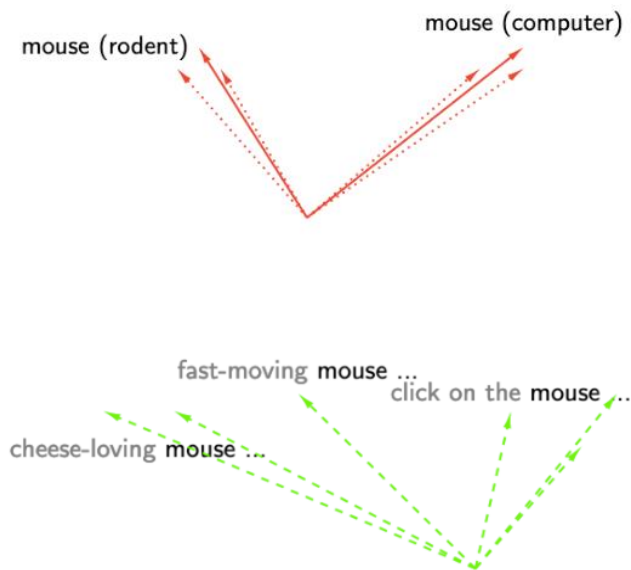
sat: [0 0 0 1 0 0 0]

on: [0 0 0 0 1 0 0]

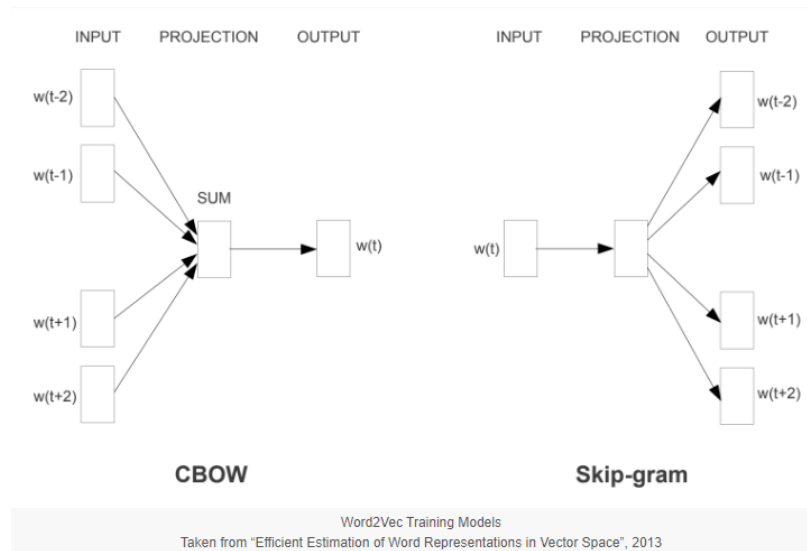
the: [0 0 0 0 0 1 0]

mat: [0 0 0 0 0 0 1]

Arrays to encode words

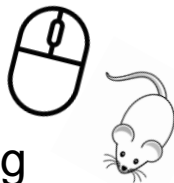


Stanford AI



Word embeddings evolution

Same word
different meaning
same representation



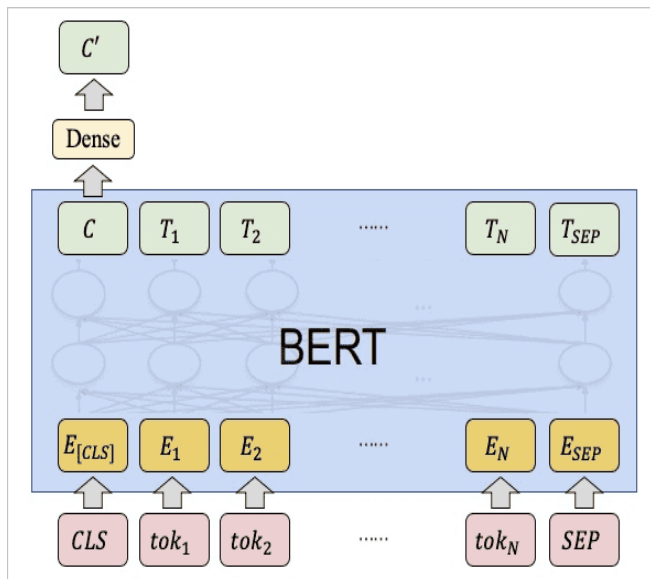
Same word
same meaning
different context
different representation



