Adversarial Examples Against a BERT ABSA Model

Fooling Bert With L33T, Misspelligh, and Punctuation,

N. Hofer, P. Schöttle, A. Rietzler, S. Stabinger

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Conference: in grau und bissi kleiner als Datum

Motivation

Adversarial Examples Against a BERT ABSA Model

Satz nicht fett, bis auf BERT

Bidirectional Encoder Representations from Transformers - BERT

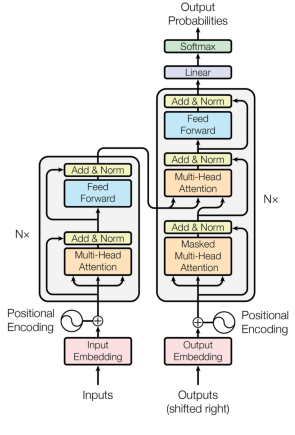

Abbildung: Transformer Model Architecture (Vaswani et al., 2017)

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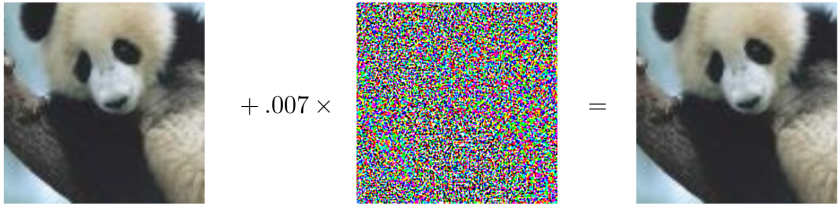

Abbildung: Adversarial Examples in Computer Vision (Goodfellow et al, ICLR 2015)

Motivation

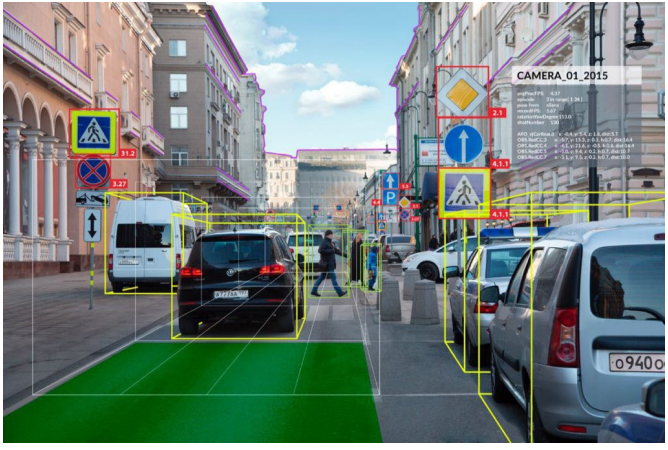

Abbildung: Object detection in autonomous driving (Source: becominghuman.ai)

Motivation

Abbildung: Tweet containing misleading information regarding Covid-19, detected and labeled correctly

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Abbildung: Tweet containing misleading information regarding Covid-19. Potential problems due to the use of Leet Speak.

Adversarial Attacks against BERT for ABSA

1. Fine-Tuning BERT base for ABSA

1. Balken schöner. Z.B. so wie Block Boxen
2. Position so fixieren, dass ich das Bild Slide für Slide aufbaut.

Adversarial Attacks against BERT for ABSA

1. Fine-Tuning BERT base for ABSA

Aspect-based Sentiment Analysis

Adversarial Attacks against BERT for ABSA

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Aspect-based Sentiment Analysis

Dataset: SemEval-2015 Task 12

- Labels contain a set of **Entity - Attribute - Sentiment**
- 23 Entities - 9 Attributes - 3 Sentiments (POS, NEG, NEU)
- **Entity:** reviewd entity
- **Attribute:** particular attribute of an entity
- **Sentiment:** polarity towards the entity and its attribute

Entity Labels	
1. LAPTOP	13. BATTERY
2. DISPLAY	14. GRAPHICS
3. KEYBOARD	15. HARD DISK
4. MOUSE	16. MULTIMEDIA DEVICES
5. MOTHERBOARD	17. HARDWARE
6. CPU	18. SOFTWARE
7. FANS& COOLING	19. OS
8. PORTS	20. WARRANTY
9. MEMORY	21. SHIPPING
10. POWER SUPPLY	22. SUPPORT
11. OPTICAL DRIVES	23. COMPANY
Attribute Labels	
A. GENERAL	E. USABILITY
B. PRICE	F. DESIGN& FEATURES
C. QUALITY	G. PORTABILITY
D. OPERATION& PERFORMANCE	H. CONNECTIVITY
	I. MISCELLANEOUS

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The computer is excellent for gaming but I think it is way too expensive!!

