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EDM-RoBERTa (Enhancing the Dependency Mechanism of RoBERTa)

YU-TING LEE[1], YEN-CHING CHANG[2]

[1] Department of Medical Informatics, Chung Shan Medical University, Taiwan
[2] Department of Medical Informatics, Chung Shan Medical University, Taiwan

Corresponding author: Yen-Ching Chang (e-mail: nicholas@csmu.edu.tw).

ABSTRACT A Sentiment Analysis plays a very important role in the prediction and response of social issues, especially for an outburst of disease and racism. In order to analyze public sentiment on certain issue, Single-headed Recurrent Neural Network (SHA-RNN), and Transformer are considered. Given that short-term dependencies and long-term dependencies of text can provide different benefits, out model is implemented through Transformer with Bidirectional Encoder Representation from Transformers (BERT) as its encoder, and with Boom Layer from SHA-RNN as its modified feed forward neural networks. Compared with the original Transformer and SHA-RNN, our proposed model can not only possesses the long-term dependencies requirements, but improve the short-term dependency defects found in traditional Transformer-based models. Therefore, our model can provide more accurate sentiment analysis for reference of disease tracking and prevention as well as for judgement of various remarks.

INDEX TERMS
Natural language processing, Natural languages, Computational linguistics, Sentiment Analysis

I. INTRODUCTION

This Natural language processing is the main objective of combining deep neural networks and linguistics, focusing on the communication between natural language and computers. Natural language processing is divided into natural language understanding (NLU), and natural language generation (NLG). Both NLU and NLG are introduced in understanding inputs, which are made in forms of sentences in text and speech formats. It's important to realize that language is far more than human languages. Languages have many forms of encoding, and each word is a signifier that maps into a signified meaning.

II. RNNs, LSTM

Recurrent neural networks (RNNs), long short-term Memory (LSTM), and Transformer have been firmly established as state of the art approaches in language modeling. Numerous efforts have since continued to push the limits of language models quality estimation. In RNNs based models, words in the sequences are read in order and each is assigned with certain weights and vectors. As the distance between words and depths of networks become further and deeper, the weights input earlier would be diluted, which easily occurred due to gradient vanishing. As an example, [1] shows that language models using LSTM process the effective context size of about 200 tokens on average but are only capable of sharply distinguishing 50 tokens nearby, indicating that LSTM is hard to manage long-term dependencies. With the attention mechanism introduced in Transformer, researchers create the techniques on paying attention to specific word in sequences. For RNNs, instead of only encoding the whole sentence in a hidden state, each word has a corresponding hidden state h^{t-1} passed along with the encoding of whole sequence to the current decoding stage. Compared with RNNs and Transformer, Transformer introduced attention mechanism to improve time series problem which is a major defect in RNNs based models. For an input token, its input representation is constructed by summing the corresponding tokens, segments, and position embeddings. As the input representations would pass through multi-headed attention, the feed-forward neural networks, and layer normalization are applied. An output representation from encoder (also known as inputs of decoder) would then pass through masked multi-head attention and feed-forward neural networks which are connected with residual connection. What if the feature extraction techniques of Transformer never existed, what would happen to the development in language understanding? Perhaps RNNs still take the lead as main analytic models. Thus, the Single Headed Attention RNN (SHA-RNN) was popular when proposed earlier. In this research, we proposed to rebuild the encoder architecture introduced in Transformer, to improve the defect of capturing short-term memory in Transformer-based models.

III. RELATED WORKS

A. Transformer

Transformer is a Sequence to Sequence (Seq2Seq) model embedded with attention mechanism. In optimizing the evaluation on machine translation and model training, it performs well in specific tasks. The architecture is composed of an encoder, and a decoder. The inputs from sequences are passed through encoder with position encoding to ensure the tokens are read in order and remain the dependencies in phrases. The decoder is composed of multi-headed attention, feed forward neural networks, and residual connection between layers.

IV. UNITS

Use either SI (MKS) or CGS as primary units. (SI units are strongly encouraged.) English units may be used as secondary units (in parentheses). This applies to papers in data storage. For example, write "15 Gb/cm^2 (100 Gb/in^2)." An exception is when English units are used as identifiers in trade, such as "3½-in disk drive." Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity in an equation.

The SI unit for magnetic field strength H is A/m. However, if you wish to use units of T, either refer to magnetic flux density B or magnetic field strength symbolized as $\mu_0 H$. Use the center dot to separate compound units, e.g., "$A{\cdot}m^2$."

V. SOME COMMON MISTAKES

The word "data" is plural, not singular. The subscript for the permeability of vacuum μ_0 is zero, not a lowercase letter "o." The term for residual magnetization is "remanence"; the adjective is "remanent"; do not write "remnance" or "remnant." Use the word "micrometer" instead of "micron." A graph within a graph is an "inset," not an "insert." The word "alternatively" is preferred to the word "alternately" (unless you really mean something that alternates). Use the word "whereas" instead of "while" (unless you are referring to simultaneous events). Do not use the word "essentially" to mean "approximately" or "effectively." Do not use the word "issue" as a euphemism for "problem." When compositions are not specified, separate chemical symbols by en-dashes; for example, "NiMn" indicates the intermetallic compound $Ni_{0.5}Mn_{0.5}$ whereas "Ni–Mn" indicates an alloy of some composition Ni_xMn_{1-x}.

