Sentiment Analysis Using BERT and Multi-Instance Learning

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Presentation Overview

1. **Project Goal:** What are we going to do?
2. **Motivation:** Why is the project important?
3. **Tools**: Which tools and techniques are we going to use?
4. **Methodology:** How are we going to do it?
5. **Evaluation:** How are we going to measure our results?
6. **Plan for the next two weeks.**

1. Project Goal: What are we going to do?

Develop a domain specific sentiment analysis model to predict sentence-level sentiment on social media comments on organic food products.

1. **Project Goal:** What are we going to do?

- Example:

[Rating: ★★] I had a very mixed experience at The Stand. The burger and fries were good. The chocolate shake was divine: rich and creamy. The drive-thru was horrible. It took us at least 30 minutes to order when there were only four cars in front of us. We complained about the wait and got a half–hearted apology. I would go back because the food is good, but my only hesitation is the wait.

Summary
+ The burger and fries were good
+ The chocolate shake was divine
+ I would go back because the food is good
– The drive-thru was horrible
– It took us at least 30 minutes to order

- As a whole, the review conveys negative sentiment, but aspects of the reviewer's experience were clearly positive.

- This goes largely unnoticed when focusing solely on the review's overall rating.

2. **Motivation:** Why is the project important?

- Coarse-grained document-level annotations are relatively easy to obtain due to the widespread use of opinion grading interfaces (e.g., star ratings ac-companying reviews), but the acquisition of sentence- or phrase-level sentiment labels remains laborious and expensive.

- Sentence- or phrase-level sentiment labels are relevant to opinion mining applications: detecting or summarizing consumer opinions in online product reviews.

- For sentiment analysis in the organic food domain, it is useful to have the sentiment labels on a sentence or phrase level.

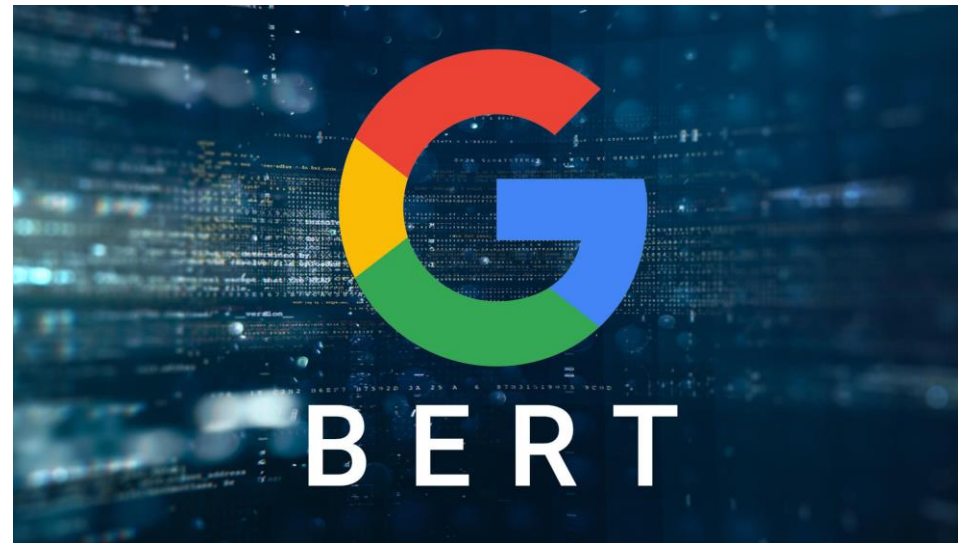# 3. **Tools**: Which tools and techniques are we going to use?

- BERT: Bidirectional Encoder Representations from Transformers.
- MILNET: Multiple Instance Learning Networks.