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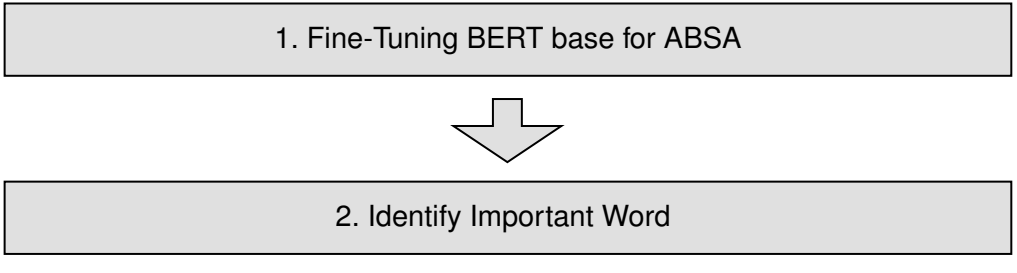
Aspect-based Sentiment Analysis

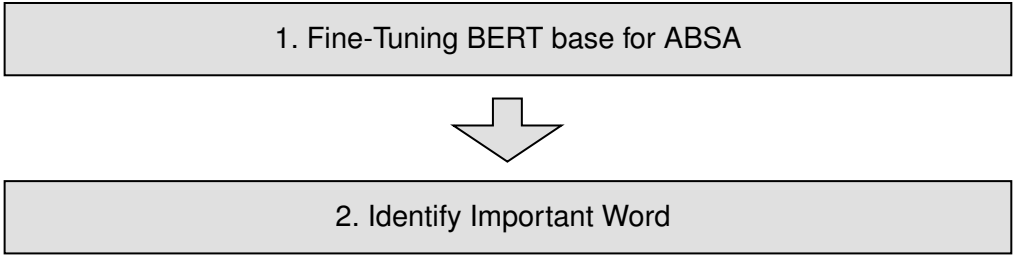
The computer is excellent for gaming but I think it is way too expensive !!

Aspect: Gaming, Sentiment: POS
Aspect: Price, Sentiment: NEG

Adversarial Attacks against BERT for ABSA



Adversarial Attacks against BERT for ABSA



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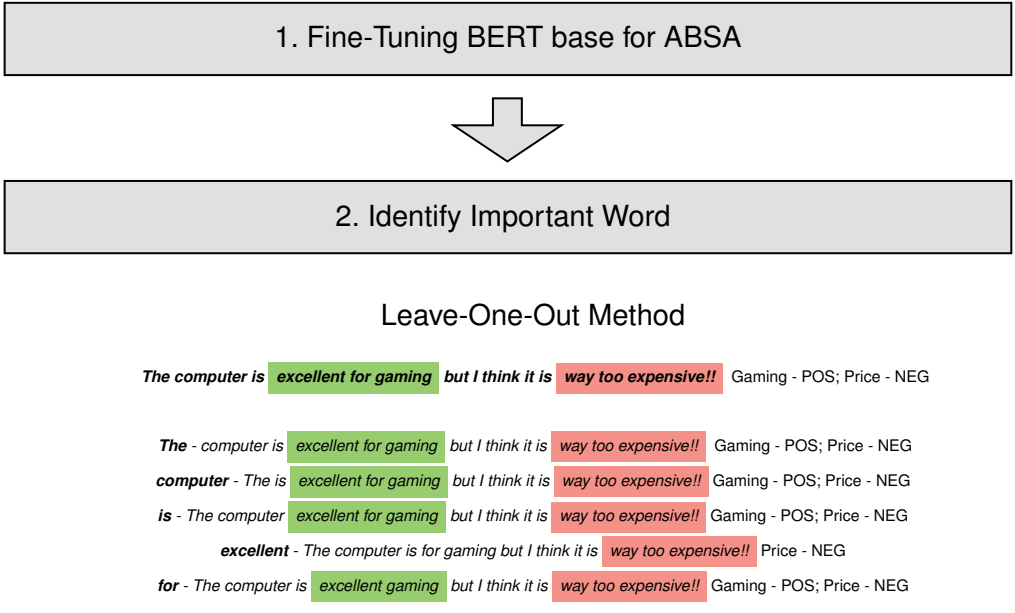