Be aware of the different meanings of the homophones "affect" (usually a verb) and "effect" (usually a noun), "complement" and "compliment," "discreet" and "discrete," "principal" (e.g., "principal investigator") and "principle"

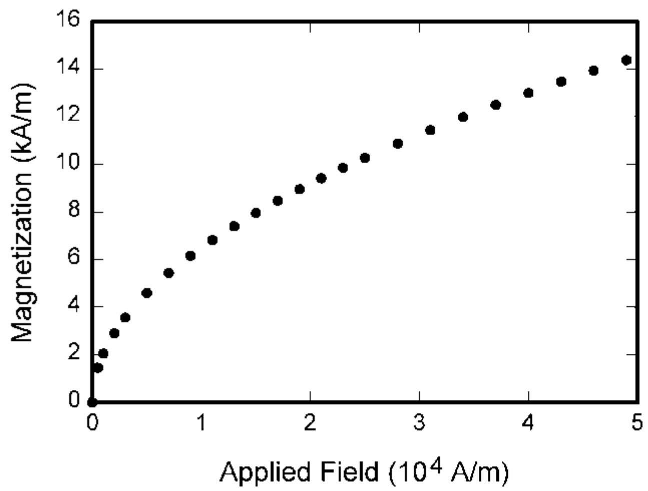

FIGURE 1. Magnetization as a function of applied field. Note that "Fig." is abbreviated. There is a period after the figure number, followed by two spaces. It is good practice to explain the significance of the figure in the caption.

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Prefixes such as "non," "sub," "micro," "multi," and "ultra" are not independent words; they should be joined to the words they modify, usually without a hyphen. There is no period after the "et" in the Latin abbreviation "*et al.*" (it is also italicized). The abbreviation "i.e.," means "that is," and the abbreviation "e.g.," means "for example" (these abbreviations are not italicized).

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VI. GUIDELINES FOR GRAPHICS PREPARATION AND SUBMISSION

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The following list outlines the different types of graphics published in IEEE journals. They are categorized based on their construction, and use of color / shades of gray:

1) COLOR/GRAYSCALE FIGURES

Figures that are meant to appear in color, or shades of black/gray. Such figures may include photographs, illustrations, multicolor graphs, and flowcharts.

2) LINE ART FIGURES

Figures that are composed of only black lines and shapes. These figures should have no shades or half-tones of gray, only black and white.

3) AUTHOR PHOTOS

Head and shoulders shots of authors that appear at the end of our papers.

4) TABLES

Data charts which are typically black and white, but sometimes include color.

TABLE I
UNITS FOR MAGNETIC PROPERTIES

Symbol	Quantity	Conversion from Gaussian and CGS EMU to SI [a]
Φ	magnetic flux	1 Mx $\rightarrow 10^{-8}$ Wb $= 10^{-8}$ V·s
B	magnetic flux density, magnetic induction	1 G $\rightarrow 10^{-4}$ T $= 10^{-4}$ Wb/m^2
H	magnetic field strength	1 Oe $\rightarrow 10^3/(4\pi)$ A/m
m	magnetic moment	1 erg/G = 1 emu $\rightarrow 10^{-3}$ A·m^2 $= 10^{-3}$ J/T
M	magnetization	1 erg/(G·cm^3) = 1 emu/cm^3 $\rightarrow 10^3$ A/m
$4\pi M$	magnetization	1 G $\rightarrow 10^3/(4\pi)$ A/m
σ	specific magnetization	1 erg/(G·g) = 1 emu/g $\rightarrow$ 1 A·m^2/kg
j	magnetic dipole moment	1 erg/G = 1 emu $\rightarrow 4\pi \times 10^{-10}$ Wb·m
J	magnetic polarization	1 erg/(G·cm^3) = 1 emu/cm^3 $\rightarrow 4\pi \times 10^{-4}$ T
χ, κ	susceptibility	$1 \rightarrow 4\pi$
χ_ρ	mass susceptibility	1 cm^3/g $\rightarrow 4\pi \times 10^{-3}$ m^3/kg
μ	permeability	$1 \rightarrow 4\pi \times 10^{-7}$ H/m $= 4\pi \times 10^{-7}$ Wb/(A·m)
μ_r	relative permeability	$\mu \rightarrow \mu_r$
w, W	energy density	1 erg/cm^3 $\rightarrow 10^{-1}$ J/m^3
N, D	demagnetizing factor	$1 \rightarrow 1/(4\pi)$

Vertical lines are optional in tables. Statements that serve as captions for the entire table do not need footnote letters.

[a]Gaussian units are the same as cg emu for magnetostatics; Mx = maxwell, G = gauss, Oe = oersted; Wb = weber, V = volt, s = second, T = tesla, m = meter, A = ampere, J = joule, kg = kilogram, H = henry.

B. MULTIPART FIGURES

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Most charts, graphs, and tables are one column wide (3.5 inches / 88 millimeters / 21 picas) or page wide (7.16 inches / 181 millimeters / 43 picas). The maximum depth a graphic can be is 8.5 inches (216 millimeters / 54 picas). When choosing the depth of a graphic, please allow space for a caption. Figures can be sized between column and page widths if the author chooses, however it is recommended that figures are not sized less than column width unless when necessary.

There is currently one publication with column measurements that do not coincide with those listed above. Proceedings of the IEEE has a column measurement of 3.25 inches (82.5 millimeters / 19.5 picas).

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Figure axis labels are often a source of confusion. Use words rather than symbols. As an example, write the quantity "Magnetization," or "Magnetization *M*," not just "*M*." Put units in parentheses. Do not label axes only with units. As in Fig. 1, for example, write "Magnetization (A/m)" or "Magnetization ($A \cdot m^{-1}$)," not just "A/m." Do not label axes with a ratio of quantities and units. For example, write "Temperature (K)," not "Temperature/K."

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APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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REFERENCES

[1] S. Li, X. Jin, Y. Xuan, X. Zhou, W. Chen, Y.-X. Wang, et al. Enhancing the Locality and Breaking the Memory Bottleneck of Transformer on Time Series Forecasting. Presented at NeuralIPS 2019. Available: https://arxiv.org/abs/1907.00235

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