

# NLP Project

## Aspect-Based Sentiment Analysis

AI VIET NAM  
Nguyen Quoc Thai

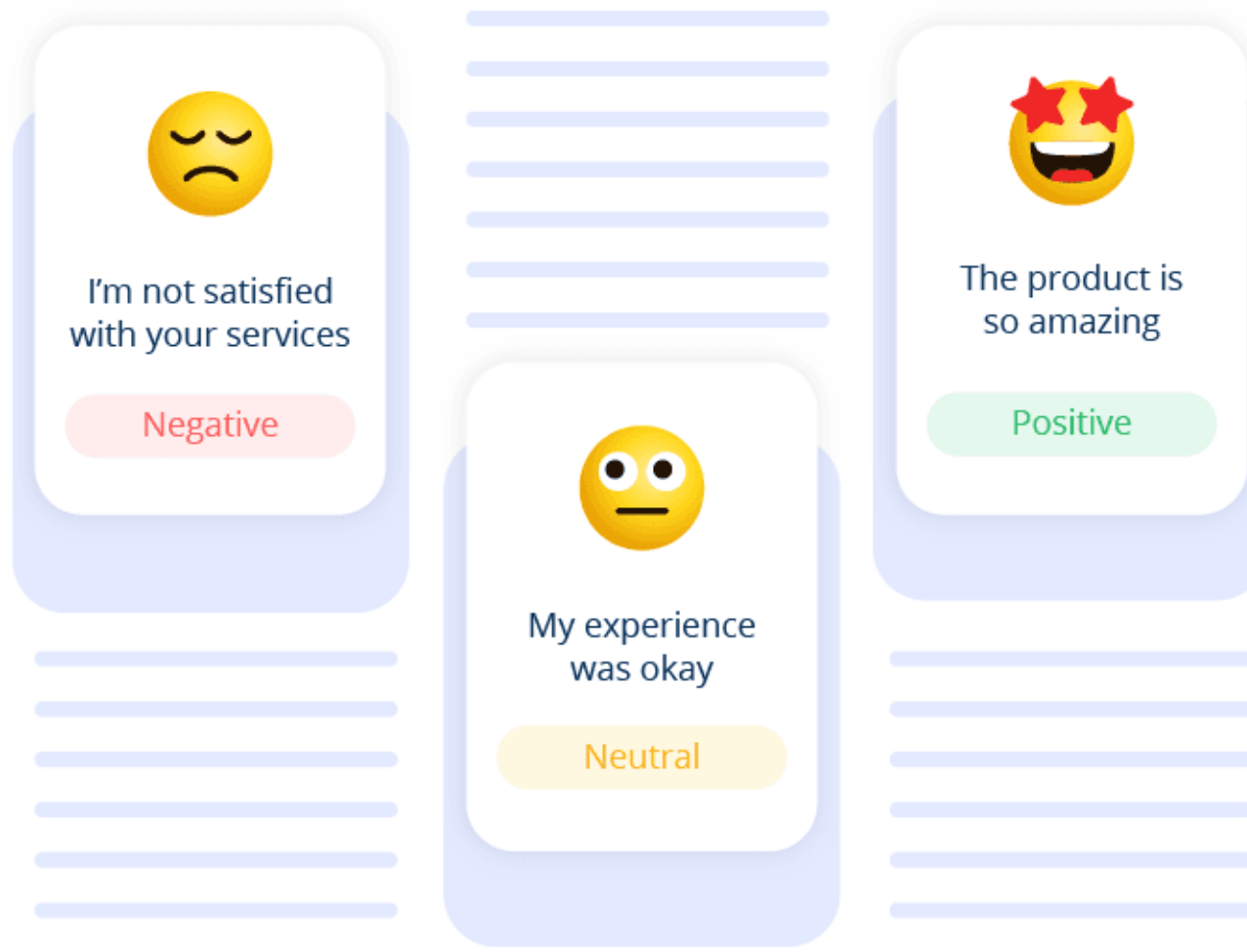
# Outline

- **Sentiment Analysis**
- **Aspect-based Sentiment Analysis**
- **Aspect Sentiment Pair Extraction**

# Sentiment Analysis



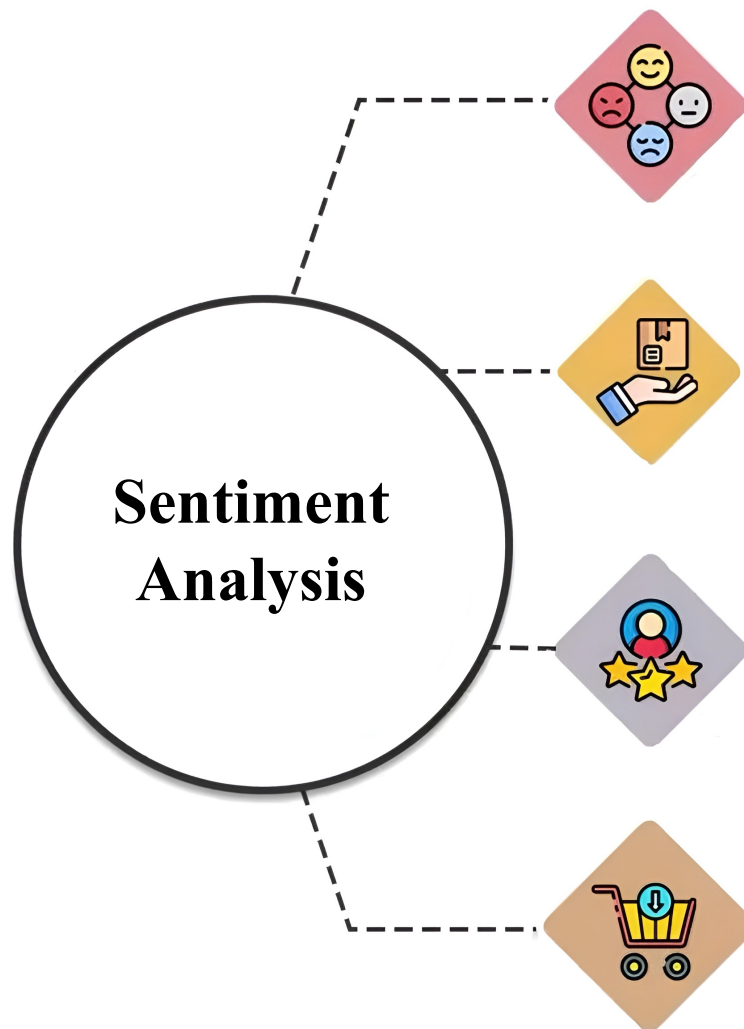
## Sentiment Analysis



# Sentiment Analysis



## Types of Sentiment Analysis



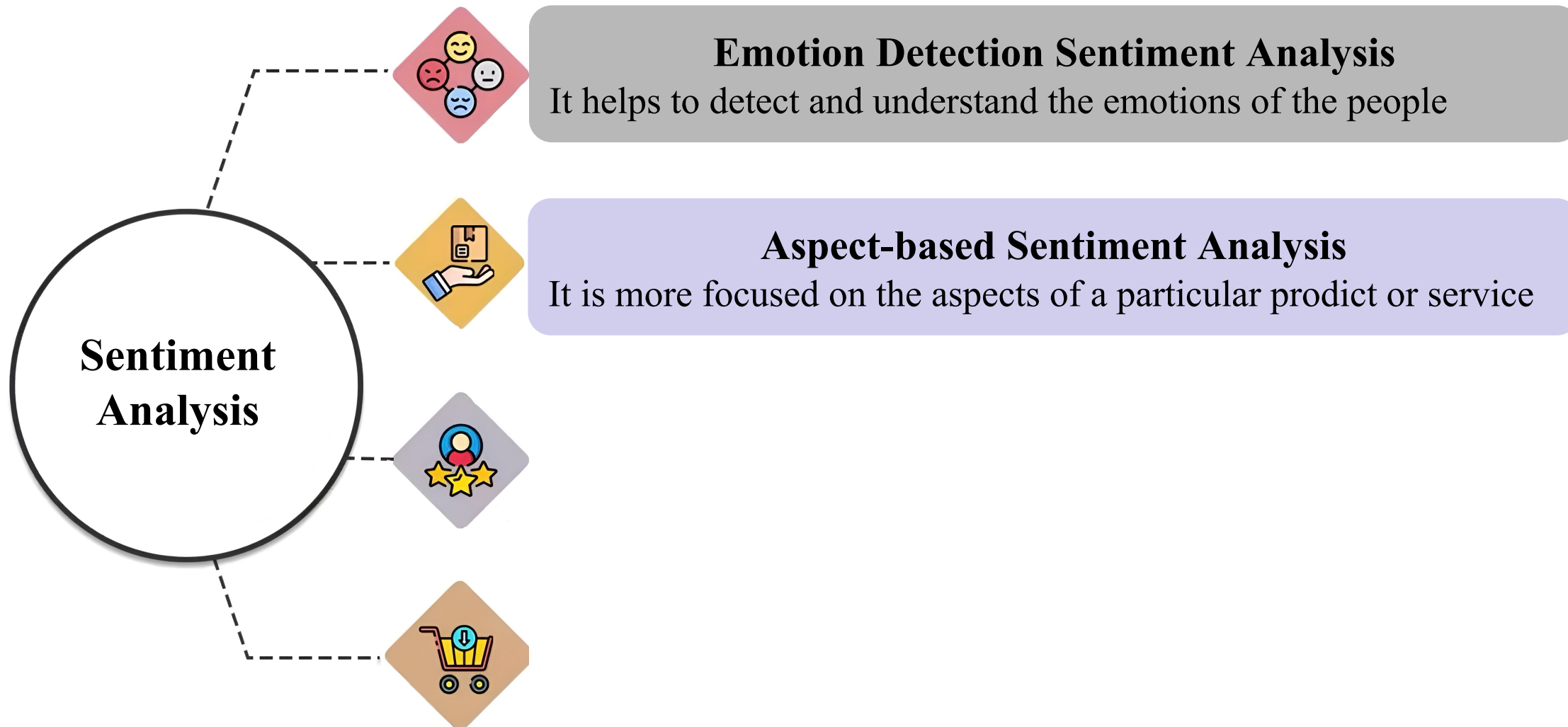
### Emotion Detection Sentiment Analysis