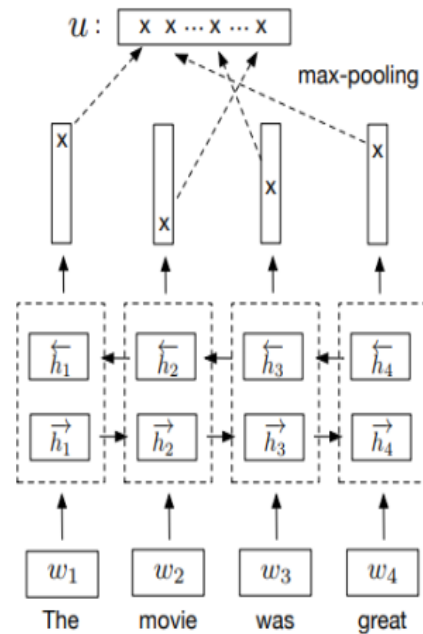
Same word
same meaning
different context
same representation



From word to sentence embeddings

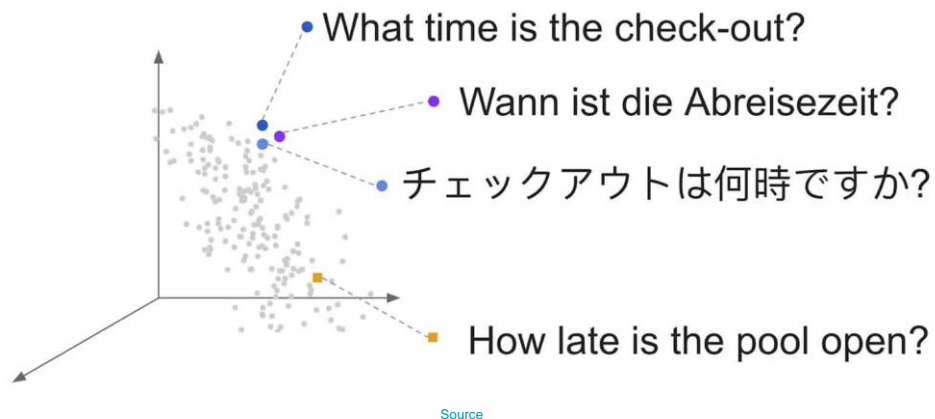


CLS BERT



InferSent

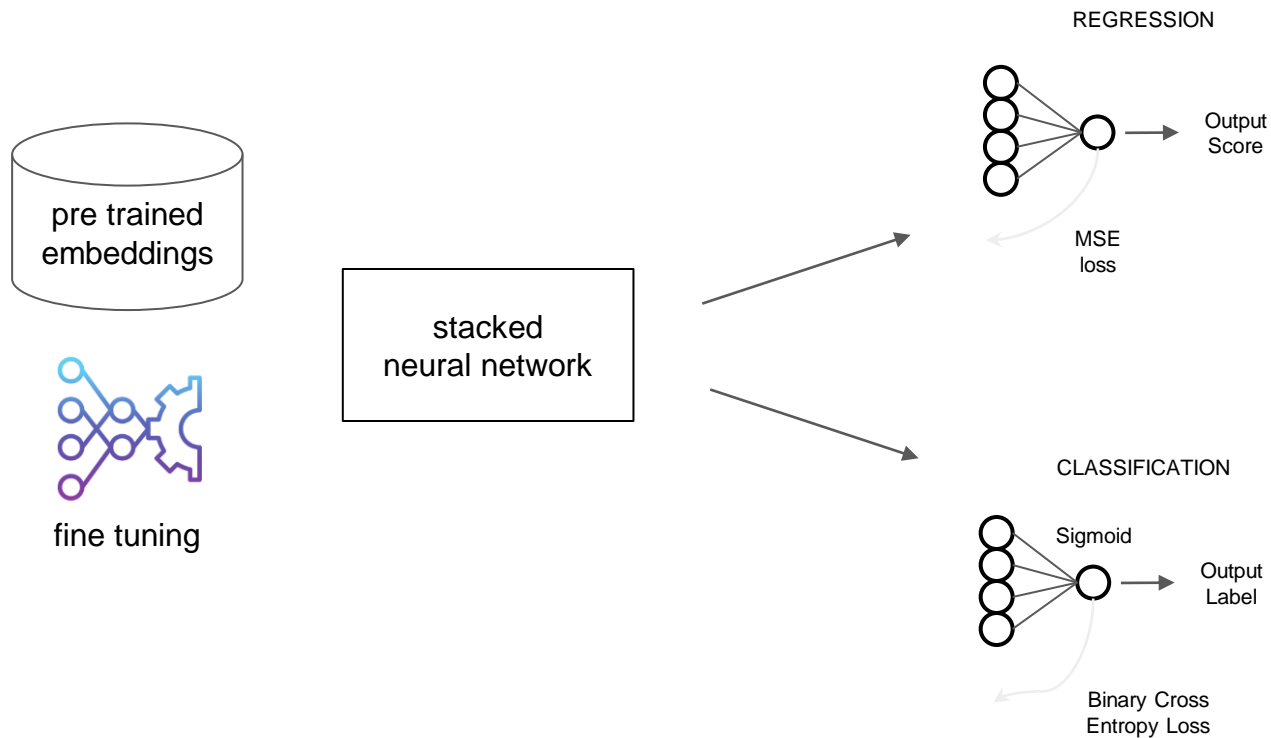
Multilingual sentence embeddings

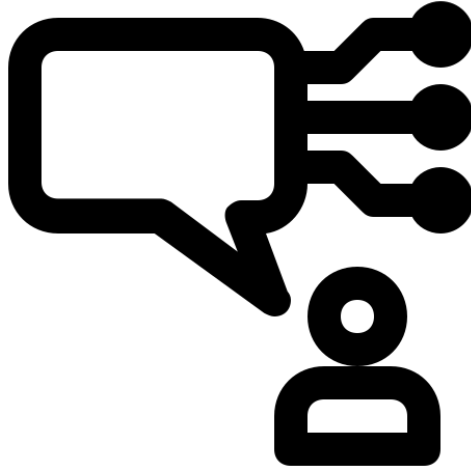


Sentence embeddings in **multilingual** similarity

Multilingual human values and personality traits

Regression on traits and classification





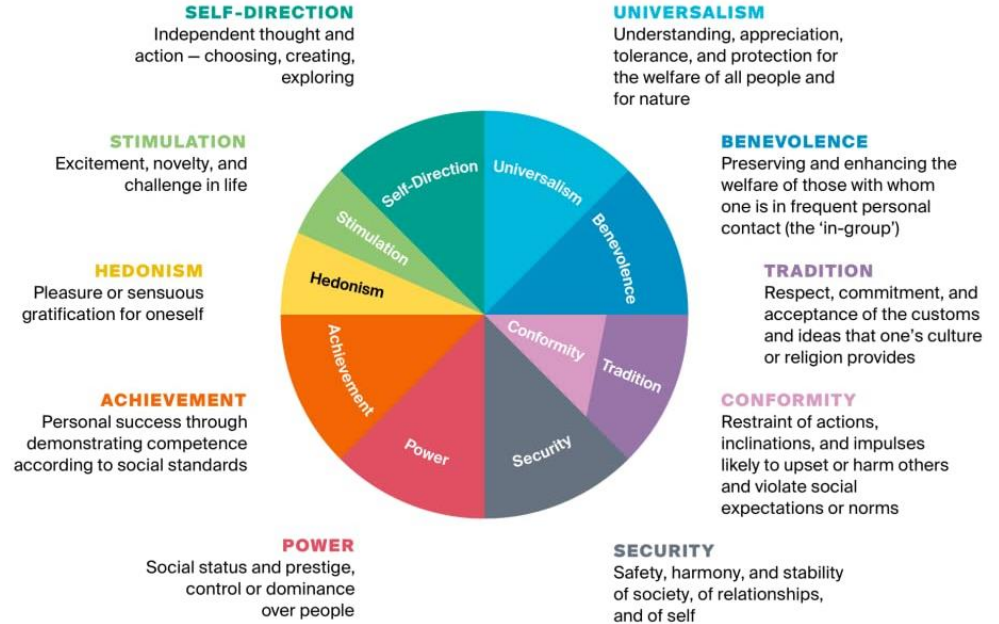
