

Sentiment Analysis and Aspect-Based SA and Beyond

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Objective

- Lesson 1: Sentiment Analysis
- Lesson 2: Aspect-based Sentiment Analysis
- Lesson 3: Applications of SA and ABSA
- Lesson 4: Beyond SA and ABSA

Lesson 1

Sentiment Analysis

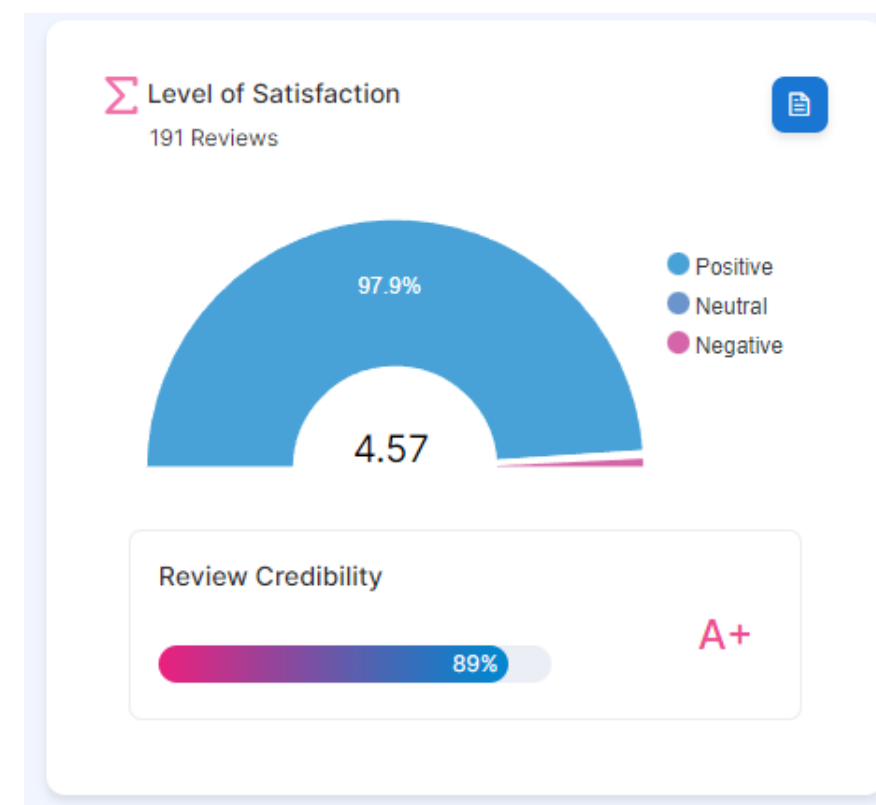
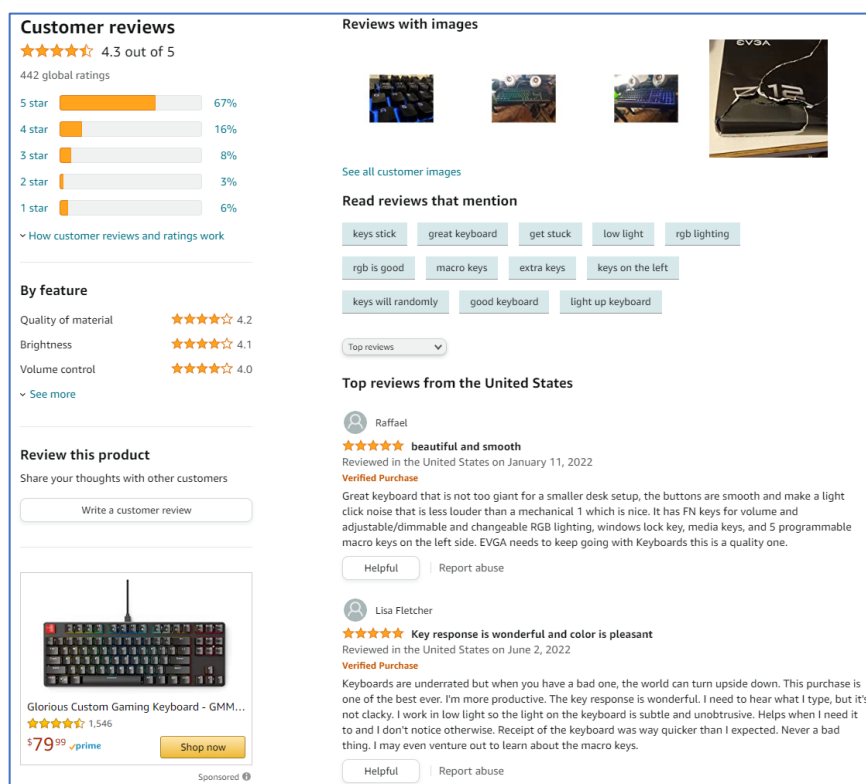


- Sentiment analysis is a computational study or task of classifying the polarity on a given text
- Sentiment analysis is also called as opinion analysis or opinion mining



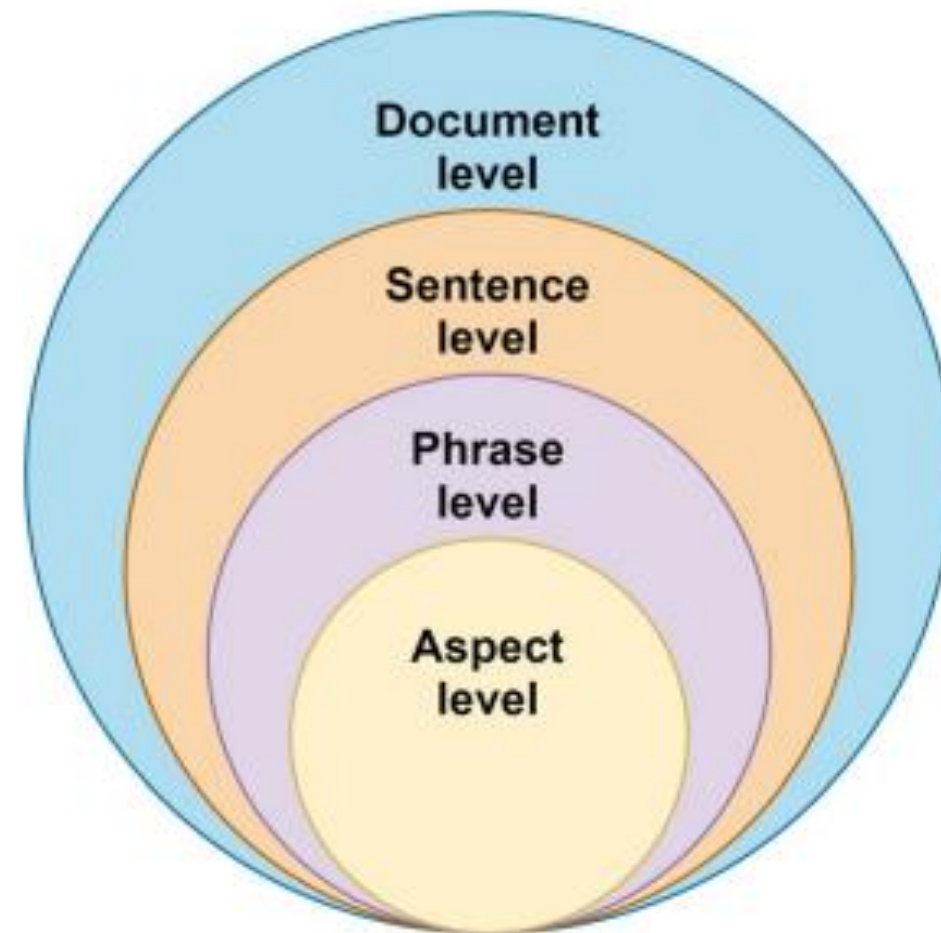
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◀ Sentiment Analysis Results ▶