It helps to detect and understand the emotions of the people

# Sentiment Analysis



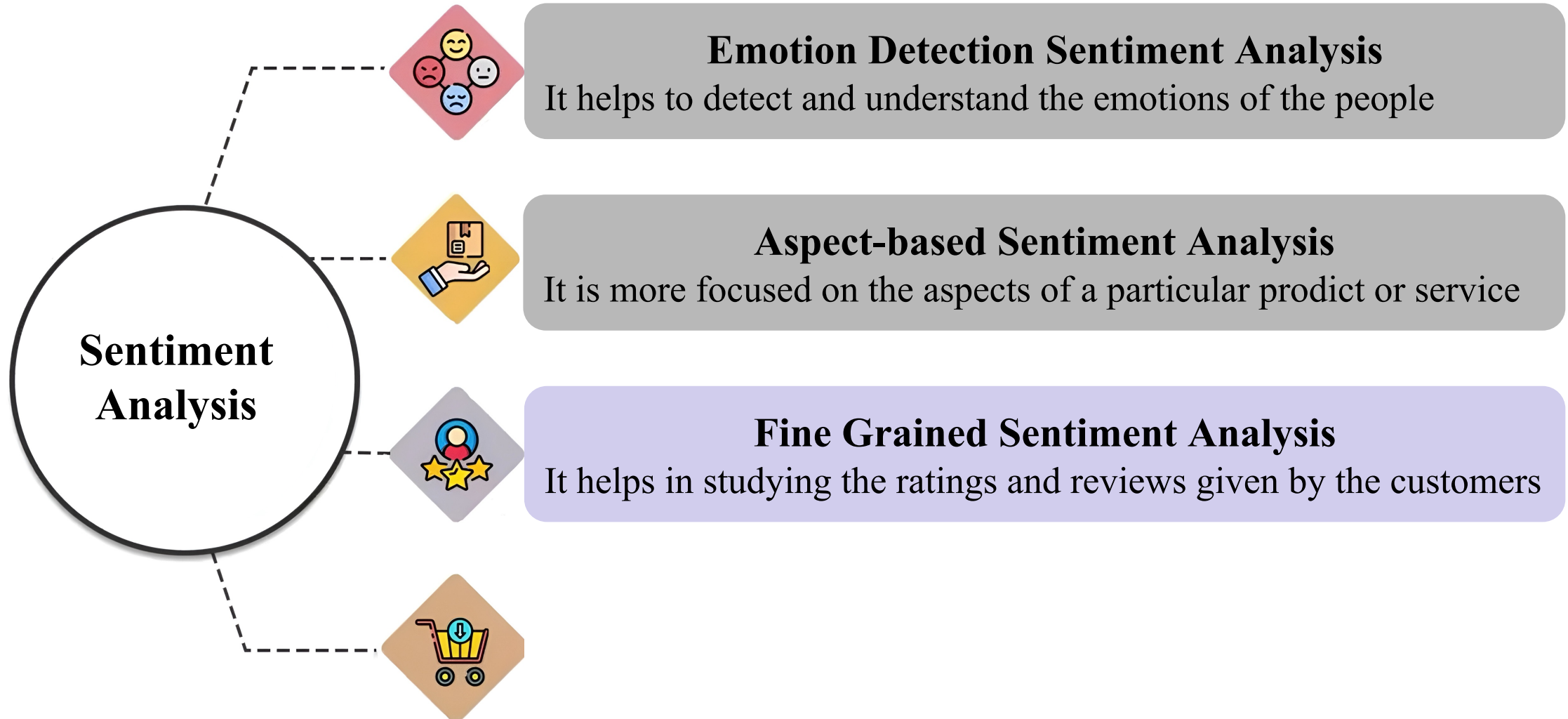
## Types of Sentiment Analysis



# Sentiment Analysis



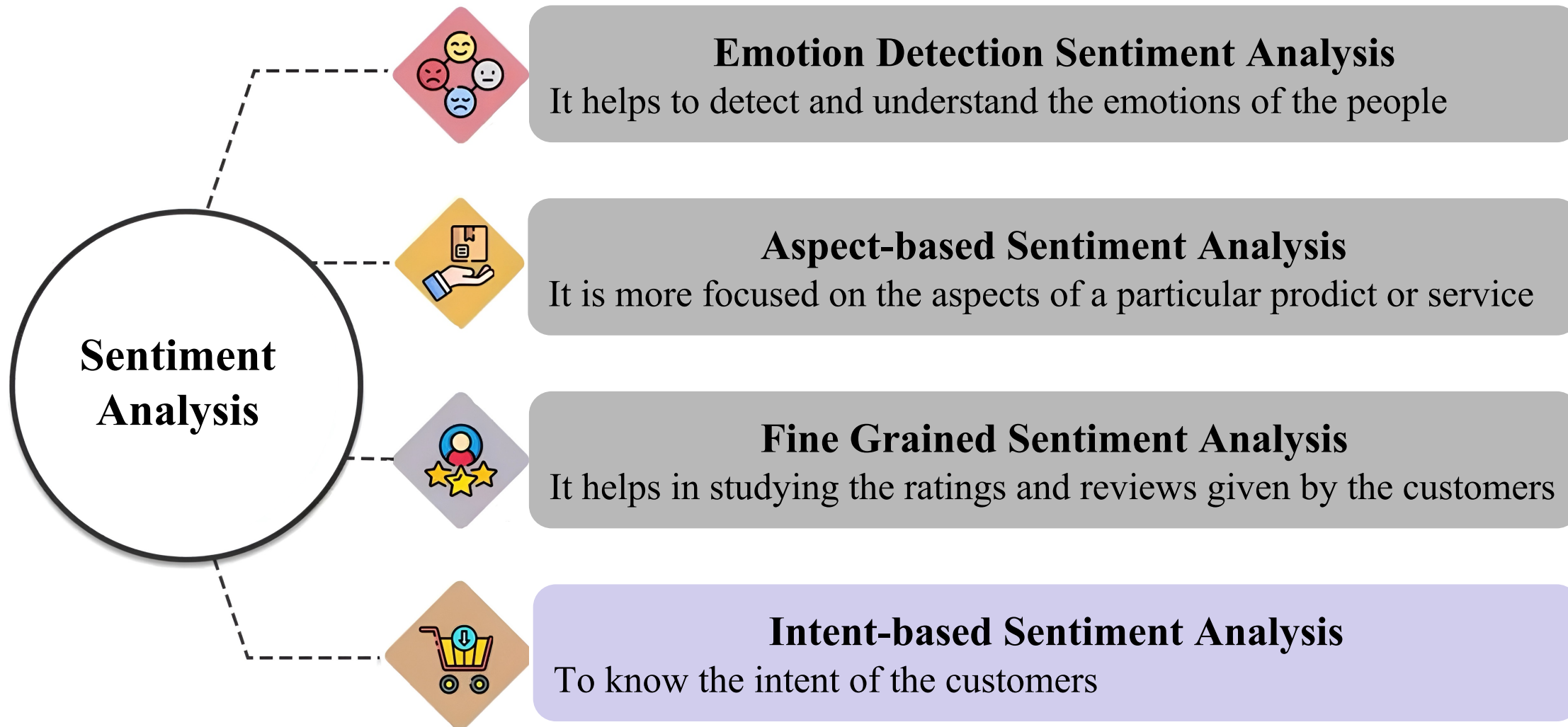
## Types of Sentiment Analysis



# Sentiment Analysis



## Types of Sentiment Analysis



# Sentiment Analysis



## NTC-SCV Dataset for Sentiment Analysis

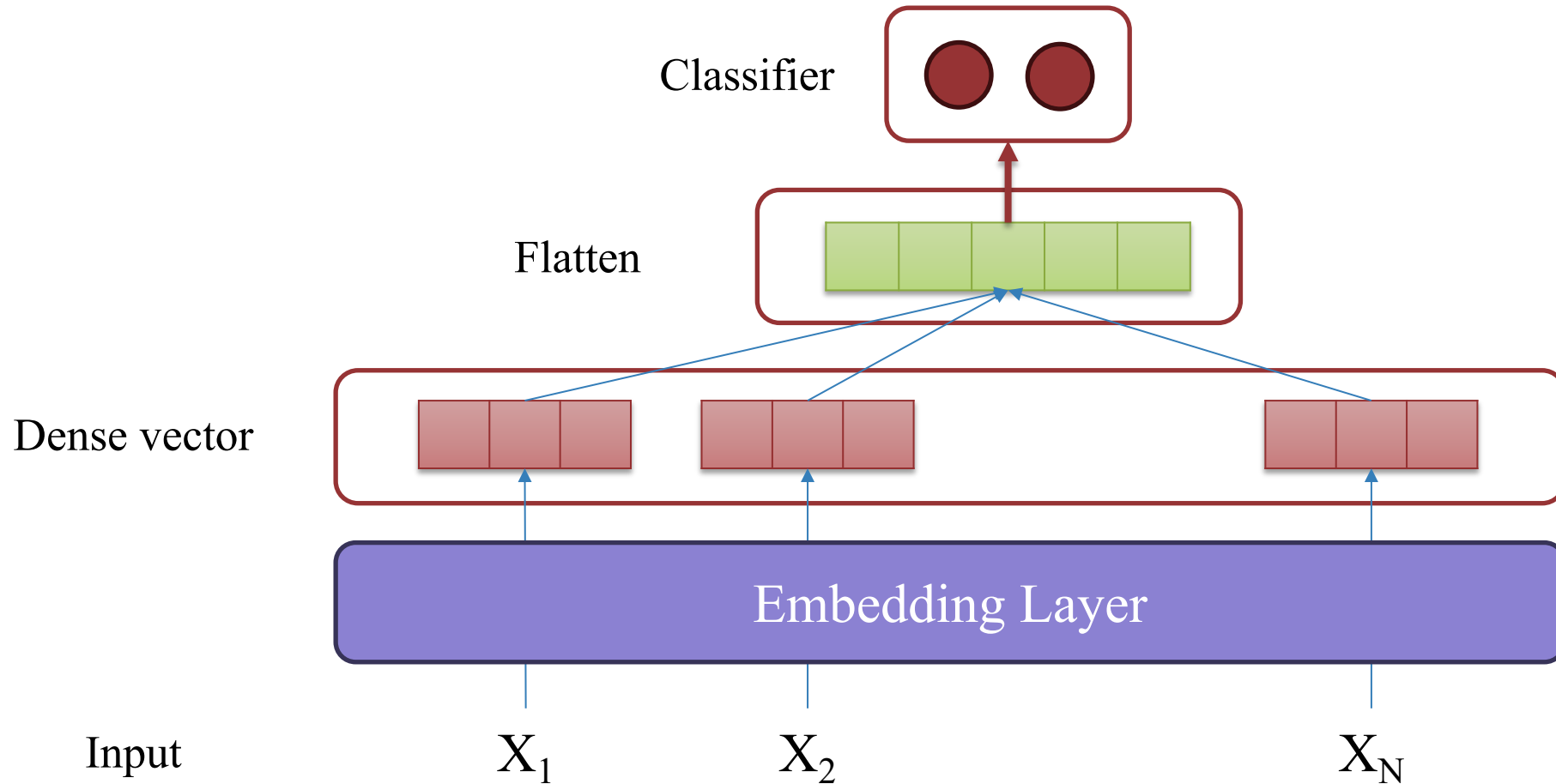
Positive Example	Negative Example
Mình được 1 cô bạn giới_thiệu đến đây , tìm địa_chỉ khá dễ . Menu nước uống chất khỏi nói . Mình muốn cũng đc 8 loại nước ở đây , món nào cũng ngon và bổ_dưỡng cả .	