Baseline of SWOT Classification using Bidirectional Encoder Representations from Transformers for Business Intelligence Cloud Platform

Okestro

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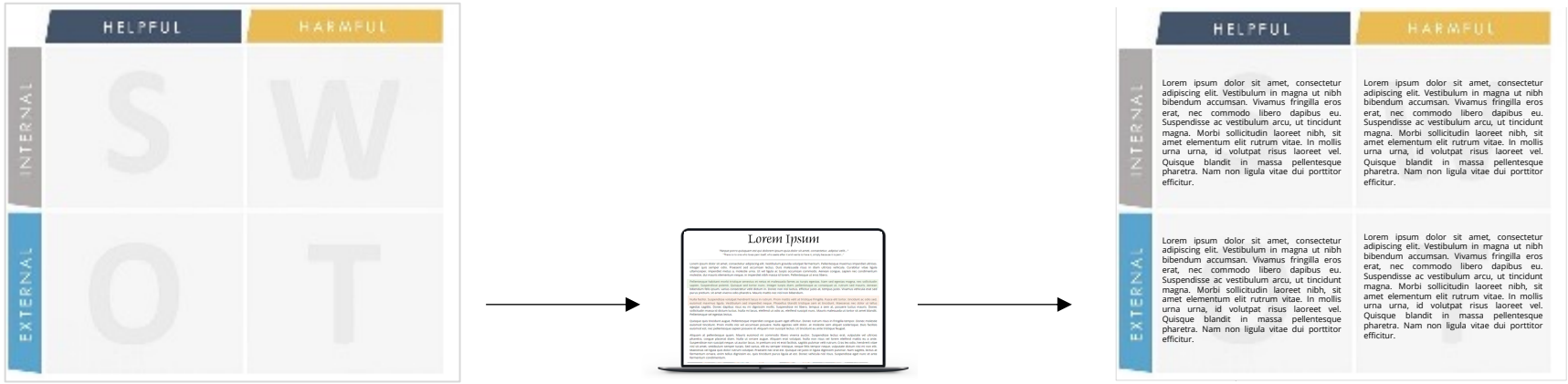
Introduction

- The Business Intelligence system is a **decision support system** to provide key information about the company.
- Establishing the right business strategy through the analysis of **internal** and **external** environmental factors of a company can lead to corporate innovation and performance creation.

- Therefore, the process of recognizing the **strengths** and **weaknesses** of the company and accurately analyzing the **opportunities** and **threats** outside the company is critical.

Introduction



- As part of the development of marketing artificial intelligence services that can be commercialized in cloud-based platforms, this study proposes a method of automating **SWOT classification** using artificial intelligence.

Problem Setup

OKESTRO

1) There is not much text data labeled with S/W/O/T.

www.jobkorea.co.kr
www.catch.co.kr
www.marketing91.com/
…

→ **Not enough number to train deep learning model**

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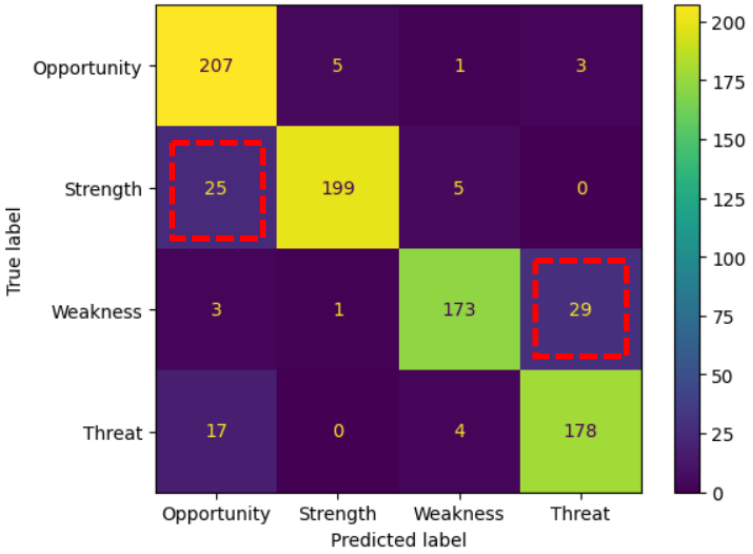
Sol) BERT

- SWOT classification through **Bidirectional Encoder Representations from Transformers(BERT)**, which is widely used in the natural language processing.
- Transfer learning
  - **Storing** knowledge gained while solving one problem and **applying it to a different but related problem.**

Problem Setup



2) The model cannot distinguish between

S and O, W and T.

Strength? Opportunity?

- *"이 기세를 몰아 하이퍼커넥트는 **독자적인 기술을 바탕**으로 북미 독일 지역에 신규 서비스를 출시하며 지속적으로 **해외 시장을 확대 공략** 중이다."*

Weakness? Threat?