- Sentiment analysis has been investigated on several levels

Fig. 1 Level of sentiment analysis



- Three mainly used approaches for SA include Lexicon Based Approach, Machine Learning Approach, and Other Hybrid Approach

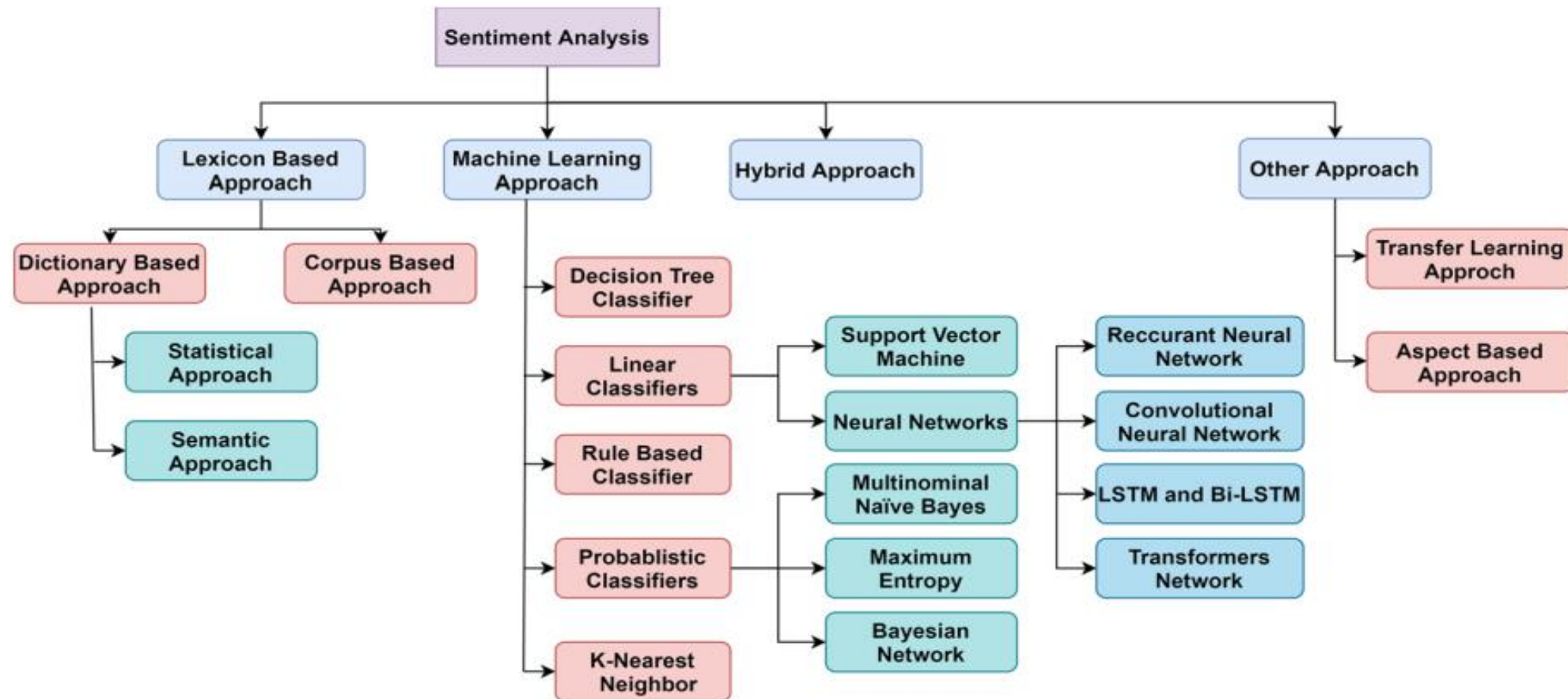
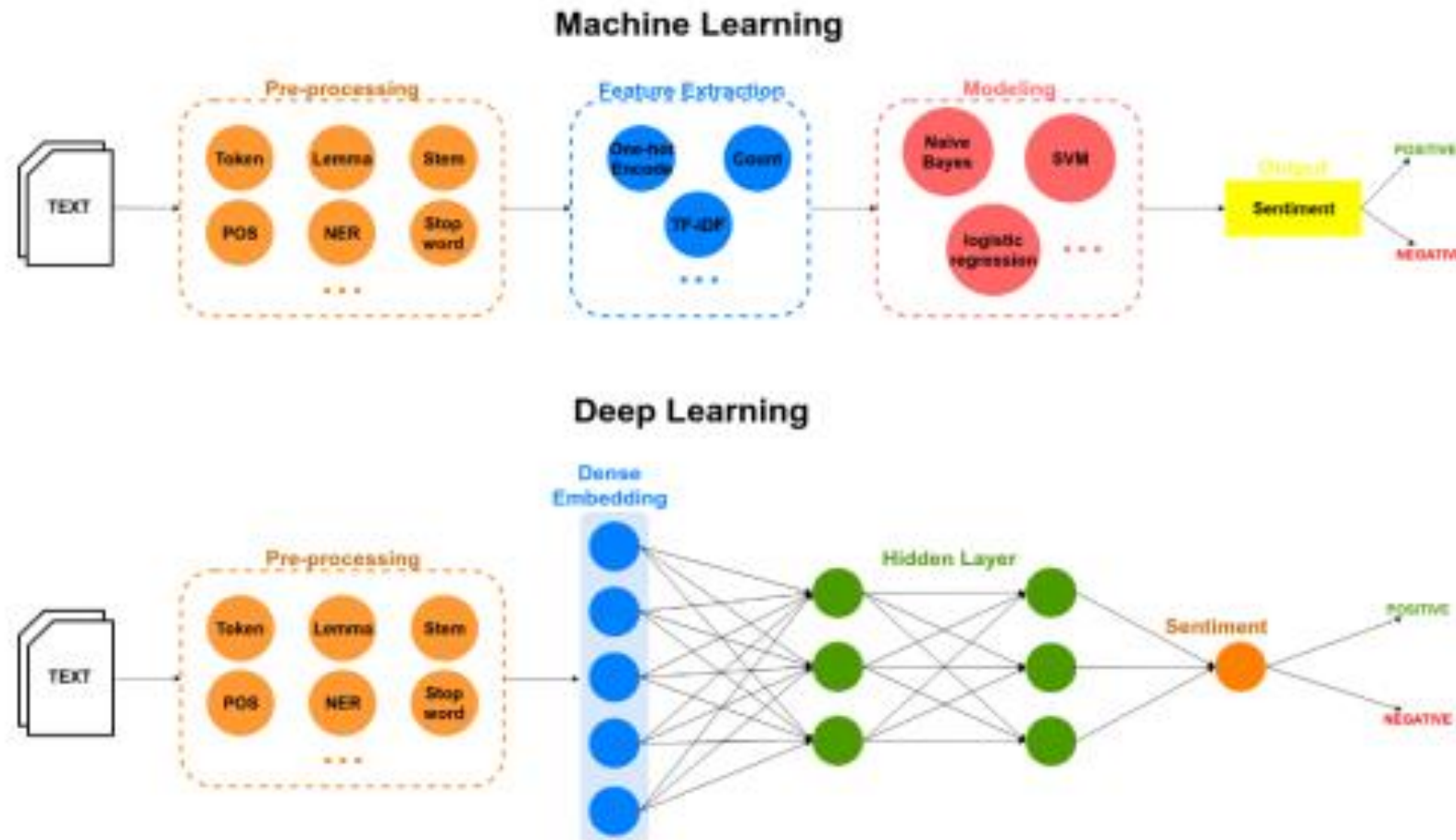


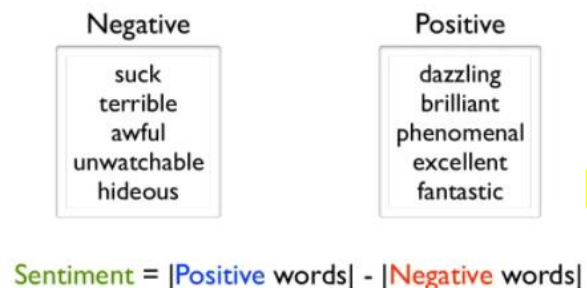
Fig. 4 Approach of sentiment analysis

- Three mainly used approaches for SA include Lexicon Based Approach, Machine Learning Approach, and Other Hybrid Approach



■ The evolution of sentiment analysis approaches

Lexicon-based approach



Around 65% accuracy!