Quán chế_biến đồ_ăn lâu , Cá_Sapa nướng ướp rất dở , sò Lông ko tươi , nước_chấm ko ngon\nTóm_lại sẽ ko bao_giờ ghé nữa , ăn_dở mà uống tiền
Mỗi lần thềm trà sữa là làm 1 ly . Quán dễ kiếm , không_gian lại rộng_rải . Nhân_viên thì dễ_thương gần_gũi . Nói_chung thềm trà sữa là mình ghé Quán ở đây vì gần nhà .	Quán này thấy khá nhiều người bảo mình nên mình đã đi ăn thử , nhưng thực_sự ăn xong thấy không được như mong_đợi lắm .



# Sentiment Analysis



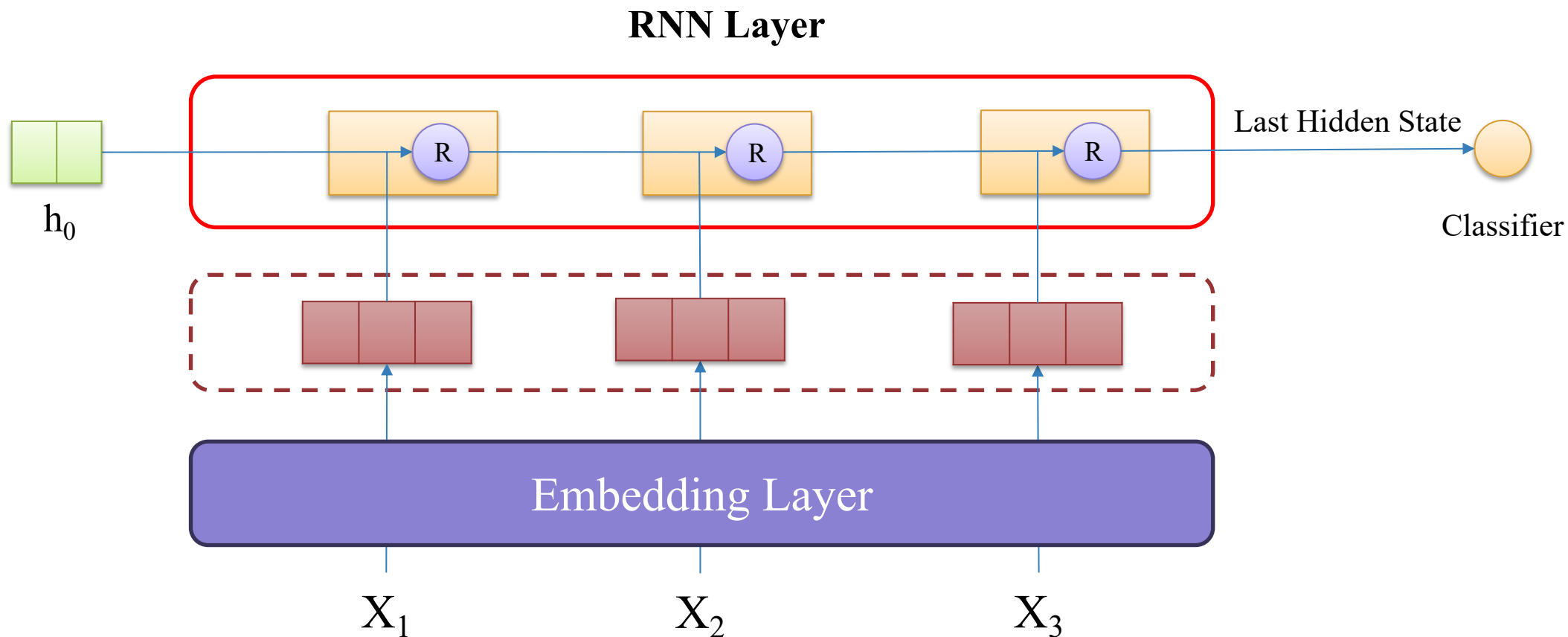
## Sentiment Analysis using Neural Network