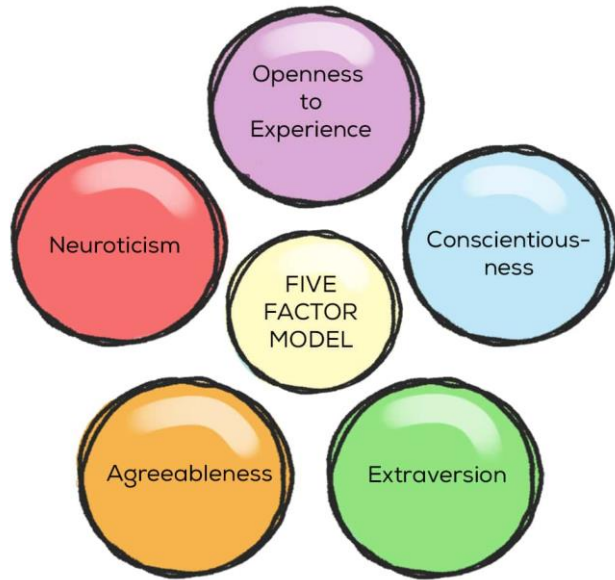
Lexical hypothesis and personality in written language

Lexical hypothesis

The lexical hypothesis is a concept in psychology and **personality research** that suggests that important individual **differences** in personality are **encoded in language**.

According to this hypothesis, **the words people use** to describe themselves and others can provide valuable information about their **personality traits, attitudes, and emotional states**.