(b) MILNET
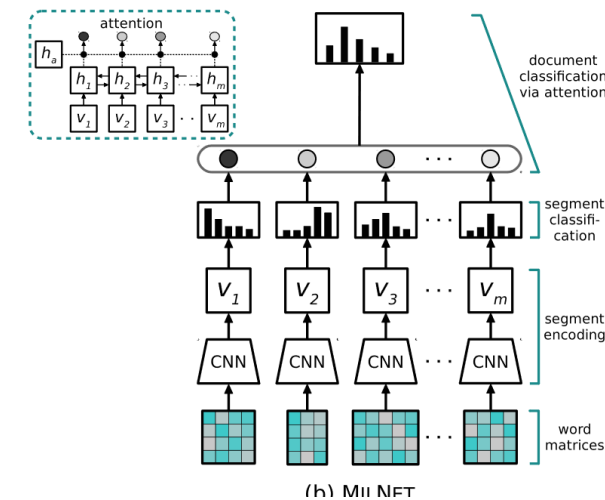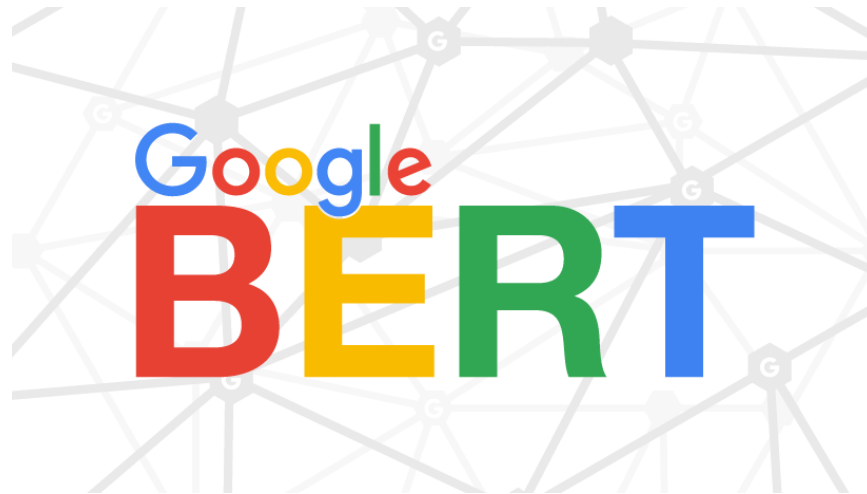
3. Tools: Which tools and techniques are we going to use?

Bidirectional Encoder Representations from Transformers (BERT):

Technique for NLP ([Natural Language Processing](#)) pre-training developed by [Google](#).

3. Tools: Which tools and techniques are we going to use?

MILNET: Multiple Instance Learning Networks:

- Deals with problems where labels are associated with groups of instances or bags (documents in our case), while instance labels (segment-level polarities) are unobserved.

- An aggregation function is used to combine instance predictions and assign labels on the bag level or to simultaneously infer bag and instance labels.

- We will do segment-level sentiment analysis as an instantiation of the latter variant