# Sentiment Analysis



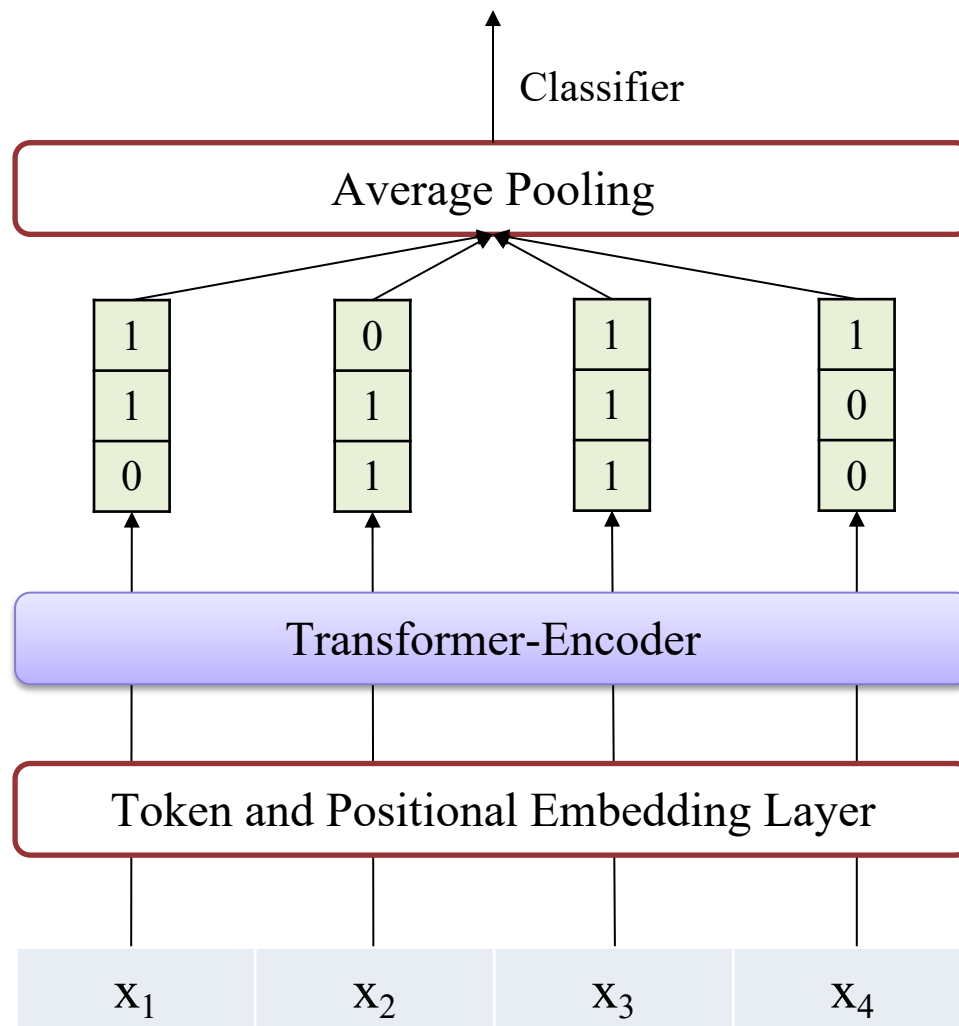
## Sentiment Analysis using RNNs



# Sentiment Analysis



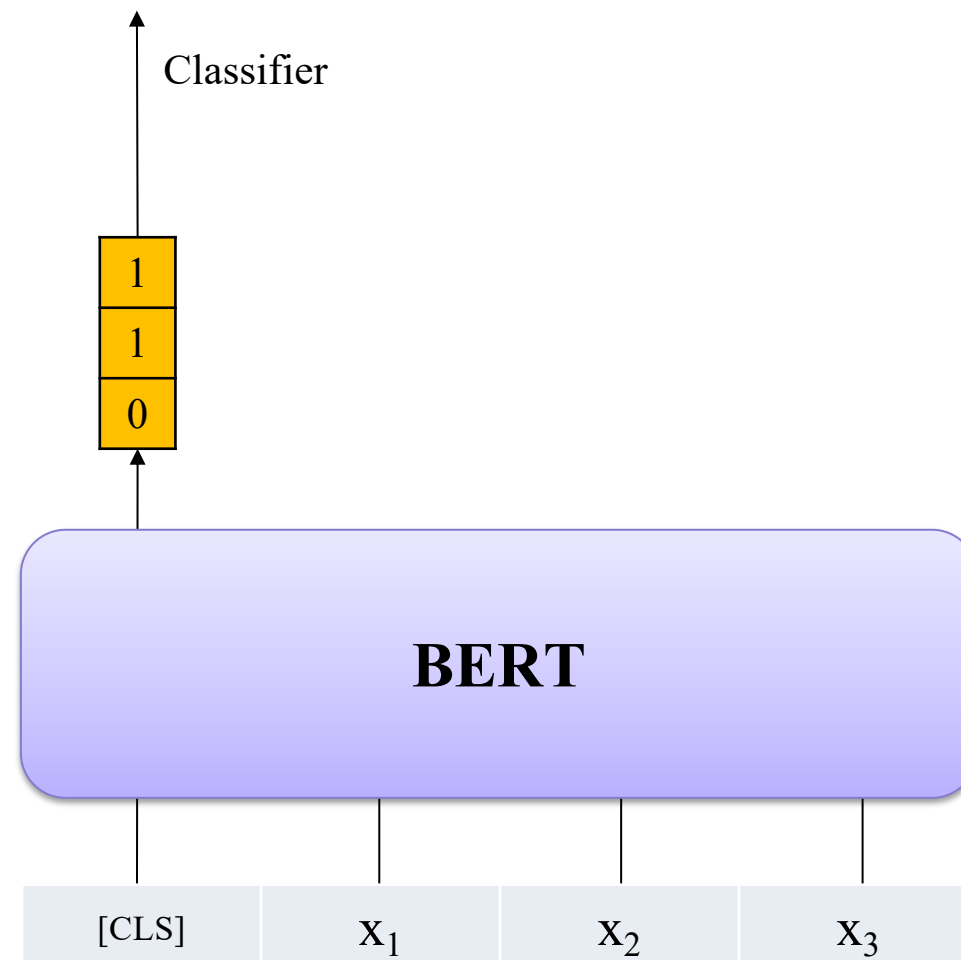
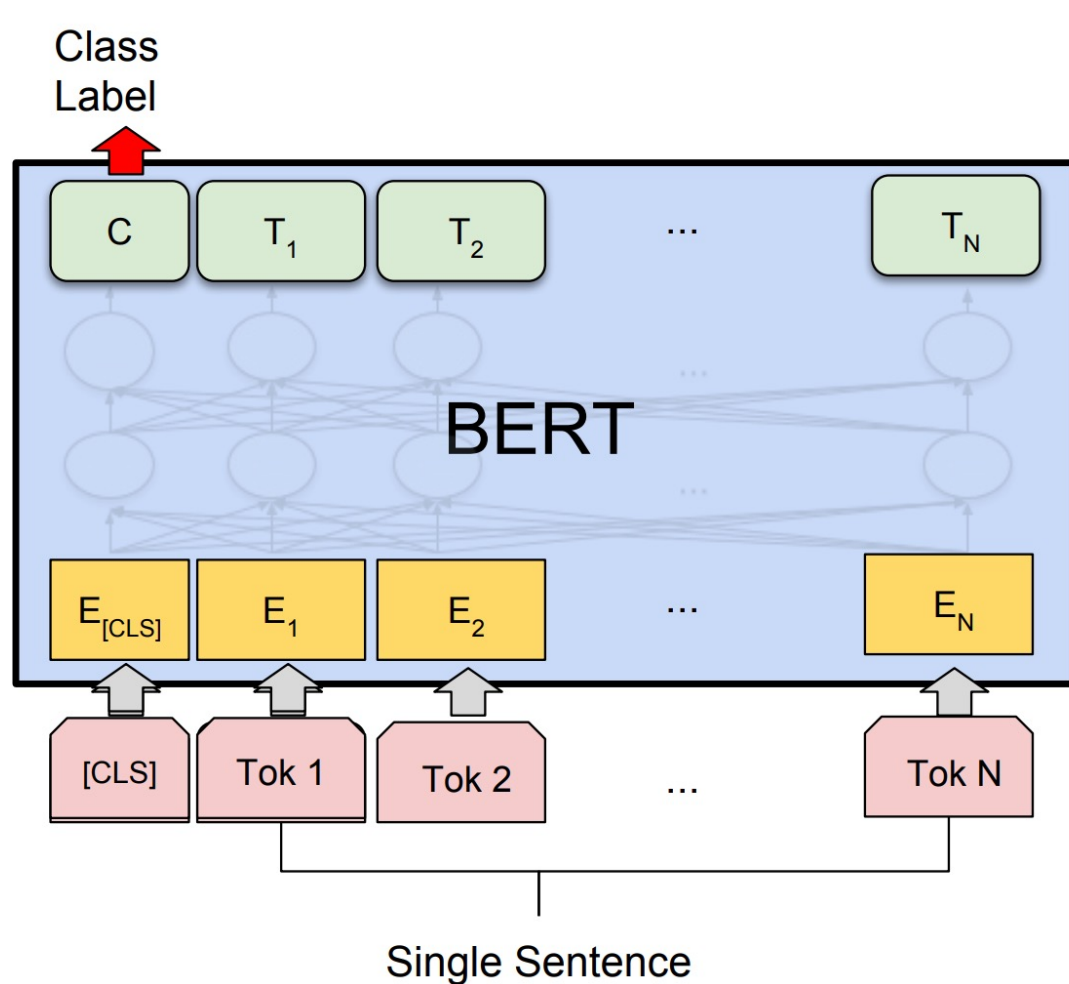
## Sentiment Analysis using Transformer-Encoder



# Sentiment Analysis



## Sentiment Analysis using Pre-trained LMs



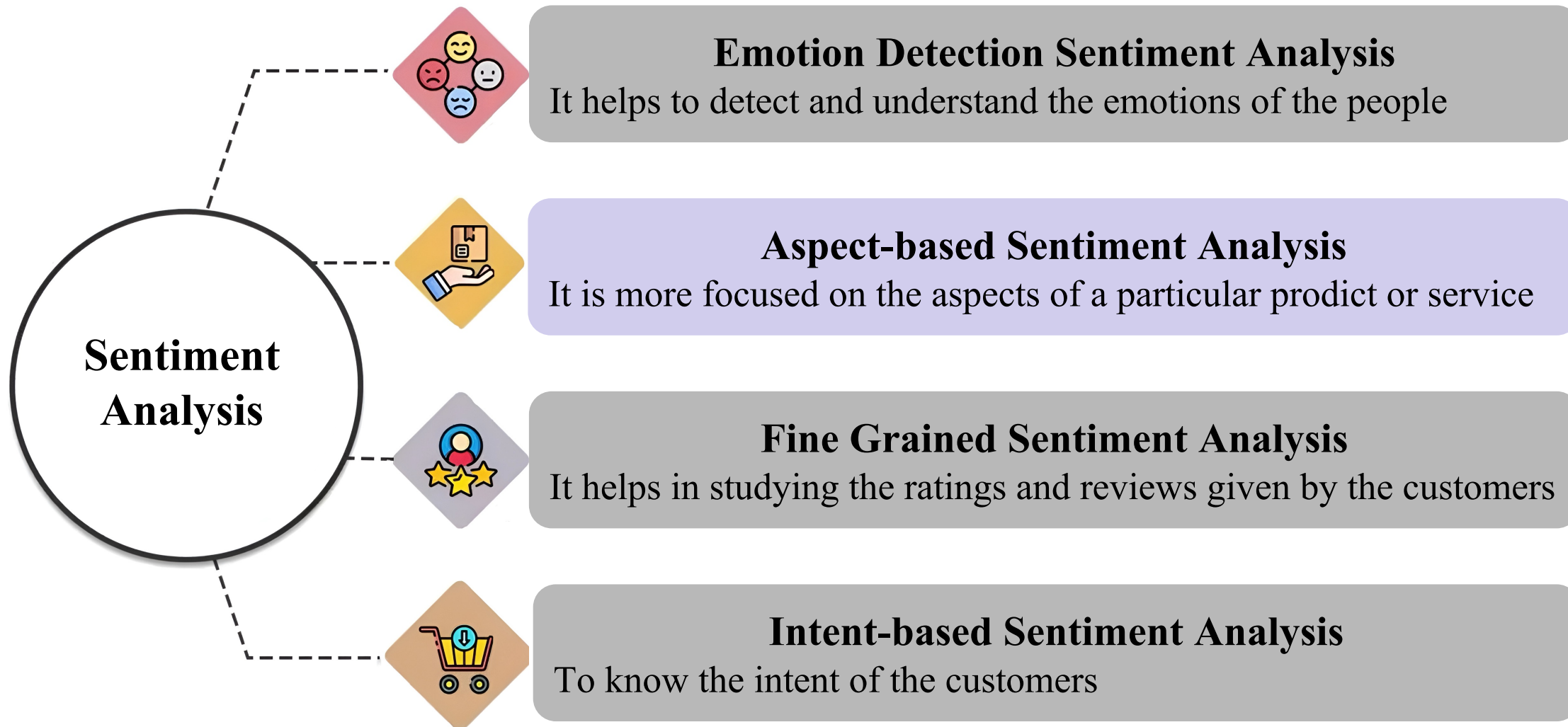
# Outline

- **Sentiment Analysis**
- **Aspect-based Sentiment Analysis**
- **Aspect Sentiment Pair Extraction**