Five Factor Model and Basic Human Values

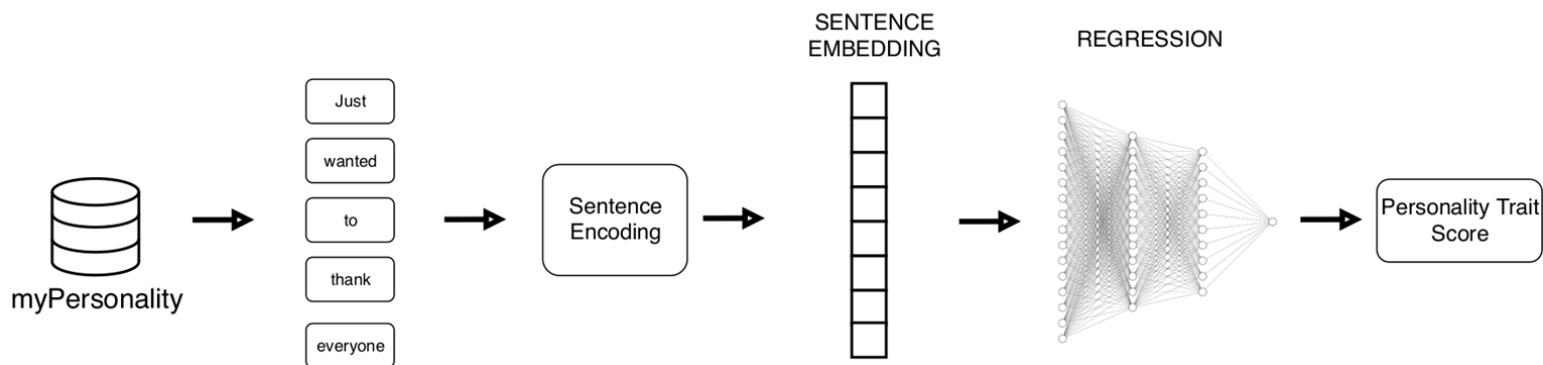


Research Questions

Is there a natural language processing model that is effective in the assessment of personality traits from written text?

Can we make this model work multilingual and so make it work in a multicultural setup without gaining errors?

Multilingual Transformer-Based Personality Traits Estimation



Multilingual Transformer-Based Personality Traits Estimation

	Mean Squared Error (MSE)				
	OPE	CON	EXT	AGR	NEU
MTPTE Multilingual	0.1759	0.3045	0.4750	0.2667	0.2911
MTPTE	0.2166	0.3556	0.5271	0.3117	0.3576
FastText + Neural Network	0.3917	0.4824	0.6100	0.3643	0.5677
IBM Personality Insights	0.3769	0.5550	0.7483	0.4289	0.9303
Transformer + SVM	0.3867	0.5596	0.7579	0.5889	0.7240
Carducci et al. [3]	0.3316	0.5300	0.7084	0.4477	0.5572
Quercia et al. [4]	0.4761	0.5776	0.7744	0.6241	0.7225

[3] Carducci, Giulio & Rizzo, Giuseppe & Monti, Diego & Palumbo, Enrico & Morisio, Maurizio. (2018). TwitPersonality: Computing Personality Traits from Tweets Using Word Embeddings and Supervised Learning. Information (Switzerland). 9. 10.3390/info9050127.

[4] D. Quercia, M. Kosinski, D. Stillwell and J. Crowcroft, "Our Twitter Profiles, Our Selves: Predicting Personality with Twitter," 2011 IEEE Third International Conference on Privacy, Security, Risk and Trust and 2011 IEEE Third International Conference on Social Computing, Boston, MA, 2011, pp. 180-185, doi: 10.1109/PASSAT/SocialCom.2011.26.