4. Methodology: How are we going to do it?

Classifier: Multiple Instance Learning Network.
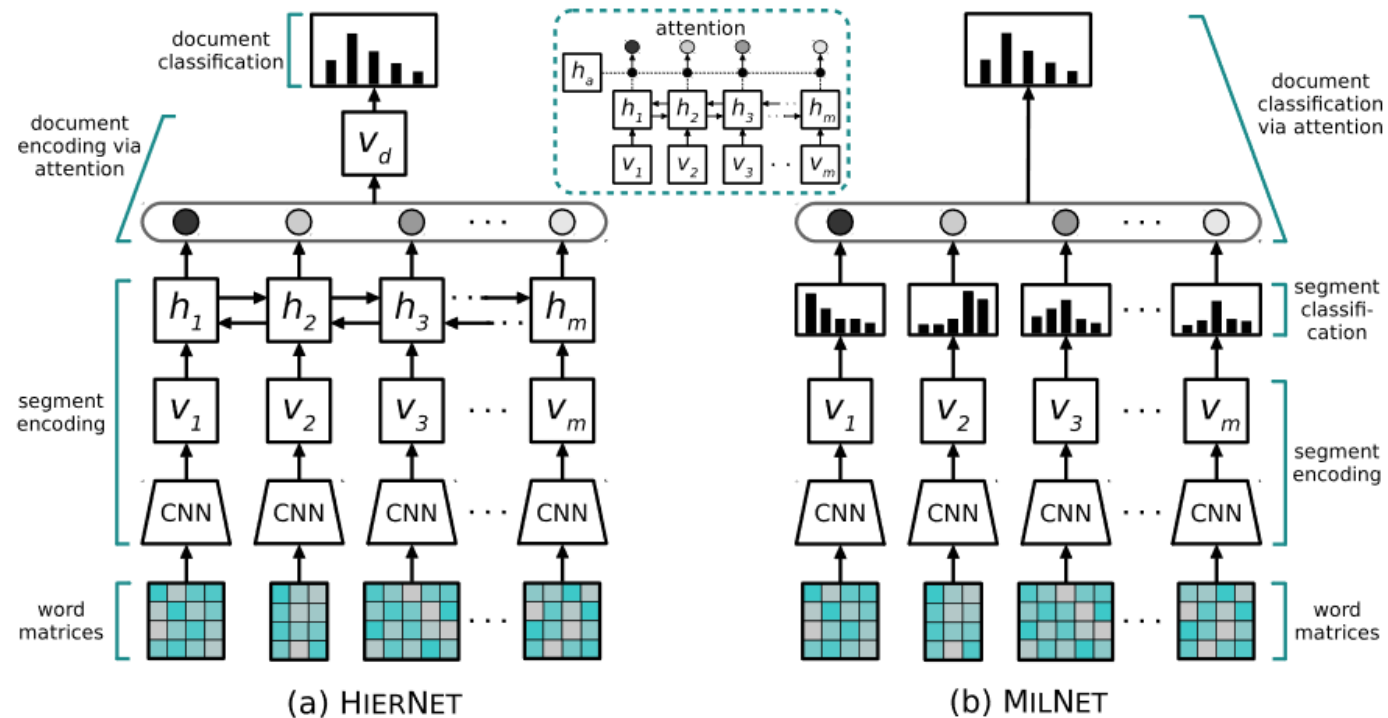
Data:

Amazon product reviews containing the keyword "organic" from the categories:

- Grocery and Gourmet Food
- Health and Personal Care
- Beauty

Features: BERT CLS embeddings on sentences.

Fine-tune the model on the Annotated Organic Dataset.

4. **Methodology:** How are we going to do it?

(a) HIERNET   (b) MILNET

5. Evaluation: How are we going to measure our results?

Performance metrics:
- Accuracy.
- Micro and Macro F1 scores per category and data split.

Baseline:
- **SentiWordnet:** Lexical resource for opinion mining.
- **NLTK (Natural Language Toolkit) SentimentAnalyzer:** NLTK utility for doing sentiment analysis.
- **NLTK (Natural Language Toolkit) VADER Sentiment Intensity Analyzer:** Lexicon and rule-based sentiment analysis tool.
- Unigram and Bigram Classifier using scikit-learn.

6. Plan for the next two weeks:

- Set Colab environment.
- Prepare the data from Amazon.
- Get Bert running with our data.
- Create the baseline for our data using SentiWordnet, NLTK SentimentAnalyzer, NLTK VADER Sentiment Intensity Analyzer, Unigram and Bigram Classifier using scikit-learn.

7. References

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- https://towardsdatascience.com/bert-explained-state-of-the-art-language-model-for-nlp-f8b21a9b6270

- https://nlpforhackers.io/sentiment-analysis-intro/

- Angelidis S. & Lapata M, Multiple Instance Learning Networks for Fine-Grained Sentiment Analysis, Institute for Language, Cognition and ComputationSchool of Informatics, University of Edinburgh.