# Sentiment Analysis



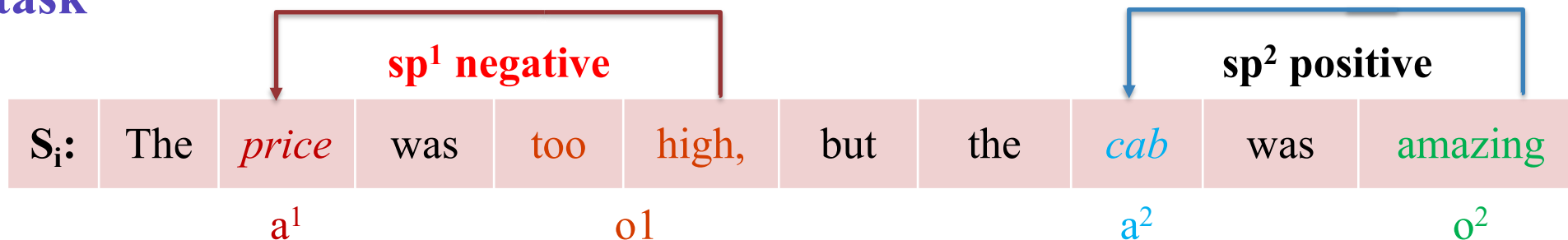
## Types of Sentiment Analysis



# Aspect-based Sentiment Analysis



## Subtask



Aspect Term Extraction (ATE)

Aspect Term Sentiment Classification (ATSC)

Aspect Sentiment Pair Extraction (ASPE)

Aspect Oriented Opinion Extraction (AOOE)

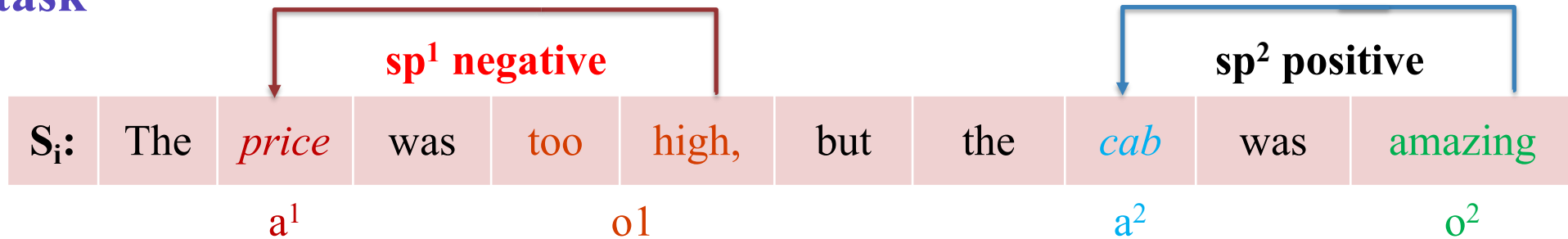
Aspect Opinion Pair Extraction (AOPE)

Aspect Opinion Sentiment Triplet Extraction (AOSTE)

# Aspect-based Sentiment Analysis



## Subtask



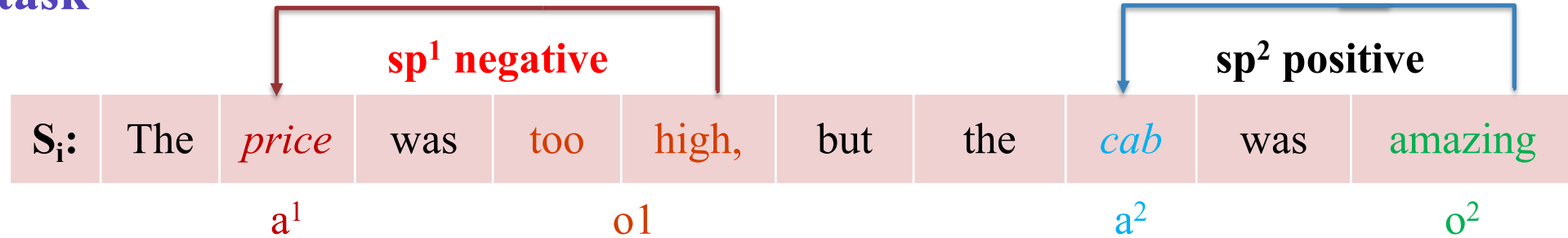
Aspect Term Extraction (ATE)	$S_i$	$a^1, a^2$
Aspect Term Sentiment Classification (ATSC)		
Aspect Sentiment Pair Extraction (ASPE)		
Aspect Oriented Opinion Extraction (AOOE)		
Aspect Opinion Pair Extraction (AOPE)		
Aspect Opinion Sentiment Triplet Extraction (AOSTE)		



# Aspect-based Sentiment Analysis



## Subtask

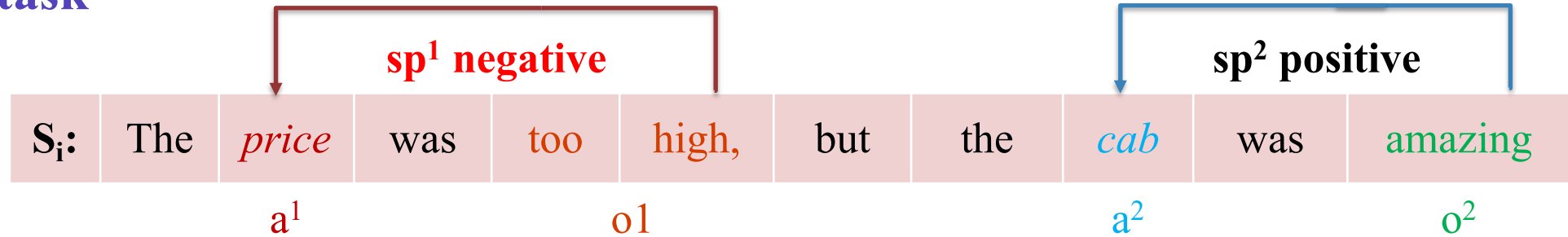


Aspect Term Extraction (ATE)	$S_i$	$a^1, a^2$
Aspect Term Sentiment Classification (ATSC)	$S_i + a^1, S_i + a^2$	$sp^1, sp^2$
Aspect Sentiment Pair Extraction (ASPE)		
Aspect Oriented Opinion Extraction (AOOE)		
Aspect Opinion Pair Extraction (AOPE)		
Aspect Opinion Sentiment Triplet Extraction (AOSTE)		

# Aspect-based Sentiment Analysis



## Subtask

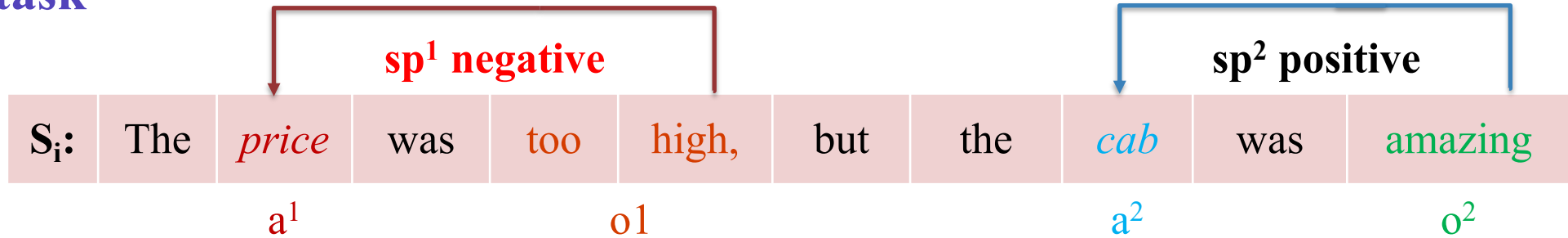


Aspect Term Extraction (ATE)	$S_i$	$a^1, a^2$
Aspect Term Sentiment Classification (ATSC)	$S_i + a^1, S_i + a^2$	$sp^1, sp^2$
Aspect Sentiment Pair Extraction (ASPE)	$S_i$	$(a^1, sp^1), (a^2, sp^2)$
Aspect Oriented Opinion Extraction (AOOE)		
Aspect Opinion Pair Extraction (AOPE)		
Aspect Opinion Sentiment Triplet Extraction (AOSTE)		

# Aspect-based Sentiment Analysis



## Subtask

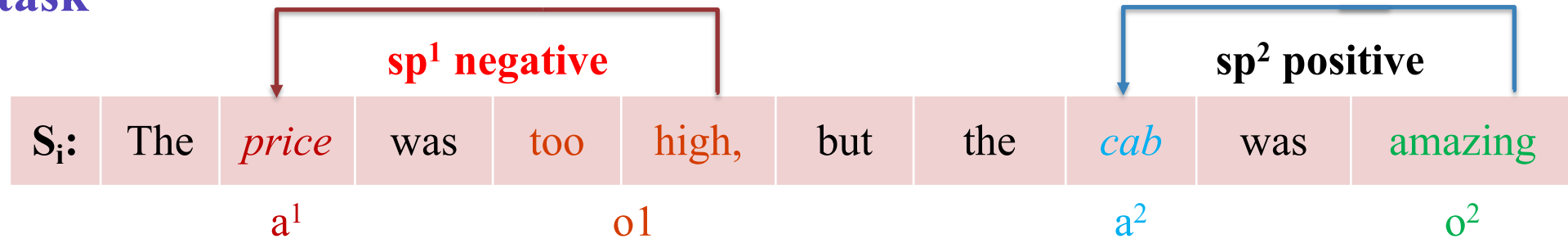


Aspect Term Extraction (ATE)	$S_i$	$a^1, a^2$
Aspect Term Sentiment Classification (ATSC)	$S_i + a^1, S_i + a^2$	$sp^1, sp^2$
Aspect Sentiment Pair Extraction (ASPE)	$S_i$	$(a^1, sp^1), (a^2, sp^2)$
Aspect Oriented Opinion Extraction (AOOE)	$S_i + a^1, S_i + a^2$	$o^1, o^2$
Aspect Opinion Pair Extraction (AOPE)		
Aspect Opinion Sentiment Triplet Extraction (AOSTE)		