Multilingual Transformer-Based Personality Traits Estimation

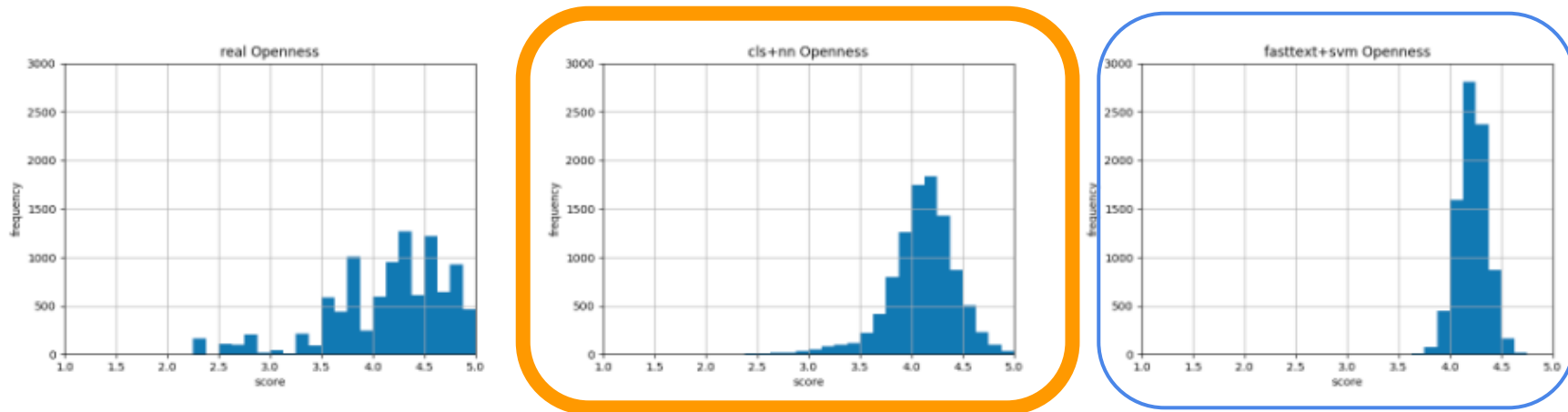
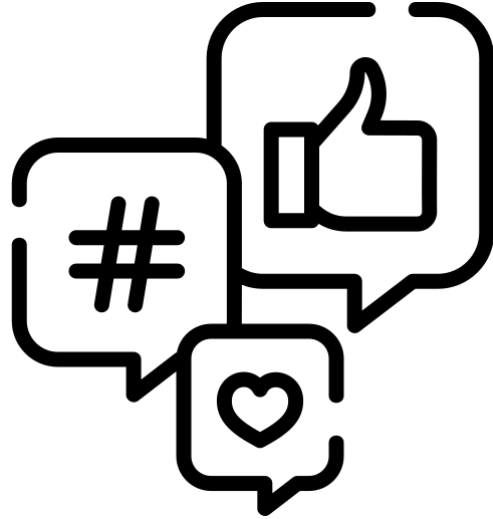


Figure 5. Openness. Histograms representing data distribution of Gold Standard on the left, our model result in the center, previous state of the art by Carducci et al. [8].



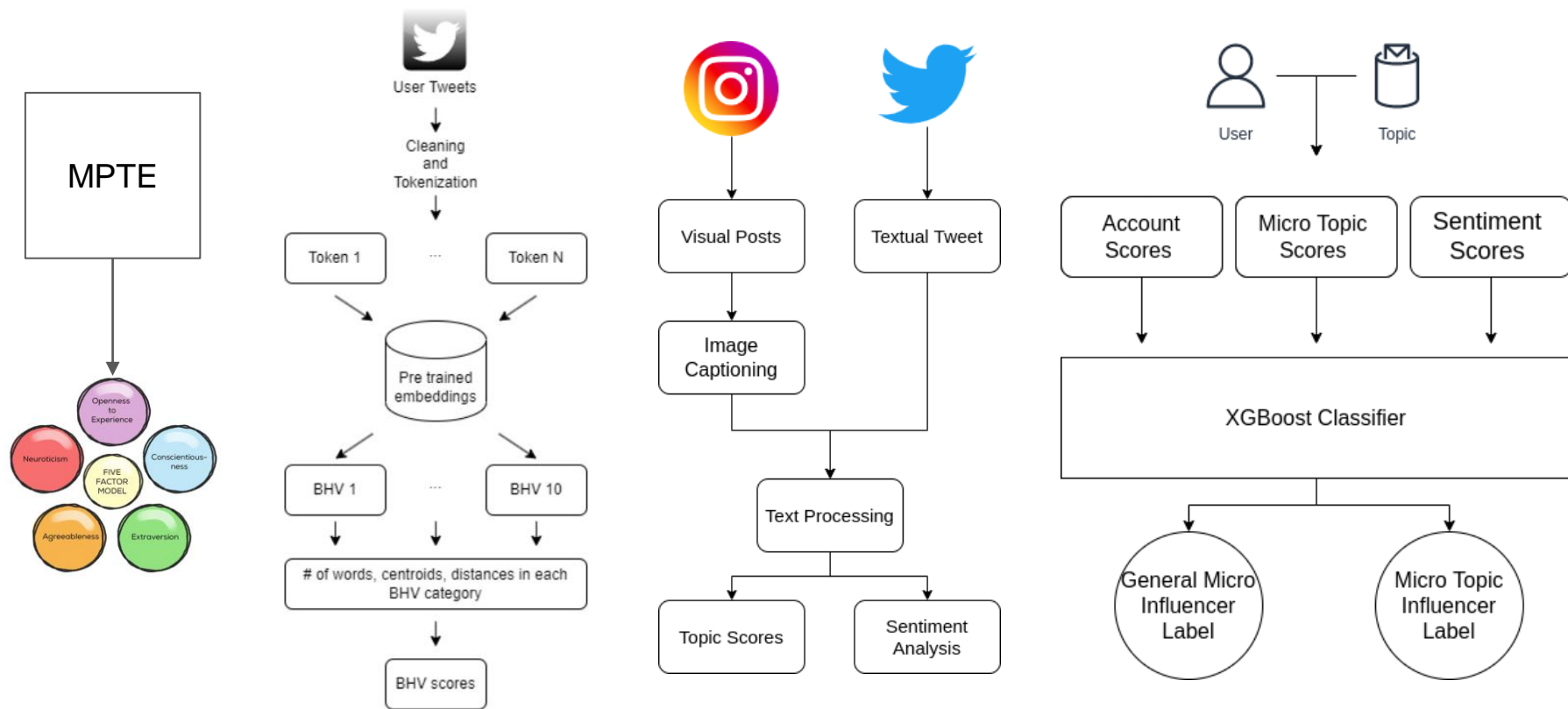
Influencing mechanism through
language in social media