Lexical based method

예) WordNet, SentiWordNet,

VADER, etc.

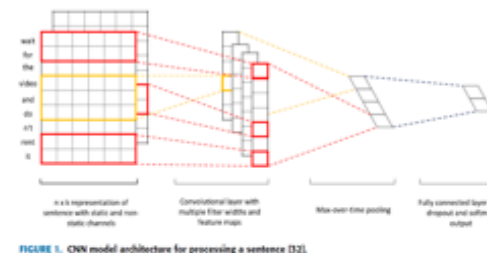
Conventional Approach



사전기반방법론(Lexicon-based method) * 머신러닝(Machine Learning)

예) WordNet, SO-PMI, TF-IDF, Naïve Bayes, SVM, etc.

Deep Learning Approach

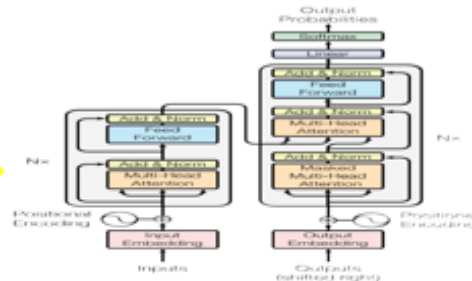


자료: R. Liu et al., Survey of Sentiment Analysis Based on Transfer Learning, IEEE (2019)

워드임베딩(Word Embedding) * 딥러닝(Deep Learning)

예) Word2Vec, Glove, CNN, RNN, LSTM, etc.

Transfer Learning Approach



자료: Vaswani et al., Attention is all you need. In Advances in Neural Information Processing Systems (2017)

트랜스포머(Transformer) * 사전학습언어모델(Language Model)

예) BERT, ELMo, ULMFiT, XLNet, GPT, etc.

(Accuracy)*	Not applicable	74.28 ~ 84%	83.36 ~ 90.62%
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* Accuracy – The performance comparison on English review text dataset for ABSA - SemEval 2014, SemEval 2015, SemEval 2016

- Sentiment analysis is a computational study or task of classifying the polarity on a given text

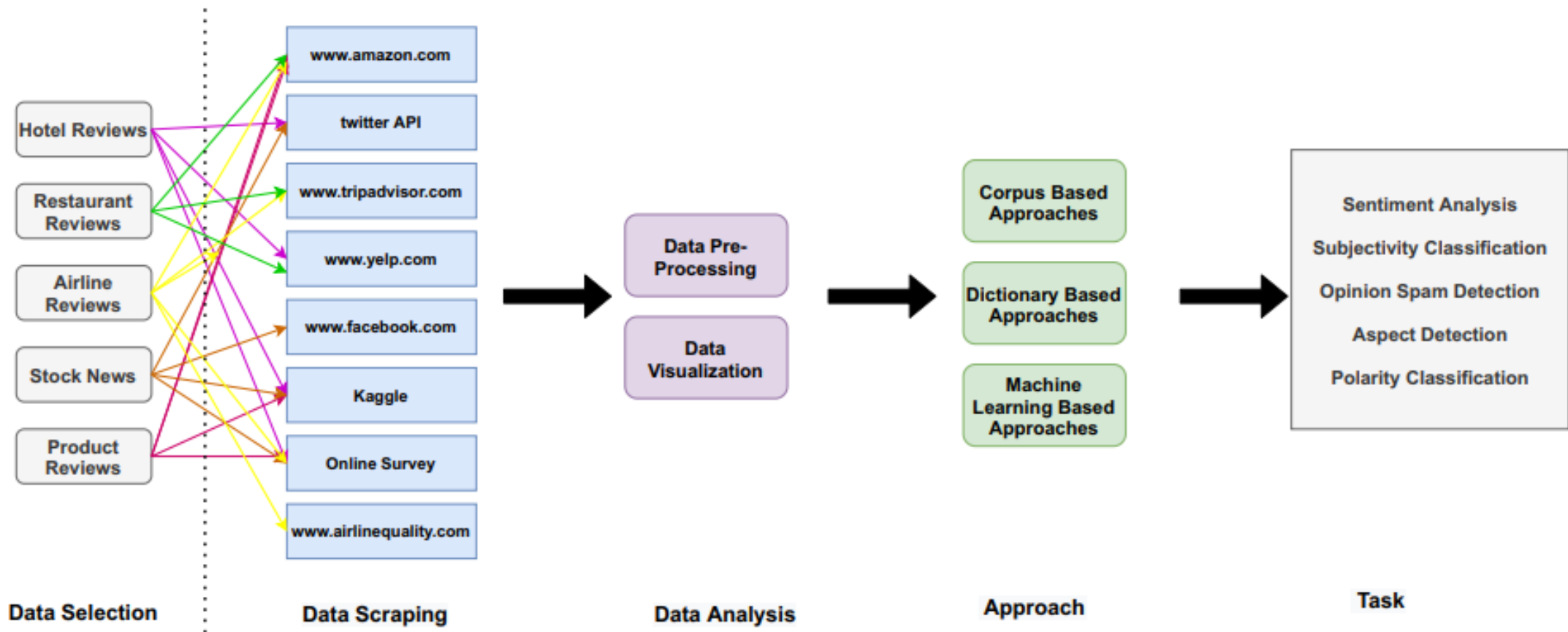
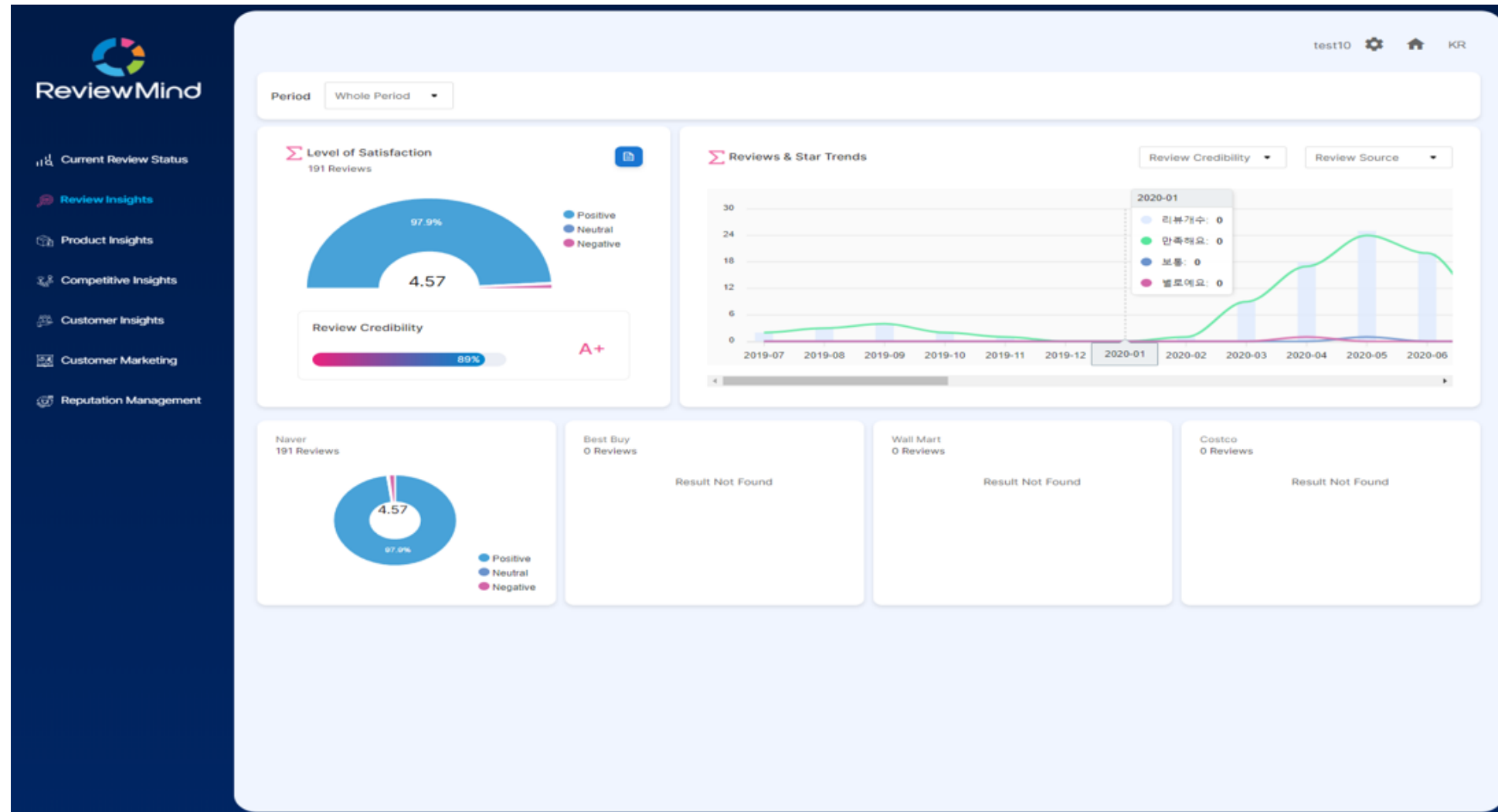


