Aspect-Based Sentiment Analysis of Japanese Hotel Reviews

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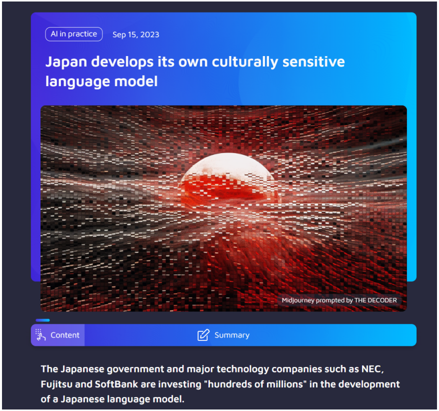
1. Introduction

2. Data Processing

3. Modelling

4. Limitations and Future Work

Motivation



Sep 15, 2023

Japan develops its own culturally sensitive language model

The Japanese government and major technology companies such as NEC, Fujitsu and SoftBank are investing "hundreds of millions" in the development of a Japanese language model.

Figure: (Source: The Decoder. https://the-decoder.com/japan-develops-its-own-culturally-sensitive-language-model/)

Problem Statement

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- However, many Japanese do not know enough English to leave a review without using an automatic translator application, and are much more comfortable leaving reviews in their native Japanese.
- As a non-Japanese small business owner, it would be a great help to have a data-driven tool that can help to interpret their true sentiments about your service.

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- Briefly compare two Japanese sentiment analyzers – oseti and asari.

Data Source

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- Non-dynamic webpage – easier access to relevant information;
- Tends to be cluttered, but does not matter much to a scraper.
- All reviews need to have the actual review text; the English site does not require that.

Final Dataset

- 7340 reviews total, from 182 hotels across the 6 prefectures of the Tohoku region:
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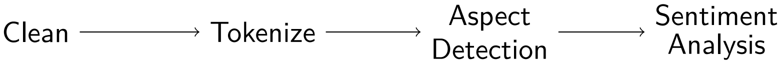
- Reviews without ratings are ignored by the scraper;
- 5568 reviews have all scores populated; this is used mainly for performance metrics.

Data Workflow



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- Used for words without kanji representation.

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- Originated from the Chinese script;
- Each kanji has at least 2 pronunciations – kun-yomi (Japanese pronunciation) and on-yomi (Chinese pronunciation);
- Provides semantics to words.

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- Lattice-based tokenization is needed.

Lattice-based Tokenization

- Each connection has an associated cost;
- The most probable tokenization is the route with the lowest total cost.

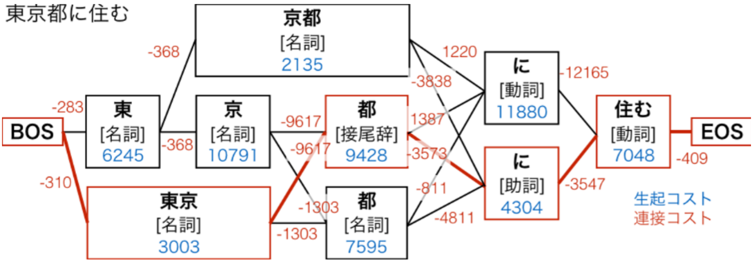

Figure: A lattice of tokens (Credit: Wanasit Tanakitrungruang)

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Figure: Mekabu (Source: Wakasa no Himitsu)

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Figure: Natto on rice. (Source: Wikipedia)

Aspect Detection

- We use natto-py together with CountVectorizer to extract out a list of the most common words in the entire dataset;
- Then assign each sentence in a review its relevant aspects.

Example output for natto-py

A token from natto-py looks like:

良かっ, 形容詞, 非自立,*,*, 形容詞アウオ段, 連用タ接続, 良い,
ヨカッ, ヨカッ

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In English, a similar tokenization would look something like:

running, verb,*,*,*,*,present progressive tense,run,run,run

Aspect Keywords I

Aspect	Definition	Keywords
Service	Acts of help towards customer satisfaction	サービス, スタッフ, フロント, チェックイン, 丁寧, 親切, 接客, サーバ
Location	Access and landscape around the hotel	立地, 駅, バス, 近く, 便利, 駐車, コンビニ, 場所
Room	The attributes of the room	部屋, 広い, 宿泊, ベッド, 値段

Aspect Keywords II

Aspect	Definition	Keywords
Amenities	Other facilities in the hotel excluding room and bath	アメニティ, 無料
Bathroom	Bath in the hotel room, or a public bath	風呂, 温泉, 浴場, 露天風呂, 清潔, 湯, トイレ
Food	Morning or evening meals	朝食, 食事, 料理, 夕食, バイキング, メニュー, ご飯, 酒, 飲

Example: Aspect Identification in a Review

Review: “日本酒の飲み比べサーバは良かったです。また、部屋もきれいでスマホ充電など細かな気遣いも良かったです”

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Translation: “The server for the Japanese sake tasting was good. Likewise, the room was clean, and it was good that there was little to worry about things like smartphone chargers, etc. as well”

Aspects:

Service: “日本酒の飲み比べサーバは良かったです”

Food: “日本酒の飲み比べサーバは良かったです”

Room: “また、部屋もきれいでスマホ充電など細かな気遣いも良かったです”

oseti – A Japanese Sentiment Analysis Tool

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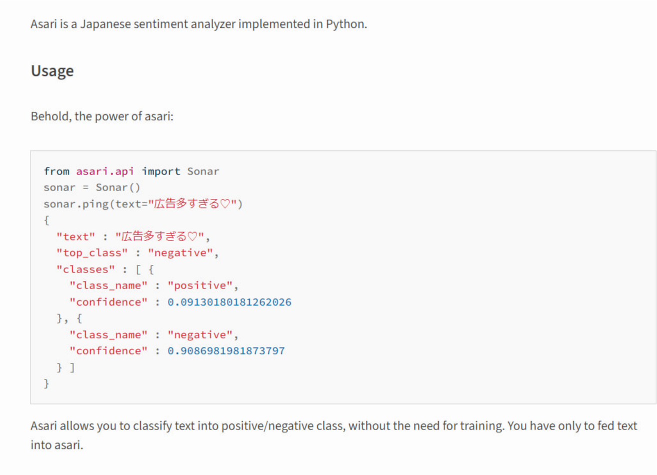
Figure: A Japanese *oseti* (Source: Wikipedia)

asari – Another Japanese Sentiment Analysis Tool



Asari is a Japanese sentiment analyzer implemented in Python.

Usage

Behold, the power of asari:

```
from asari.api import Sonar
sonar = Sonar()
sonar.ping(text="広告多すぎる♡")
{
  "text" : "広告多すぎる♡",
  "top_class" : "negative",
  "classes" : [ {
    "class_name" : "positive",
    "confidence" : 0.09130180181262026
  }, {
    "class_name" : "negative",
    "confidence" : 0.9086981981873797
  } ]
}
```

Asari allows you to classify text into positive/negative class, without the need for training. You have only to fed text into asari.

Figure: Documentation for asari

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Figure: Asari clams with udon (Source: Wikipedia)

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2. Convert each sentiment score (a number from -1 to 1) into a rating from 1 to 5;
3. The ratings given by the customer for their reviews will be taken as a “ground truth”, and the predicted scores will be compared against them.

Example Analysis of Review

Let's look at the "food" aspect of the following review:

家族でのんびり過ごせて良かったです。お料理が美味しかったし、景色も美しかったです。温泉は思ったよりも小さかったですが、泉質は結構よかった。

Translated, it reads:

I had a relaxing stay with my family. The food was delicious, and the scenery was beautiful too. Though the hot spring was smaller than I thought, the spring water was rather good.

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Analyzer	Sentiment	Predicted Score
oseti	1	5
asari	0.887214	5

Model Evaluation

As classifiers, neither sentiment analyzer performs well. However, a prediction of 4 stars when the actual customer rates 5 stars is still not too bad.

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As classifiers, neither sentiment analyzer performs well.
However, a prediction of 4 stars when the actual customer rates 5 stars is still not too bad.
Thus, we use the *mean absolute error* as a metric to gauge the performance of both models.

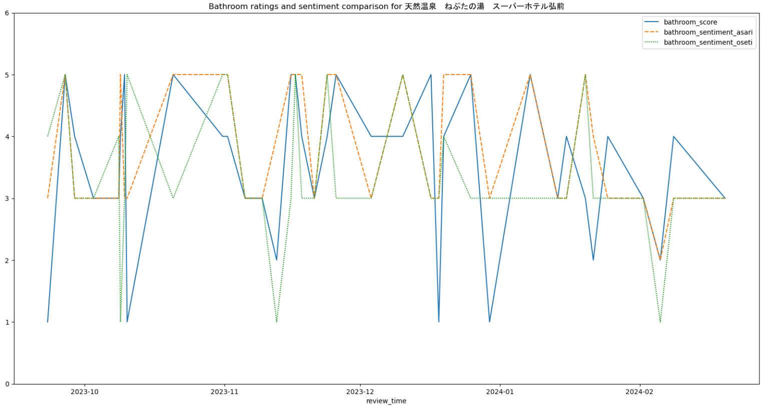

Figure: Plot of sentiments and ratings

Aspect-Based Comparison of Mean Absolute Errors

	oseti	asari
Overall	0.836027	0.600395
Service	1.054956	1.008441
Location	1.183908	1.095725
Room	1.072557	0.953125
Amenities	1.086745	1.084590
Bathroom	0.943426	0.839260
Food	0.947198	0.795617

Limitations

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- More time, more data;
- Proper labelling of aspects;
- Accounting for zero anaphora; 選んでいただいたものなら何でも結構です。(*erande itadaita mono nara nandemo kekkou desu*, lit. “Whatever (you) pick is fine.”) – aspects may not appear even though the customer intended it.

Future Work

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- Utilize a neural network approach to find hidden meanings;
- Work out a translation scheme that keeps the intent as accurately as possible.

Summary

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The End

Thank you.