# Aspect-based Sentiment Analysis



## Subtask

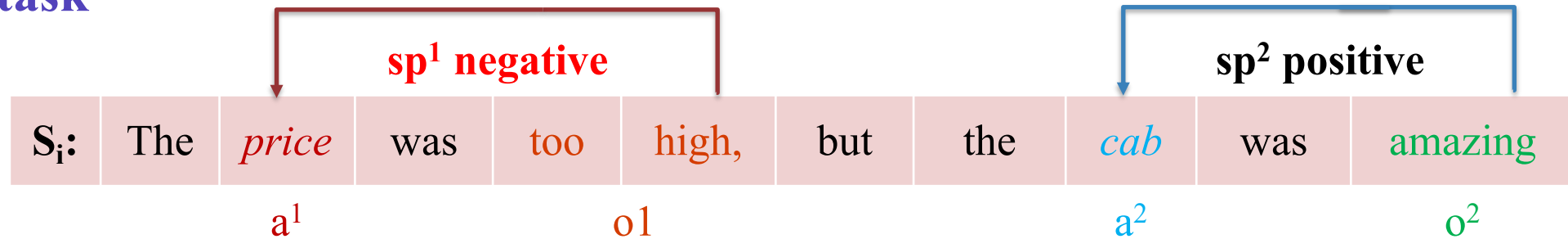


Aspect Term Extraction (ATE)	$S_i$	$a^1, a^2$
Aspect Term Sentiment Classification (ATSC)	$S_i + a^1, S_i + a^2$	$sp^1, sp^2$
Aspect Sentiment Pair Extraction (ASPE)	$S_i$	$(a^1, sp^1), (a^2, sp^2)$
Aspect Oriented Opinion Extraction (AOOE)	$S_i + a^1, S_i + a^2$	$o^1, o^2$
Aspect Opinion Pair Extraction (AOPE)	$S_i$	$(a^1, o^1), (a^2, o^2)$
Aspect Opinion Sentiment Triplet Extraction (AOSTE)		

# Aspect-based Sentiment Analysis



## Subtask



Aspect Term Extraction (ATE)	$S_i$	$a^1, a^2$
Aspect Term Sentiment Classification (ATSC)	$S_i + a^1, S_i + a^2$	$sp^1, sp^2$
Aspect Sentiment Pair Extraction (ASPE)	$S_i$	$(a^1, sp^1), (a^2, sp^2)$
Aspect Oriented Opinion Extraction (AOOE)	$S_i + a^1, S_i + a^2$	$o^1, o^2$
Aspect Opinion Pair Extraction (AOPE)	$S_i$	$(a^1, o^1), (a^2, o^2)$
Aspect Opinion Sentiment Triplet Extraction (AOSTE)	$S_i$	$(a^1, o^1, sp^1), (a^2, o^2, sp^2)$

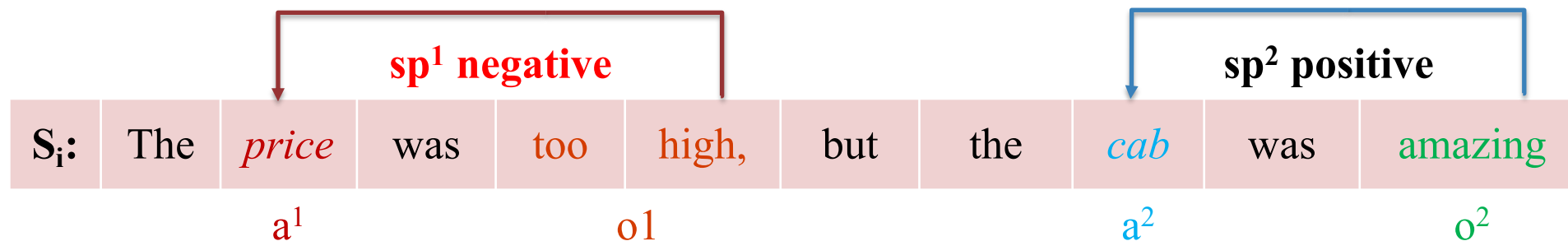
# Outline

- **Sentiment Analysis**
- **Aspect-based Sentiment Analysis**
- **Aspect Sentiment Pair Extraction**

# Aspect Sentiment Pair Extraction



## Example



$S_i$	$(a^1, sp^1), (a^2, sp^2)$
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# Aspect Sentiment Pair Extraction



## SemEval Task 4 Dataset

Domain	Train	Test	Total
Restaurants	3041	800	3841
Laptops	3045	800	3845
Total	6086	1600	7686

But the staff was so horrible to us

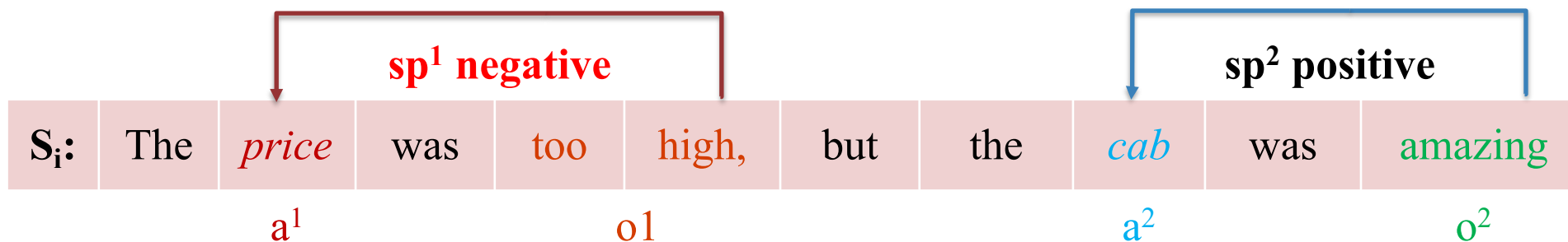
Aspect: Staff  
Sentiment: Negative



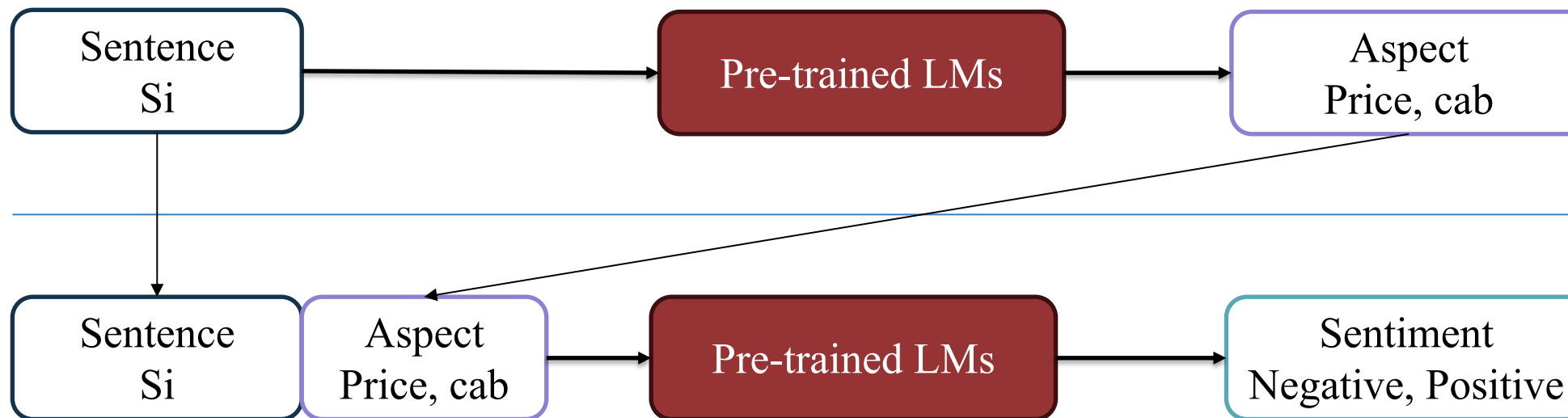
# Aspect Sentiment Pair Extraction



## Approach



### Stage 1: Aspect Term Extraction (Token-level Classification)



### Stage 2: Aspect Term Sentiment Extraction (Document-level Classification)

# Aspect Sentiment Pair Extraction



## Approach

But	the	staff	was	so	horribale	to	us
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### Stage 1: Aspect Term Extraction (Token-level Classification)