Fig. 2 General procedure of sentiment analysis

■ ReviewMind™ SW – Sentiment Analysis



- Sentiment analysis

Let's Check The Example Code!

Lesson 2

Aspect-based Sentiment Analysis



- Aspect-based sentiment analysis is the process of building a comprehensive opinion summary at the aspect level, which provides useful fine-grained sentiment information for downstream applications



Example:

LOCATION2 is central London so extremely expensive, **LOCATION1** is often considered the coolest area of London.

Target	Aspect	Sentiment
LOC1	general	Positive
LOC1	price	None
LOC1	safety	None
LOC1	transit-location	None
LOC2	general	None
LOC2	price	Negative
LOC2	safety	None
LOC2	transit-location	Positive

Table 1: An example of SentiHood dataset.

- For ABSA, the target can be described with either an aspect category or an aspect term, while the sentiment involves with the opinion term and the sentiment polarity

◁ Aspect-based Sentiment Analysis ▷

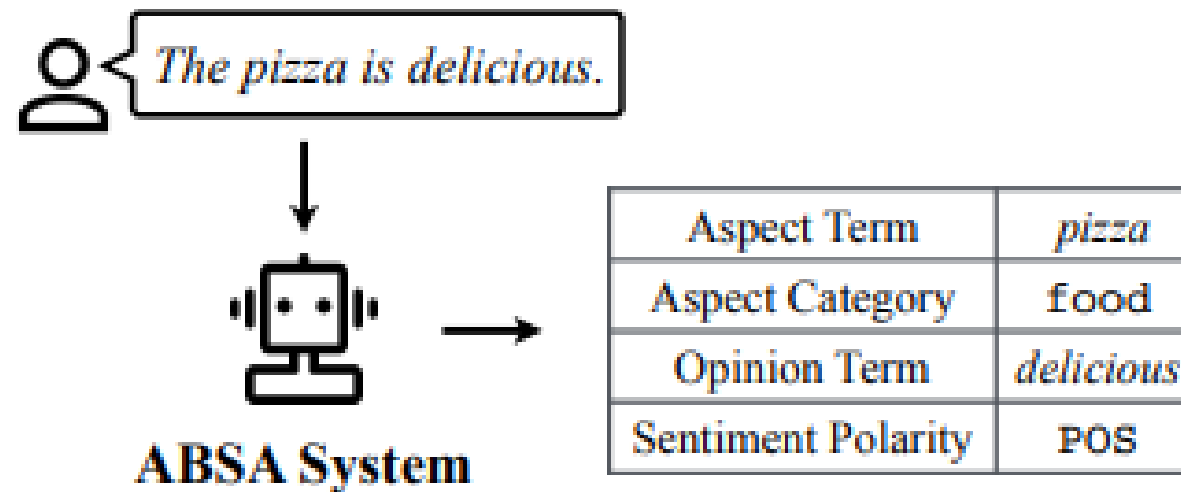


Fig. 1. An example of the four key sentiment elements of ABSA.

■ Taxonomy of ABSA tasks with the representative methods of each task

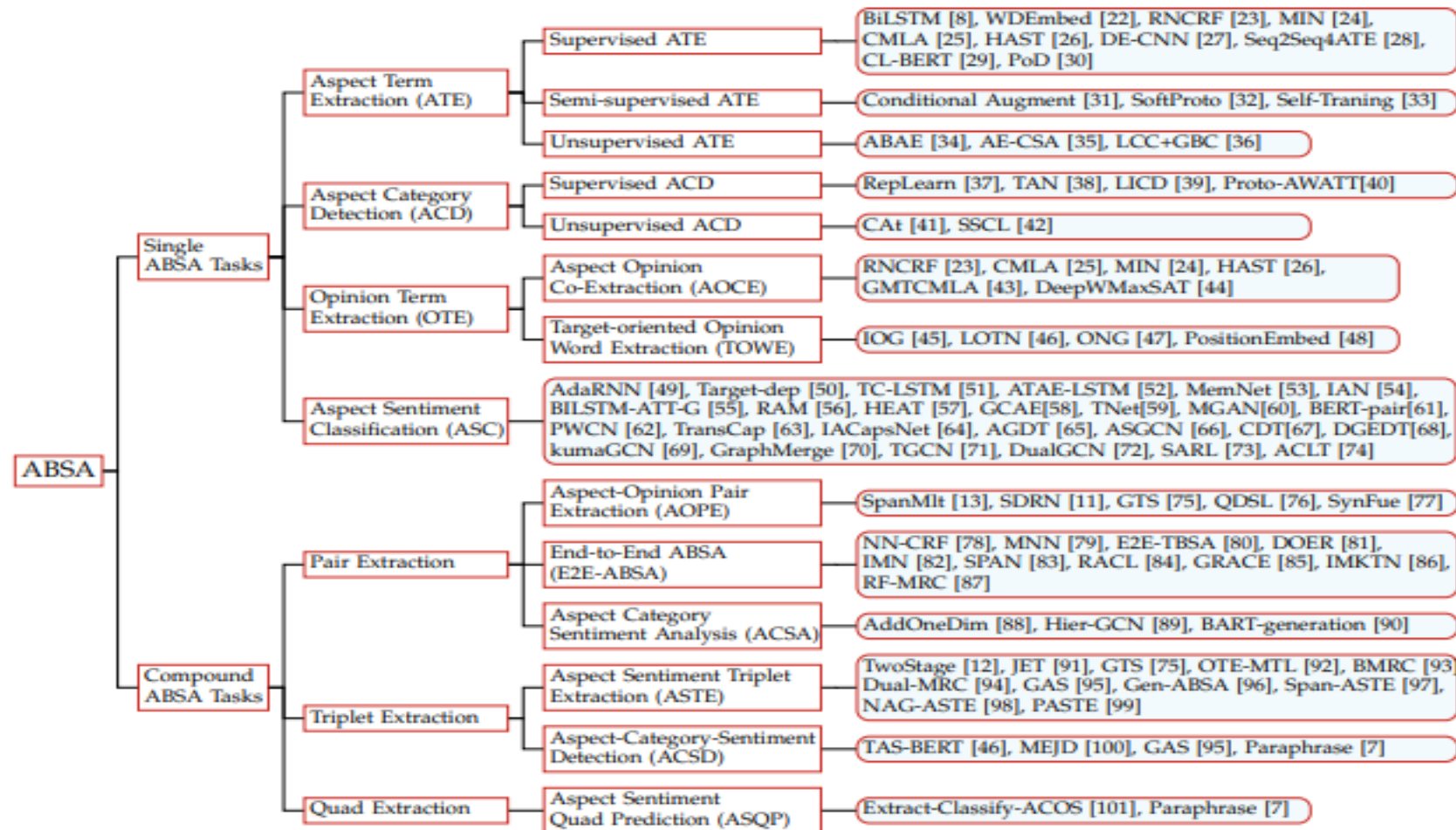


Fig. 2. Taxonomy of ABSA tasks, with representative methods of each task.