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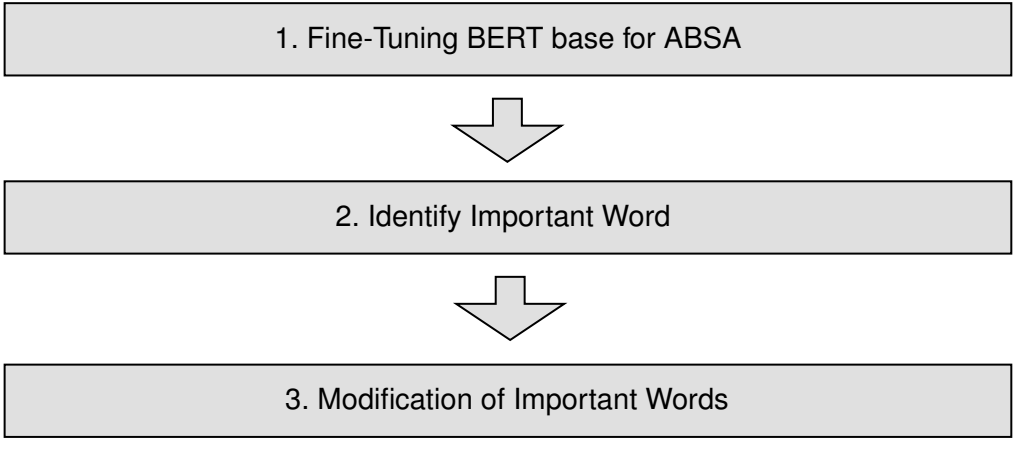
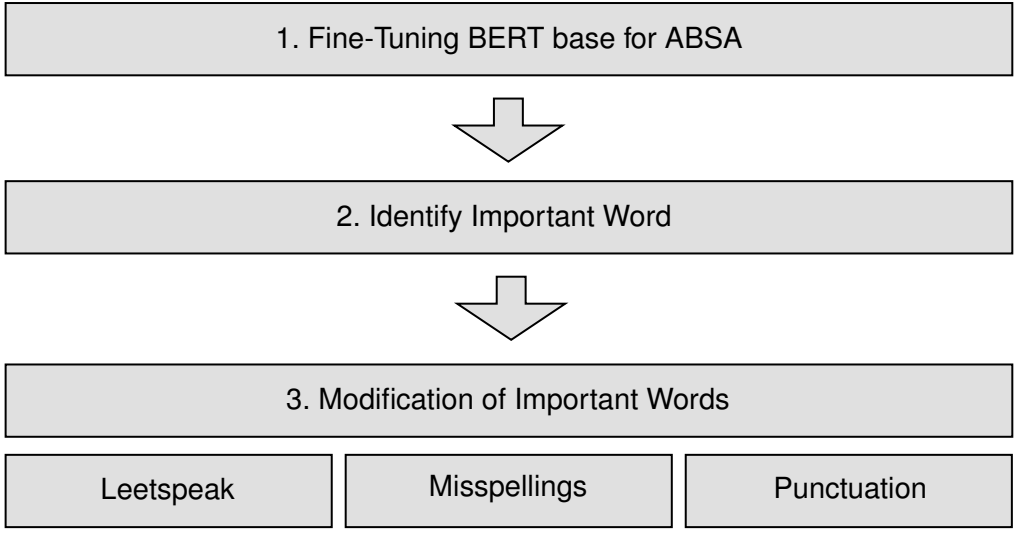


Adversarial Attacks against BERT for ABSA



Adversarial Attacks

Objectives

- Semantic Meaning
- Inconspicousness
- Relevance

Adversarial Attacks against BERT for ABSA

1. Leetspeak

The computer is excellent for gaming but I think it is way too expensive!!

Aspect: Gaming, Sentiment: POS
Aspect: Price, Sentiment: NEG

Original important word: ***excellent***
Modified important word: ***exce11ent***

The computer is exce11ent for gaming but I think it is way too expensive!!

Aspect: Gaming, Sentiment: NEG
Aspect: Price, Sentiment: NEG

Adversarial Attacks against BERT for ABSA

2. Misspellings

The computer is excellent for gaming but I think it is way too expensive!!

Aspect: Gaming, Sentiment: POS
Aspect: Price, Sentiment: NEG

Original important word: ***excellent***
Modified important word: ***ecxellent***

The computer is ecxellent for gaming but I think it is way too expensive!!

Aspect: Price, Sentiment: NEG

Adversarial Attacks against BERT for ABSA

3. Punctuation

The computer is excellent for gaming but I think it is way too expensive!!

Aspect: Gaming, Sentiment: POS
Aspect: Price, Sentiment: NEG

Original important word: ***excellent***
Modified important word: ***excellent,***

The computer is excellent, for gaming but I think it is way too expensive!!

Aspect: Laptop (general), Sentiment: NEG
Aspect: Gaming, Sentiment: NEG
Aspect: Price, Sentiment: NEG

Qualitative Results

Slide aufbauen, entsprechend dem Script:
Geht mit onslide...

Perturbation Method	Leetspeak	Misspellings	Punctuation
Dataset A - # of original sentences	943	943	943
Dataset B - # of modifiable original sentences	897	369	943
Dataset C - # of adversarial sentences	2232	1354	2555
Dataset D - # of changed predictions total	1066	420	382
Dataset E - # of changed predictions per sentence	790	259	253
Overall Success Rate	**47.76%**	**31.01%**	**14.95%**
Distinct Success Rate	**88.07%**	**70.19%**	**26.83%**

Tabelle: Comparison of the success rates of the three attack methods.

Conclusion & Further Steps

Summary

- BERT can be fooled by input modofications
- Three attack methods:
  - Leetspeak
  - Misspellings
  - Falsly placed Punctuation

Next Steps

- Transferability between Transformer Models
- Using generated adversarial datasets for Adversarial Training

Thank you!

Adversarial Examples Against A BERT ABSA Model -

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icon

Github: https://github.com/NoraH2004/adv-absa

Email: nora.hofer@uibk.ac.at

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