Applications with Micro Influencer and Fake News Spreaders

What if we **combine personality** assessment from **written text** with **social media** graphs and scores in a **multi-input** deep learning model?

Do **personality traits** and **basic human values** play a role in the **influence mechanisms** of **micro-influencers** and **fake news spreaders** on social media platforms?

Mining Micro Influencers with Multi Input and Multi Modal



Mining Micro Influencers with Multi Input and Multi Modal

Validation Metrics

Model	Accuracy	Precision	Recall	F1
Mimic + XGBoost*	0.93	0.93	0.93	0.93
BERT based**	0.79	0.81	0.80	0.80
SVM	0.88	0.90	0.88	0.89
MLP	0.63	0.62	0.63	0.62

[*] Tianqi Chen and Carlos Guestrin. 2016. XGBoost: A Scalable Tree Boosting System. In Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD '16). Association for Computing Machinery, New York, NY, USA, 785–794.

[**] Jacob Devlin, Ming-Wei Chang, Kenton Lee, and Kristina Toutanova. 2019. BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding. In Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers), pages 4171–4186, Minneapolis, Minnesota. Association for Computational Linguistics.



Fake News Spreaders

Functional Diagram



Users' tweets
labeled as
reporting checked
fake news

Stance
classification and
Gold Standard
dataset definition

NLP model

Users labeled as
Fake News
Spreaders

Stance classification and Gold Standard dataset definition



CoAID¹ dataset
with checked fake
news and related
tweets

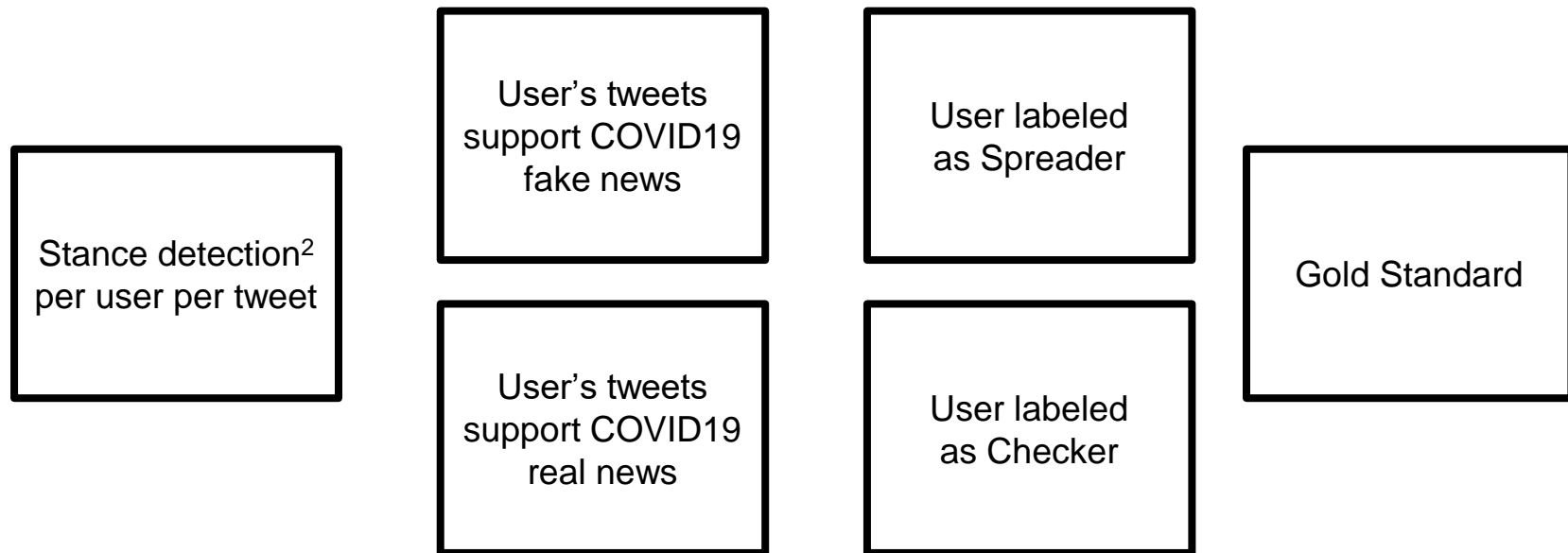
CoAID tweets
authors list

Download
of Twitter authors
timelines

Filter out tweets
not containing
fake/real news
about COVID-19

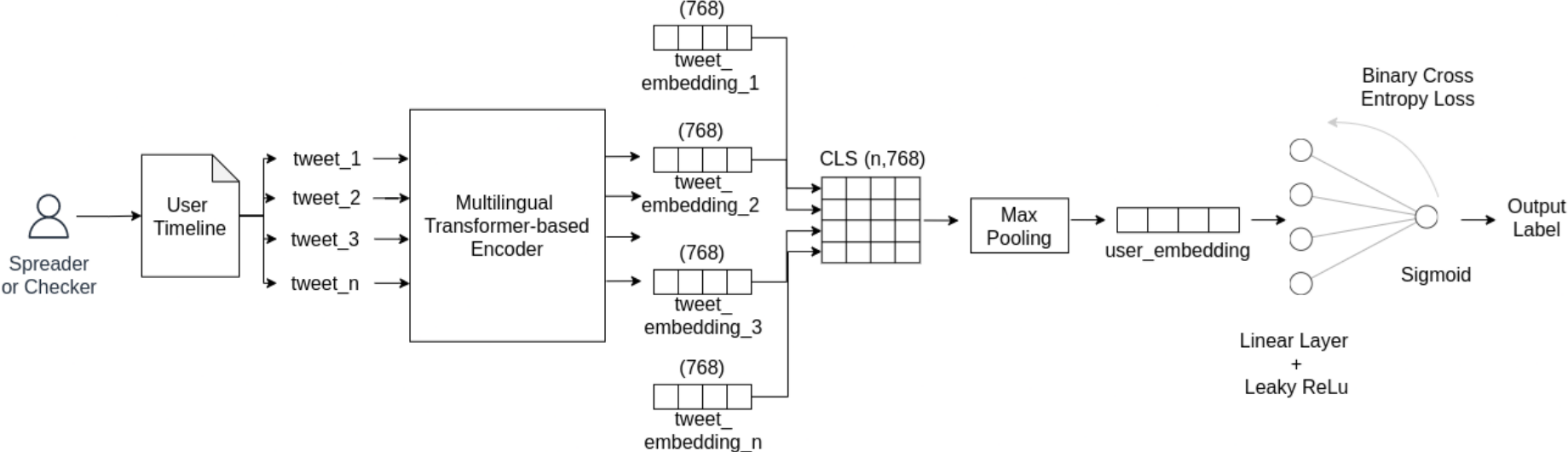
[1] <https://github.com/cuilimeng/CoAID>

Stance classification and Gold Standard dataset definition



[2] <https://cloud.gate.ac.uk/shopfront/displayItem/stance-classification-multilingual>