- Mainstream NLP modeling paradigms that are commonly used for ABSA tasks

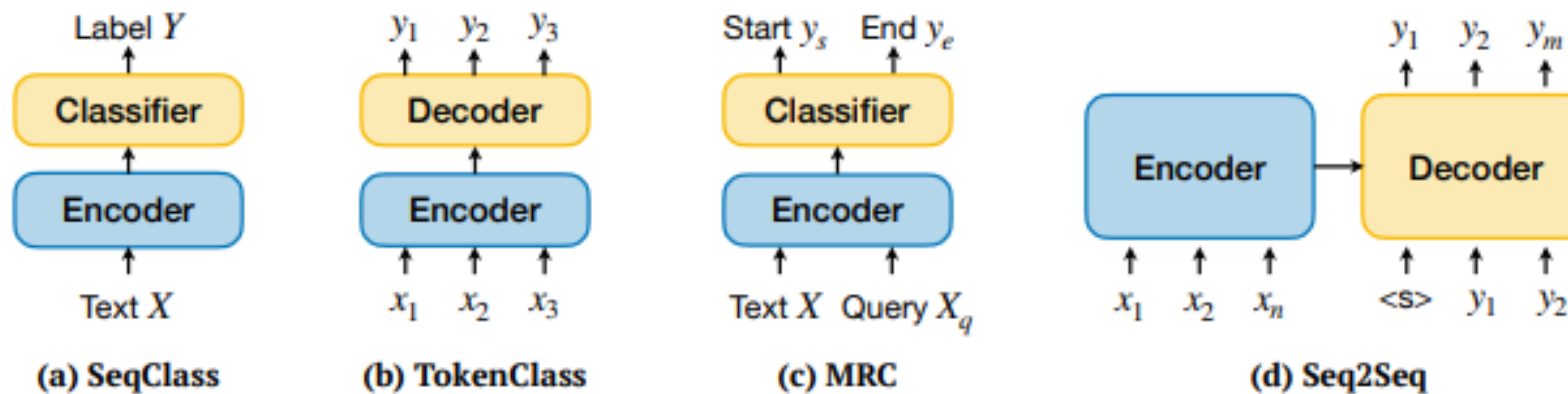
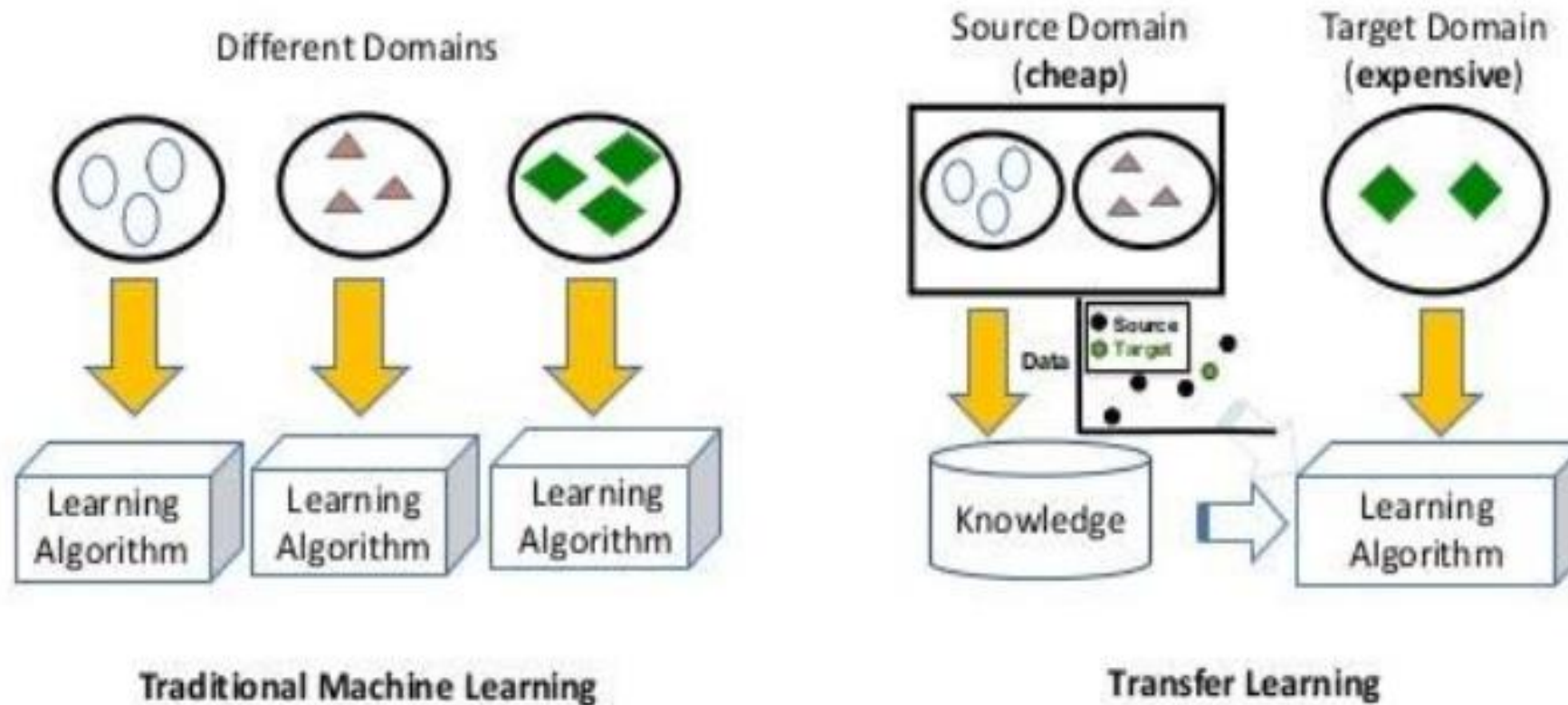


Fig. 3. Mainstream NLP modeling paradigms for ABSA tasks. Each paradigm denotes a general computational framework that can be used for multiple ABSA tasks with the same paradigm.