- *"이 기세를 몰아 하이퍼커넥트는 **독자적인 기술을 바탕**으로 북미 독일 지역에 신규 서비스를 출시하며 지속적으로 **해외 시장을 확대 공략** 중이다."*

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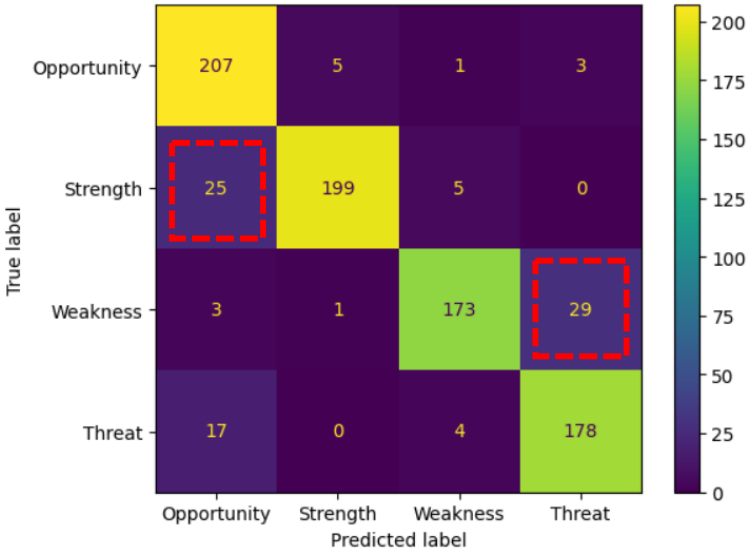


2) The model cannot distinguish between S and O, W and T.

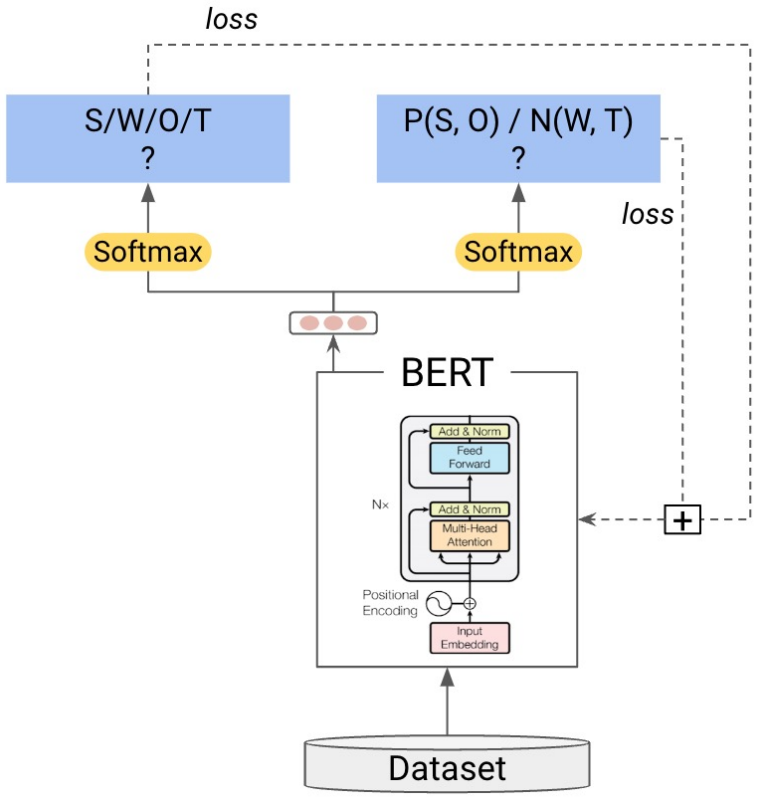
Sol) **Multitask Learning**

- Multiple learning tasks are solved **at the same time**, while exploiting commonalities and differences across tasks.

Methodology

Overall Architecture

- BERT model that uses only the **encoder** portion of the transformer.
- Models learned with **less data** using **pretrained model** on a hugging face.
- Multitask model consisting of a task that classifies **S/W/O/T** and a task that classifies **positive(S, O)** and **negative(W, T)**.
    - By **combining the loss values** extracted from each of the two tasks, the model will be able to distinguish **S and O, W and T** better.



Experiment Setup

OKESTRO

- The dataset consists of a text paragraph containing each S, W, O, and T content for the company and a corresponding label (S, W, O, and T) for each paragraph.
- The total number of paragraphs and corresponding labels is **5,650**, and the total number of sentences is **28,591**.
- Korean Language Understanding Evaluation(KLUE) pretrained language model.
- Hyper-parameter
    - Learning rate: 0.0005
    - Warmup ratio: 0.2
    - Epoch: 20
    - Batch size: 8, 32, 64

Experiment Results

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Type	Batch size	Accuracy	Precision	Recall	f1 score
Paragraph	8	0.907	0.907	0.904	0.905
	32	0.901	0.902	0.901	0.901
	64	0.907	0.908	0.905	0.905
Sentence	8	0.741	0.739	0.738	0.737
	32	0.742	0.739	0.738	0.738
	64	0.747	0.743	0.74	0.74

- Even with the use of the basic BERT model, paragraph version were able to have an accuracy of about **90%**.
- The accuracy of the sentences seemed to be **limited to some extent** because they had **sequential dependency**.

Conclusions

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- This study classified **SWOT**, one of the commonly used analysis tools in the environmental analysis process of companies, using **BERT**, which is widely used in the field of natural language processing.
- Contribution of this study is that the **baseline** model is established for the first time by incorporating AI that has not been attempted so far into SWOT analysis.
- Discussion
    - How can we consider the **sequential dependency** between sentences when using sentence version?
    - If the **subject in the sentence changes**, the answer may change directly from "threat" to "opportunity." How can a model learn these things well?

References

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