0	0	1	0	0	0	0	0
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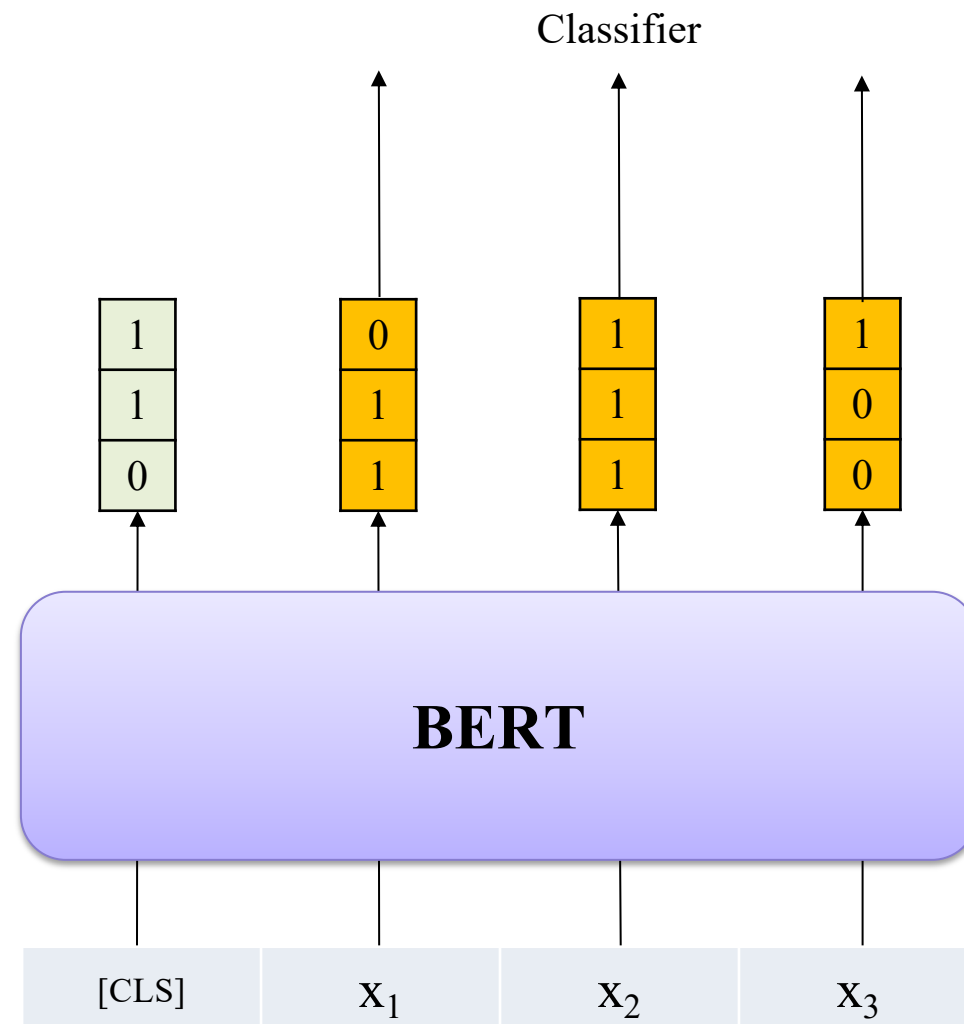
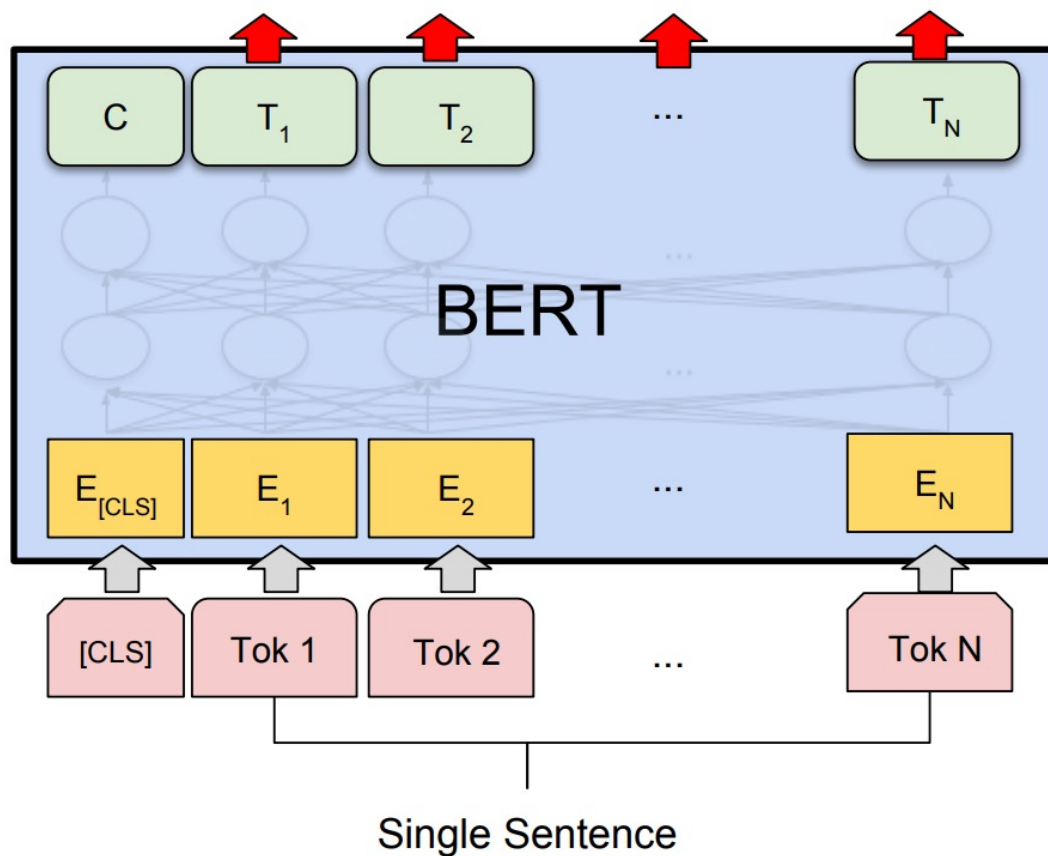
### Stage 2: Aspect Term Sentiment Extraction (Document-level Classification)

-1	-1	0	-1	-1	-1	-1	-1
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# Aspect Sentiment Pair Extraction