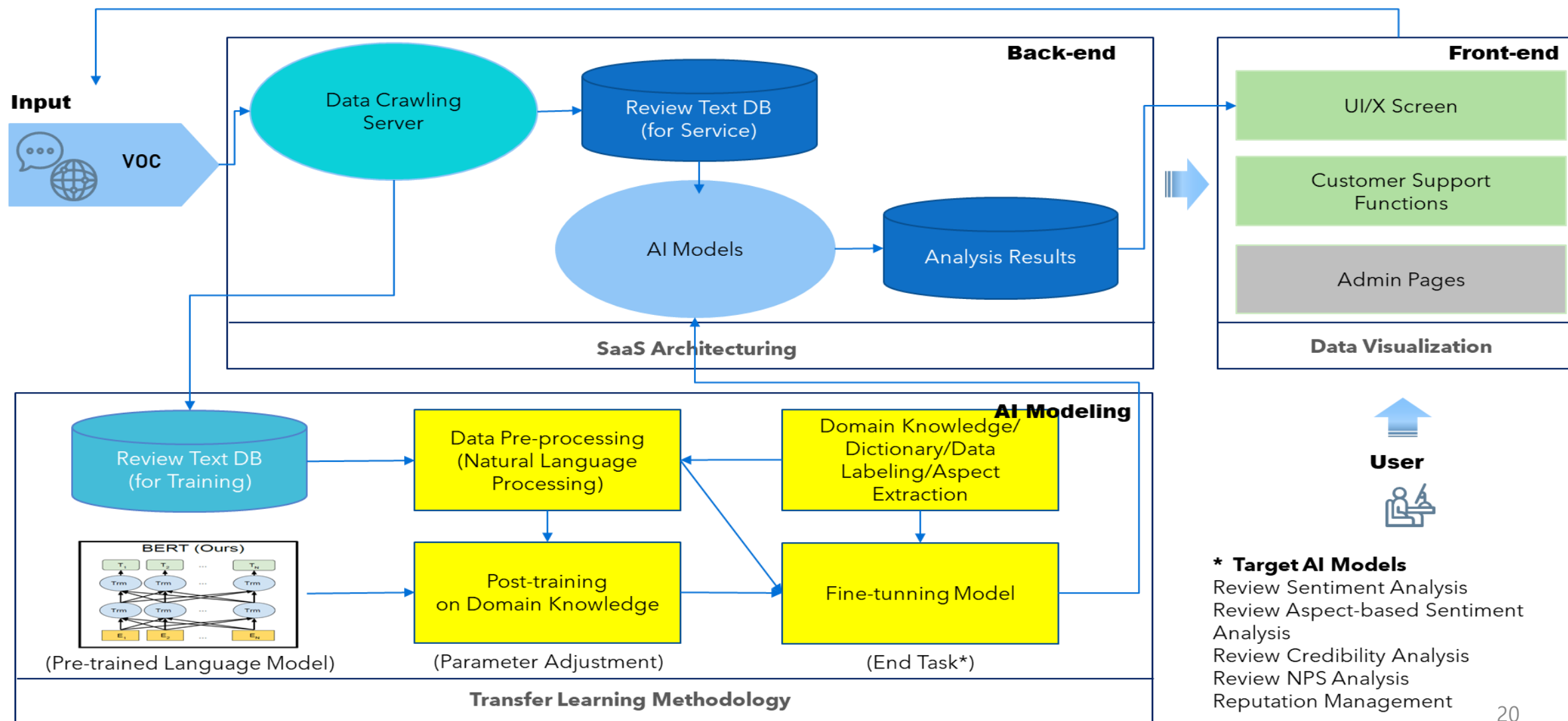
■ Aspect-based Sentiment Analysis with Pre-Trained Language Model (Transfer Learning)



■ A Comparison of SA vs ABSA

	Sentiment Analysis	Aspect-based Sentiment Analysis
Component	Target: Aspect Sentiment: Pos/Neu/Neg	Target: Aspect Category & Aspect Term Sentiment: Opinion Term & Sentiment Polarity
Method	Lexicon-based Approach Machine-learning Approach Hybrid Approach	Single ABSA Tasks Compound ABSA Tasks
Dataset	IMDb Sentiment treebank Sentiment 140 Yelp 2014, 2015	SemEval-2014, 2015 TOWE MAMS ASTE-Data-V2 ABSA-QUAD

■ ReviewMind™ SW - Aspect-based Sentiment Analysis



- Aspect-Based Sentiment analysis

Let's Check The Example Code!

Lesson 3

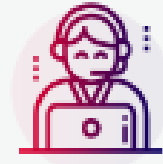
Application of SA and ABSA

The background features a large, 3D blue letter 'A' on the right side. To its left, there are several smaller, light blue geometric shapes, including squares and rectangles, some of which are stacked or arranged in a pattern. The overall design is clean and modern, with a focus on blue and white colors.

- Sentiment analysis can be used for gathering and analyzing people's opinions, thoughts, and impressions regarding various topics, products, subjects, and services



Brand Monitoring



Customer Service

Finance and
Stock MonitoringBusiness
Intelligence BuildupEnhancing the
Customer ExperienceMarket Research
and Analysis

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Business Analysis

- Brand Management
- Reputation Management
- Customer Relationship Management
- Aspect Monitoring

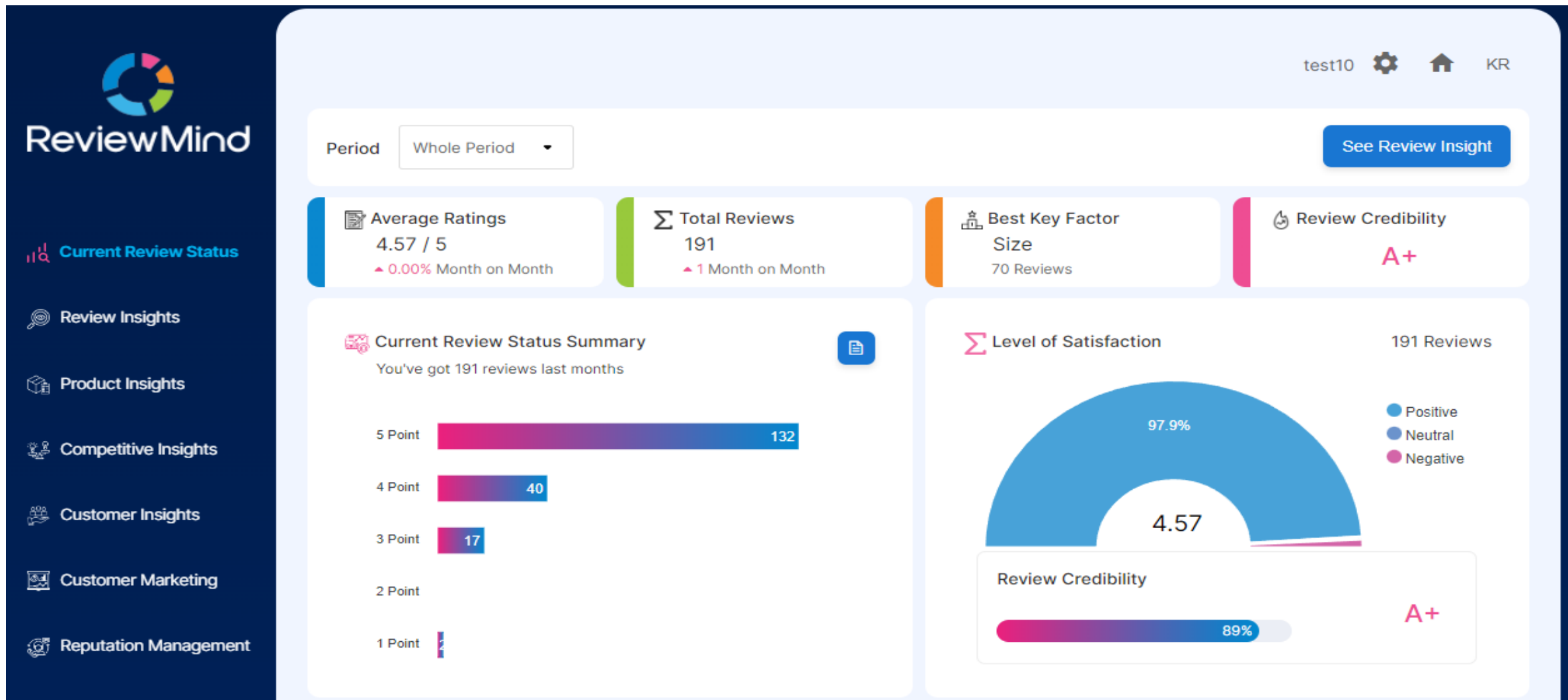
Review Analysis

- Product Reviews
- Voice of Customers Analysis
- Order Document/Speech Analysis
- RFP Analysis