NLP model

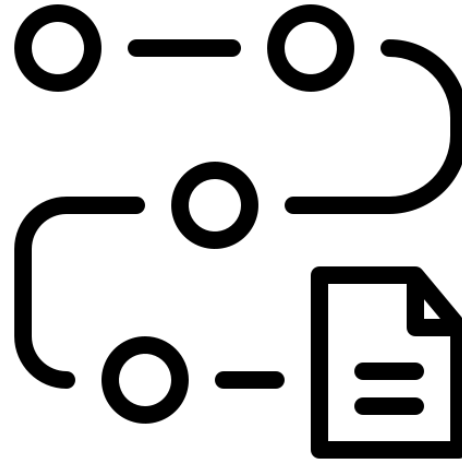


Mining Micro Influencers with Multi Input and Multi Modal

Validation Metrics

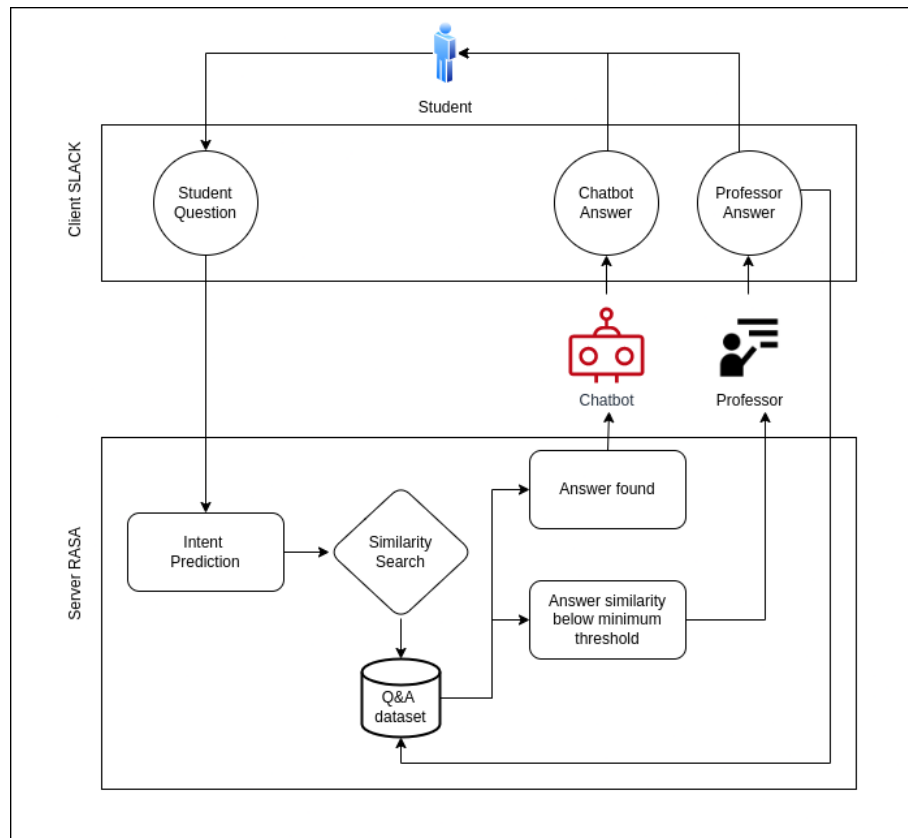
Model	precision	recall	f_1
Fake News Spreader Classifier	0.8042	0.8110	0.8076
RF Fake News Spreader Classifier	0.7977	0.8104	0.804
Giachanou et al. [29]	0.7789	0.7536	0.7660
Mixed Fake News Spreader Classifier	0.7364	0.7430	0.7234

[29] Giachanou, A.; Rissola, E.A.; Ghanem, B.; Crestani, F.; Rosso, P. The role of personality and linguistic patterns in discriminating between fake news spreaders and fact checkers. International Conference on Applications of Natural Language to Information Systems. Springer, 2020, pp. 181–192.



Conclusions and
future research directions

From processing to interaction in educational chatbots



Future research directions

A broader spectrum of emotions, psychometrics and linguistic features

Multimodal: image, sound, video

A worldwide translation map for cultural differences values

Conclusions

We explored **natural language processing and machine learning for social media analysis**, providing solutions for **personality trait estimation, micro-influencer mining, fake news spreaders classification, and educational chatbots**.

The research demonstrates **the potential** of these techniques **to understand user behaviour**, identify influencers and spreaders of fake news, and improve education.

Ethical considerations and responsible use should also be addressed.

Our work contributes to the field of **social media analysis** research, benefiting **marketing** campaigns, **misinformation** detection and **student** learning.

Publication List



Multilingual Transformer-Based Personality Traits Estimation - Information - Leonardi, Simone; Monti, Diego; Rizzo, Giuseppe; Morisio, Maurizio



Mining micro-influencers from social media posts - Leonardi, Simone; Monti, Diego Michele; Rizzo, Giuseppe; Morisio, Maurizio - SAC '20: The 35th ACM/SIGAPP Symposium on Applied Computing;

MIMIC: a Multi Input Micro-Influencers Classifier - Leonardi, Simone; Ardito, Luca. 16th International Conference on Social Media Analysis and Data Mining, May 26-27, 2022 in Barcelona.



Automated Classification of Fake News Spreaders to Break the Misinformation Chain - Information - Leonardi, Simone; Rizzo, Giuseppe; Morisio, Maurizio



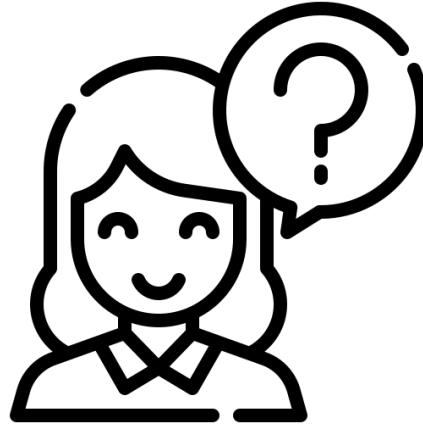
Educational Chatbot to Support Question Answering on Slack - Leonardi, Simone; Torchiano, Marco. 2022. Methodologies and Intelligent Systems for Technology Enhanced Learning, 12th International Conference. Jul 13, 2022 - Jul 15, 2022. L'Aquila. Springer.

Automated Test Selection for Android Apps Based on APK and Activity Classification - IEEE ACCESS - Ardito, Luca; Coppola, Riccardo; Leonardi, Simone; Morisio, Maurizio; Buy, Ugo

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Q&A