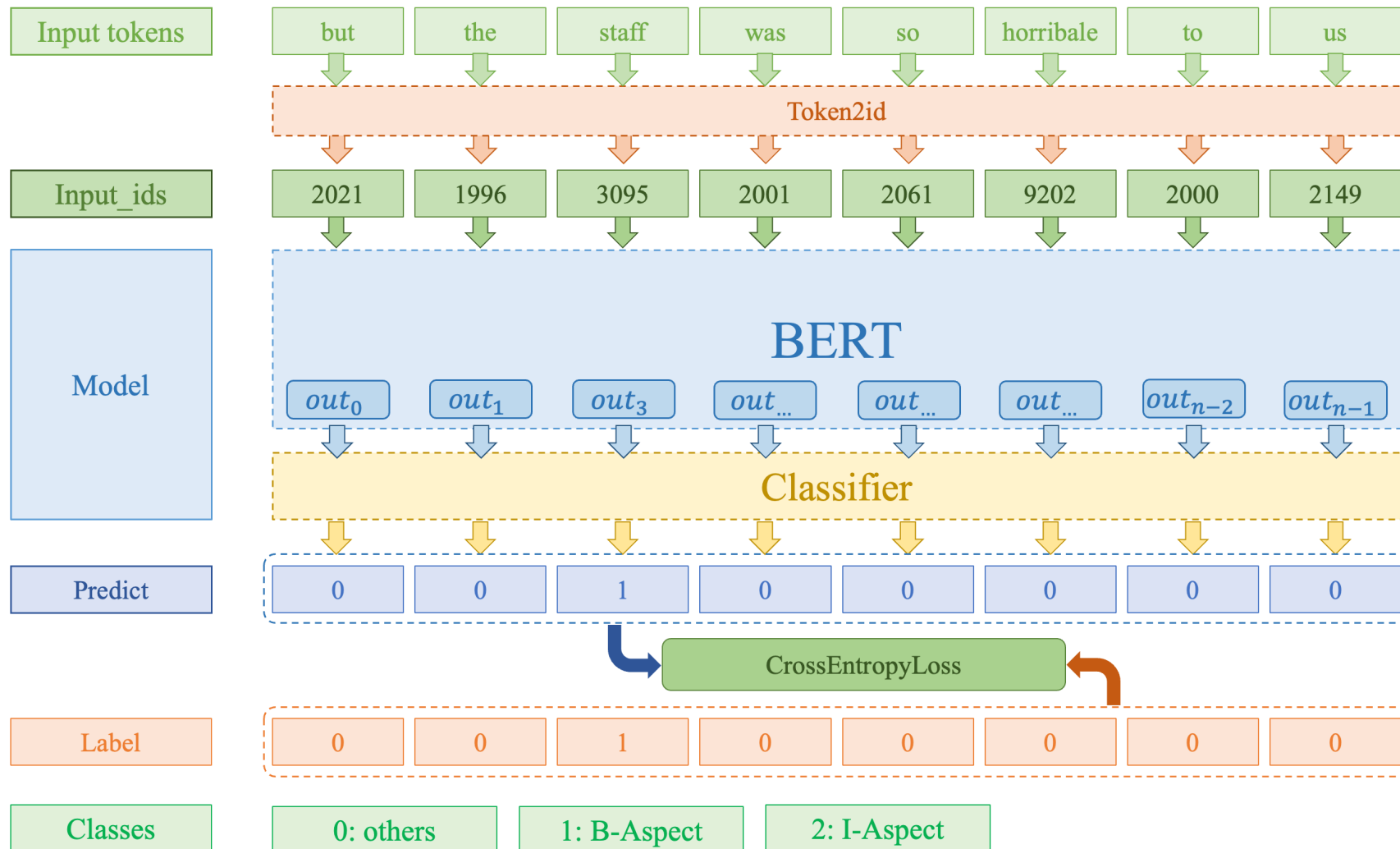
## Aspect Term Extraction



# Aspect Sentiment Pair Extraction

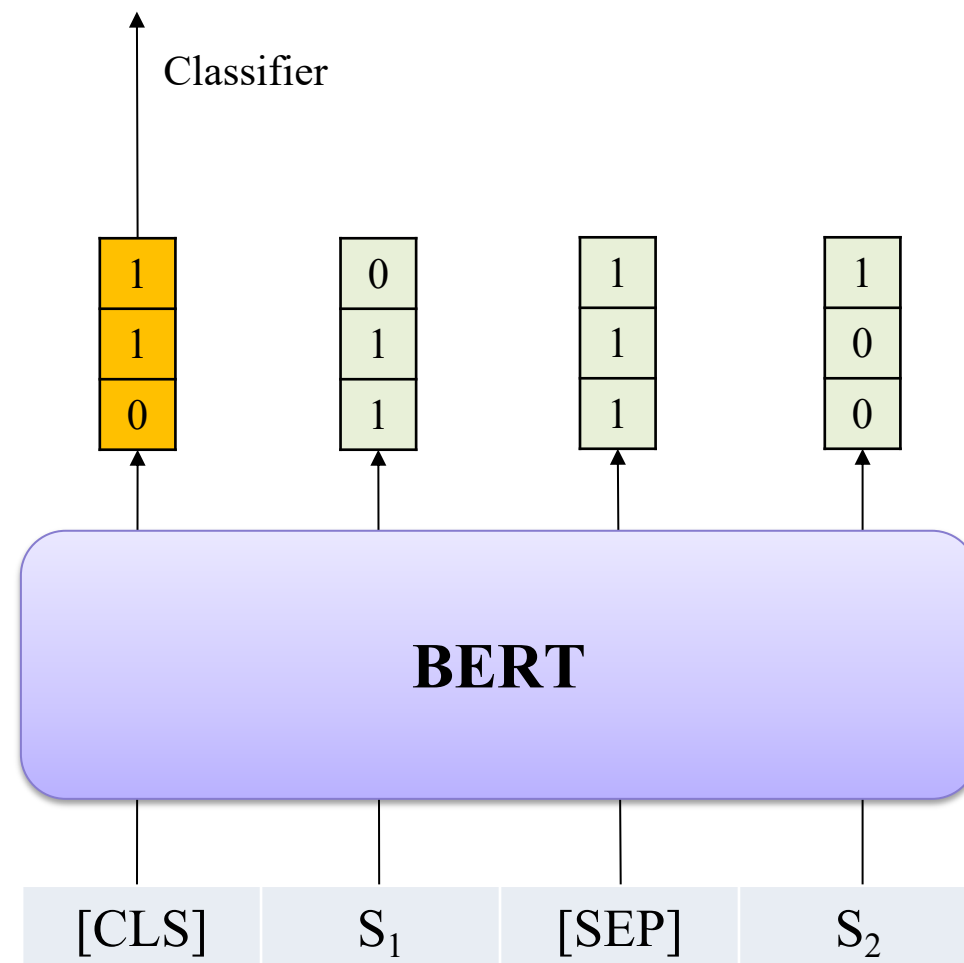
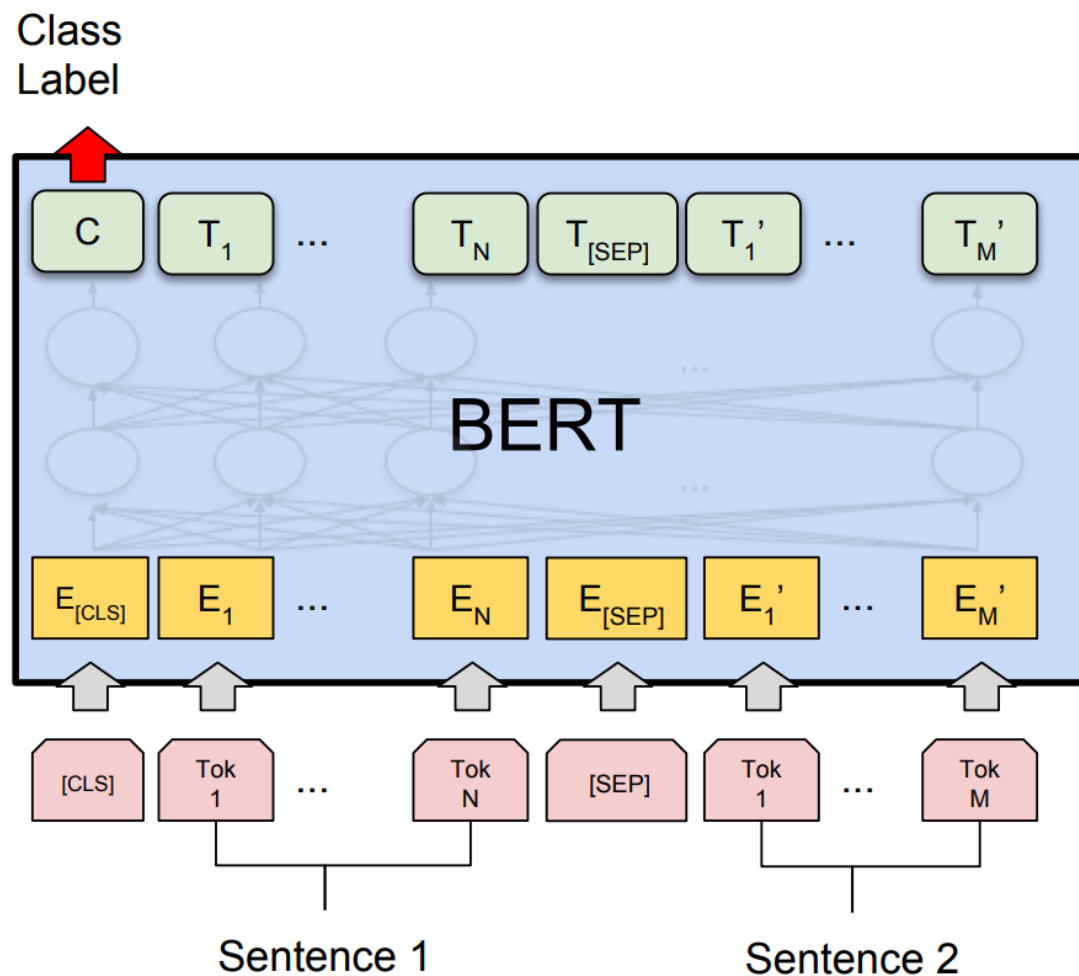


## Aspect Term Extraction



# Aspect Sentiment Pair Extraction

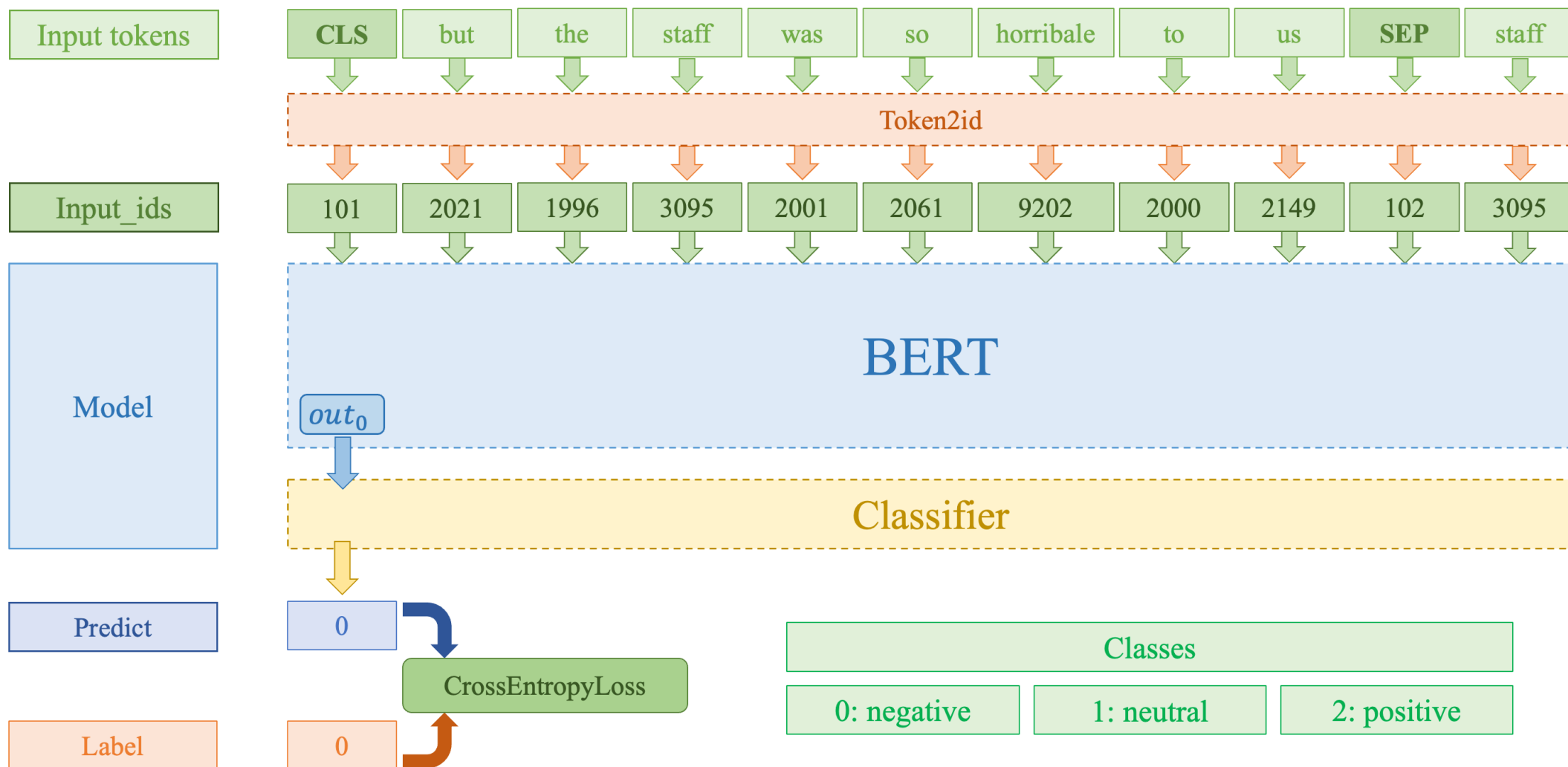
## ! Aspect Term Sentiment Extraction (Next Sentence Prediction Task)



# Aspect Sentiment Pair Extraction



## Aspect Term Sentiment Extraction (Next Sentence Prediction Task)





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# Thanks!

## Any questions?