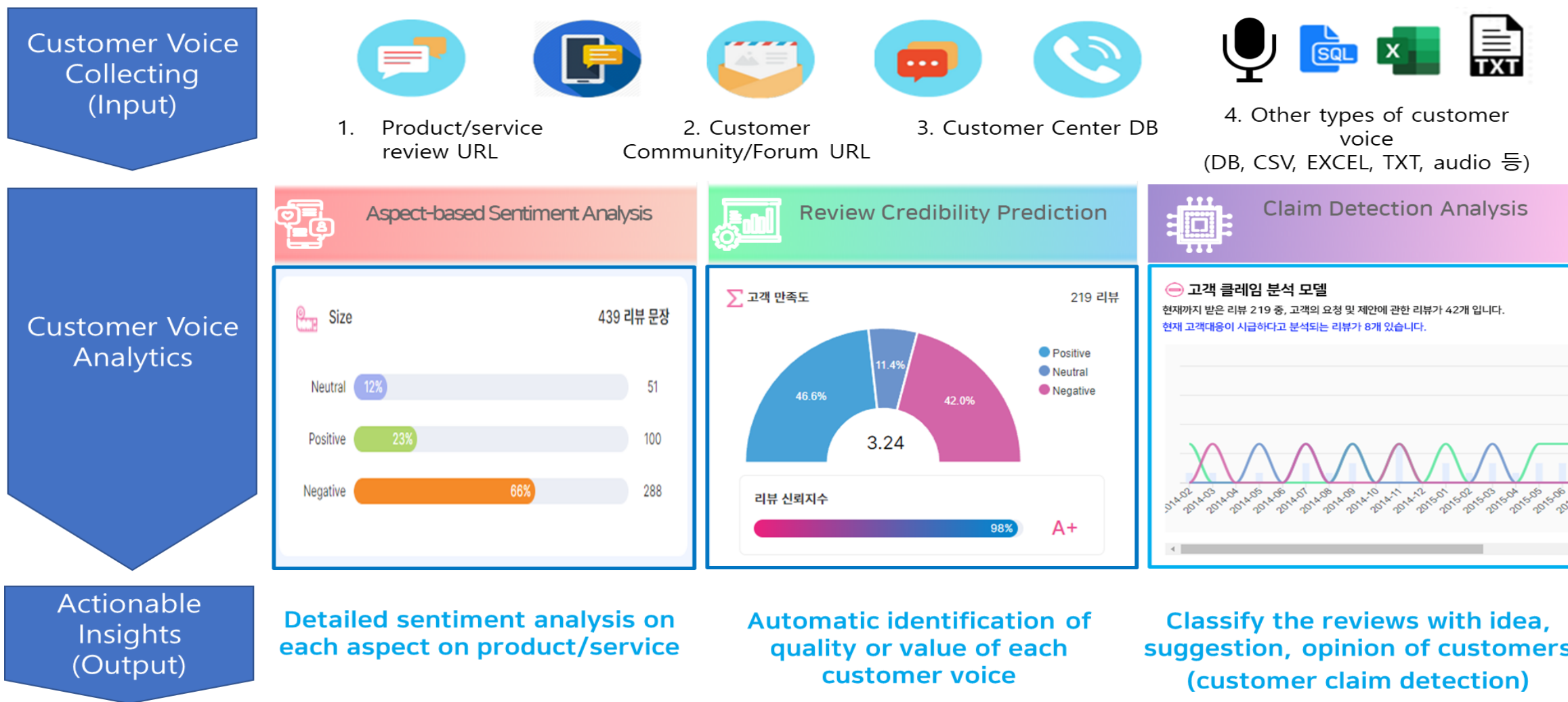
Healthcare Domain

- Patient sentiment analysis
- Well-being systematic reviews

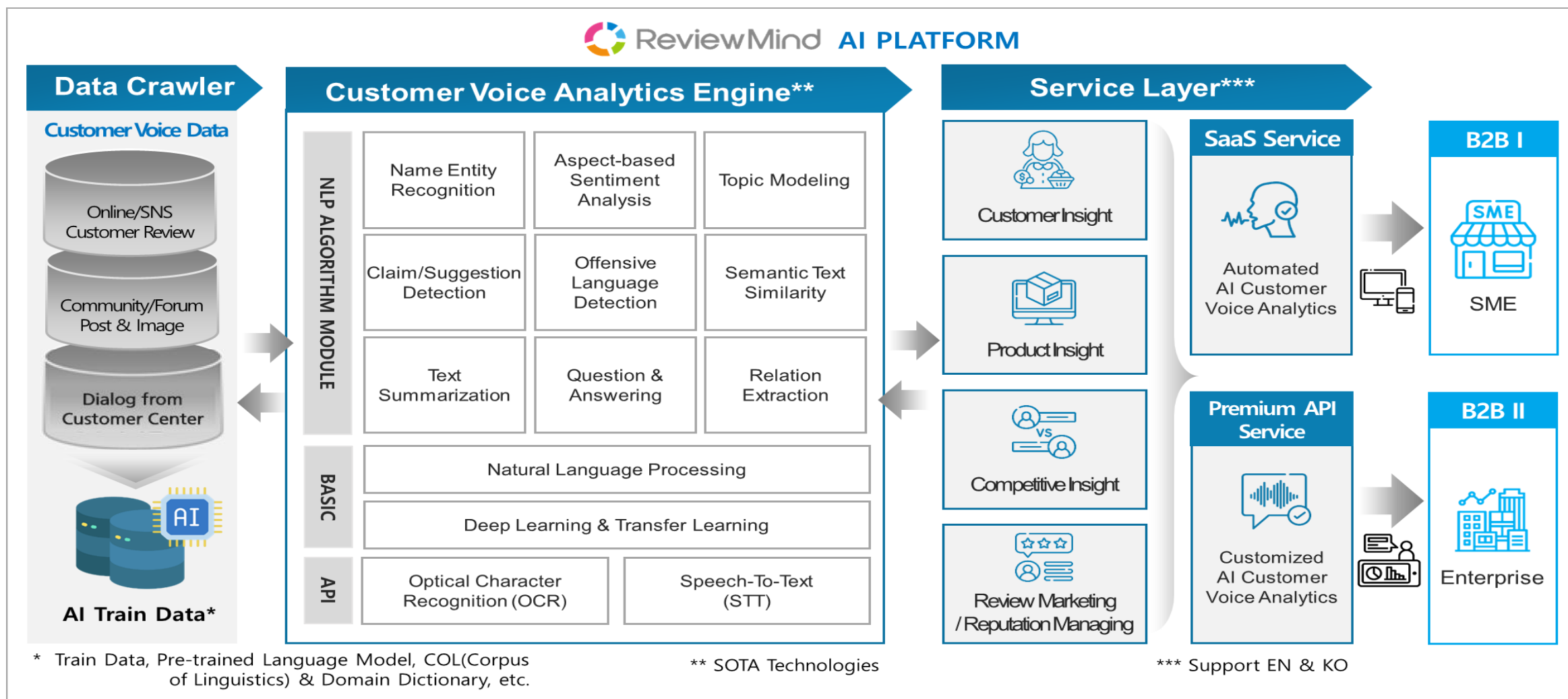
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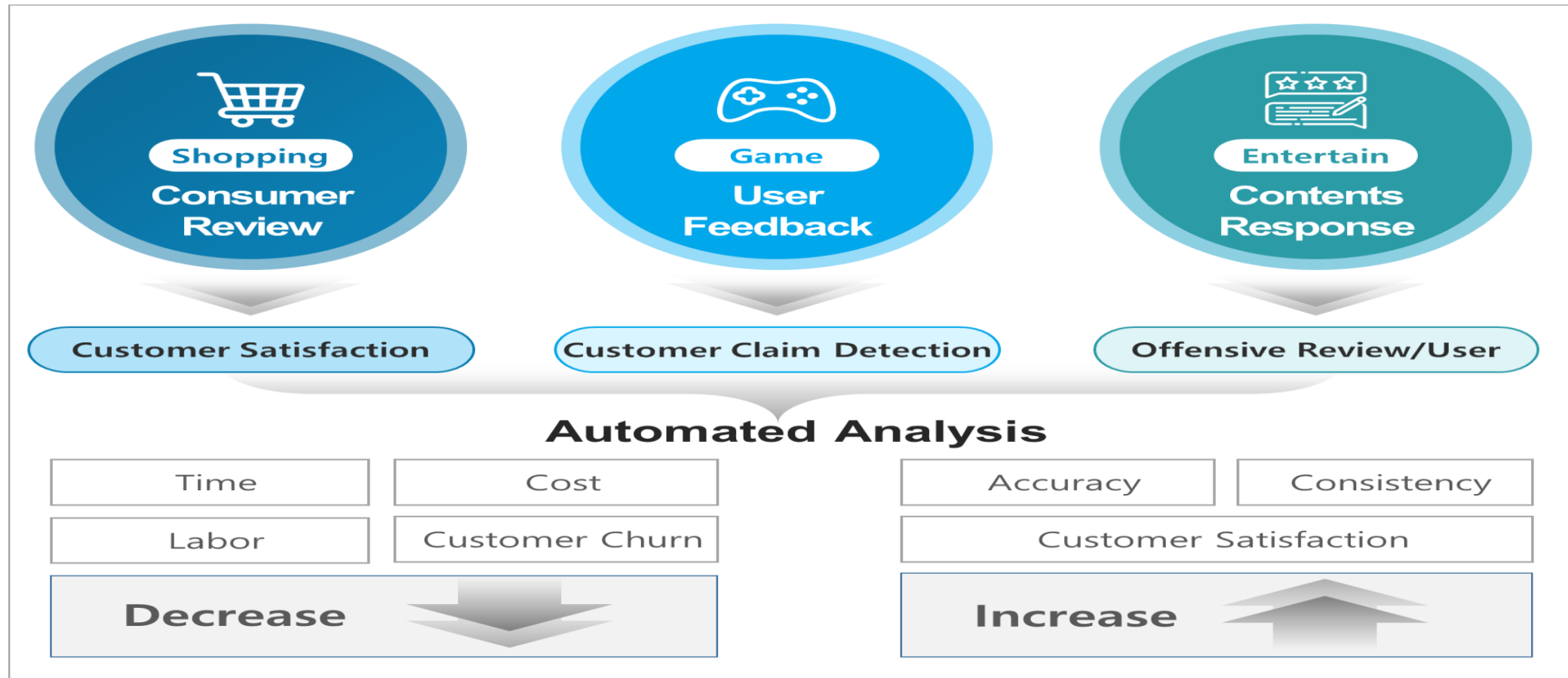
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Lesson 4

Beyond SA and ABSA



- Sentiment analysis is one of the hardest task in NLP due to its subjectivity

Subjectivity & Tone

The package is nice
The package is red

Defining Neutral

1. Objective texts
2. Irrelevant information
3. Texts containing wishes

Context & Polarity

Everything about it
Absolutely nothing!

Irony & Sarcasm

Yea, sure. So smooth!
Not one, but many!

Human Annotator Accuracy

SA is a difficult task for humans
→ inter-annotator agreement

Comparison

This product is second to none
This is better than older tools

Emojis

Special attention is need!

- Sentiment analysis is a computational study or task of classifying the polarity on a given text

◀ Challenge Type ▶

- Negation
- Domain dependence
- Bipolar words
- Huge lexicon
- Spam & Fake Detection
- Extracting features or keywords
- NLP Overheads

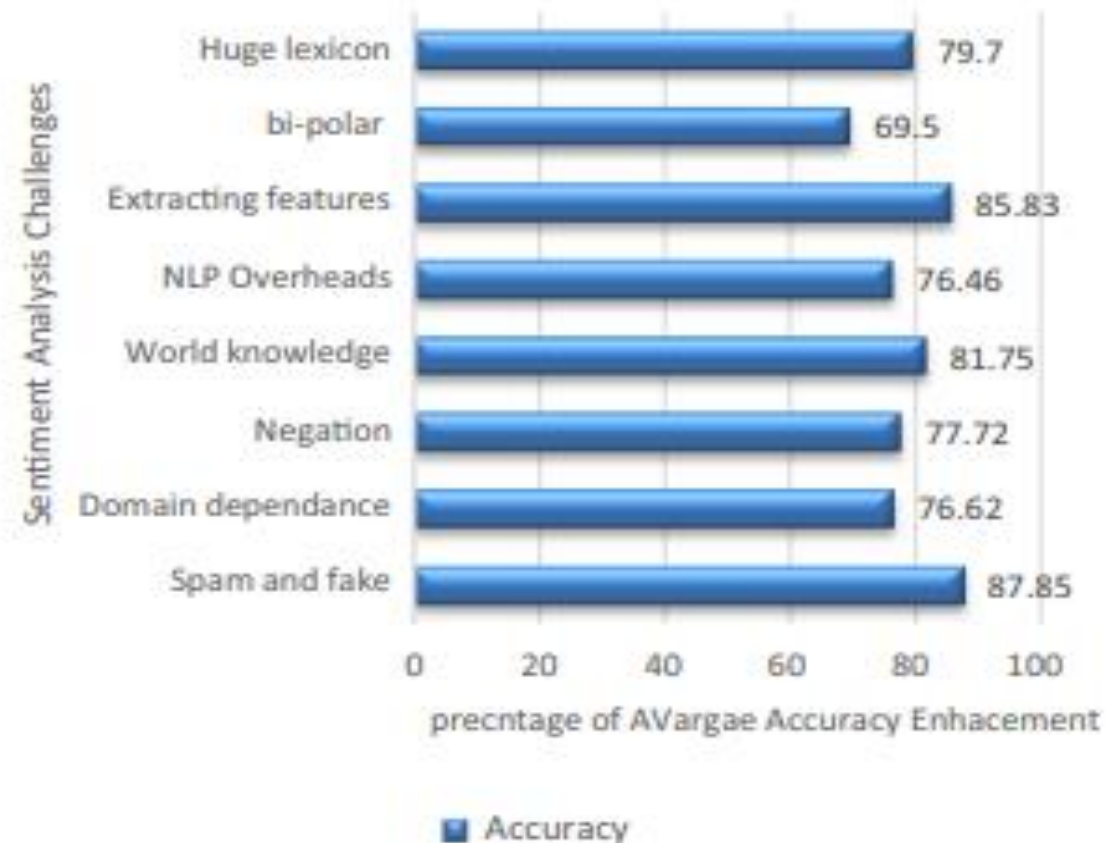


Figure 2 The improvement in accuracy results in sentiment analysis challenges.

■ Challenges and future direction of ABSA - Transferable ABSA

• Cross-domain ABSA

In real-world scenarios, which involve texts from multiple or even unseen domains,

It is likely that these models fail to obtain satisfactory predictions.

The models may not have prior knowledge about the frequently-used terms in the unseen domains.

• Cross-lingual ABSA

Opinions are often expressed in different languages in practice (ex. customer reviews)

Key problem is to obtain the language-specific knowledge in the target language

Recently, inspired by the success of exploiting PLMs, utilizing multilingual PLMs such as multilingual BERT and XLM-RoBERTa to tackle cross-lingual NLP tasks

• Multimodal ABSA

Users often share their opinions with other modalities such as images

Multimodal information can help better analyze users' sentiments towards different aspects.

Recent studies on multimodal ABSA mainly concentrate on simple ABSA task such as multimodal ATE and multimodal ASC.

Thank you!



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