



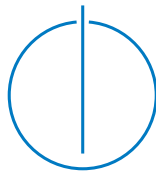
DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

Master's Thesis in Informatics

# Deep Learning for Sentiment Analysis

Ankit Bahuguna





DEPARTMENT OF INFORMATICS

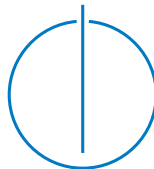
TECHNISCHE UNIVERSITÄT MÜNCHEN

Master's Thesis in Informatics

## **Deep Learning for Sentiment Analysis**

### **Deep Learning Methoden für Sentiment Analysis Probleme**

Author:	Ankit Bahuguna
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Submission Date:	September 15, 2015



I confirm that this master's thesis in informatics is my own work and I have documented all sources and material used.

Munich, Germany, September 15, 2015

Ankit Bahuguna

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In the end, I would also like to thank my family, who gave me this opportunity to study at Technical University of Munich, Germany. Without them, nothing of this would be possible.

# Abstract

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# 1 Introduction

## 1.1 Section

Citation test [Lam94].

### 1.1.1 Subsection

See Figure 8.1.



Figure 1.1: An example for a figure.

## 1.2 Section

See Table 8.1, Figure 8.2, Figure 8.3, Figure 8.4.

Table 1.1: An example for a simple table.

A	B	C	D
1	2	1	2
2	3	2	3



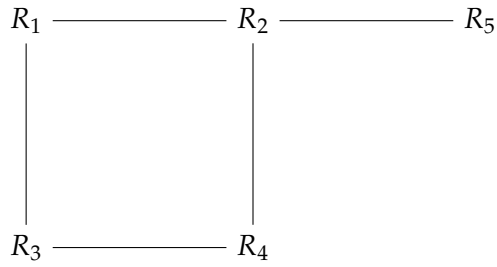


Figure 1.2: An example for a simple drawing.

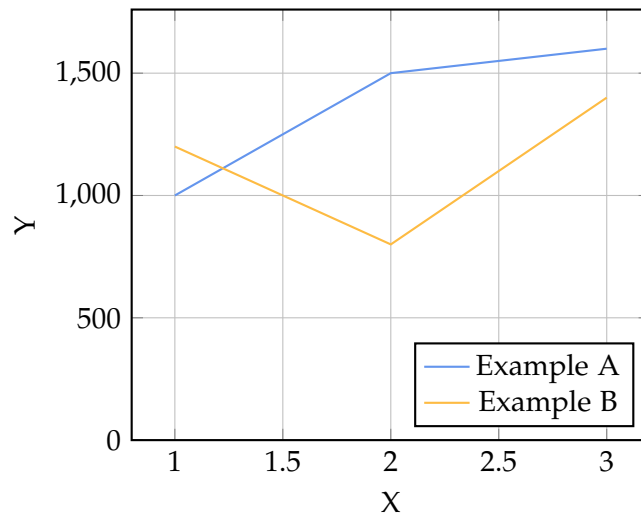


Figure 1.3: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 1.4: An example for a source code listing.

## 2 Sentiment Analysis

### 2.1 Section

Citation test [Lam94].

#### 2.1.1 Subsection

See Figure 8.1.



Figure 2.1: An example for a figure.

### 2.2 Section

See Table 8.1, Figure 8.2, Figure 8.3, Figure 8.4.

Table 2.1: An example for a simple table.

A	B	C	D
1	2	1	2
2	3	2	3

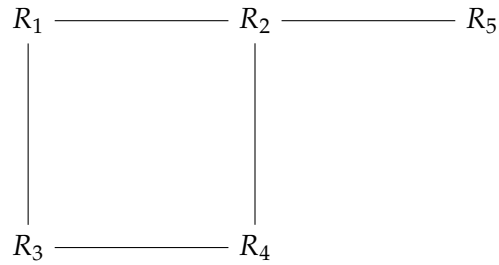


Figure 2.2: An example for a simple drawing.

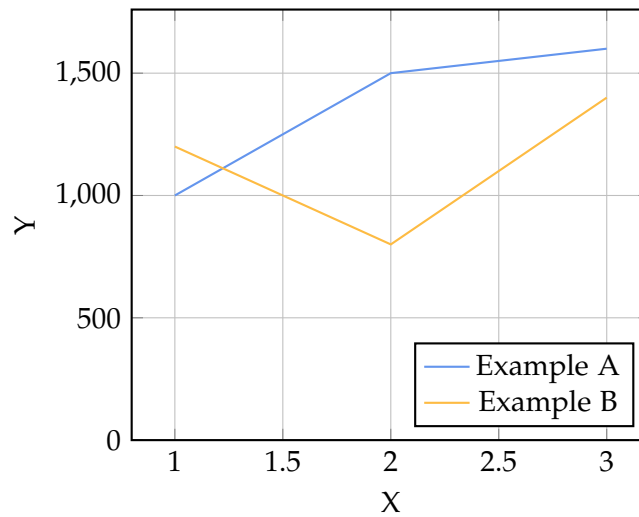


Figure 2.3: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 2.4: An example for a source code listing.

# 3 Deep Learning: An Introduction

## 3.1 Section

Citation test [Lam94].

### 3.1.1 Subsection

See Figure 8.1.



Figure 3.1: An example for a figure.

## 3.2 Section

See Table 8.1, Figure 8.2, Figure 8.3, Figure 8.4.

Table 3.1: An example for a simple table.

A	B	C	D
1	2	1	2
2	3	2	3

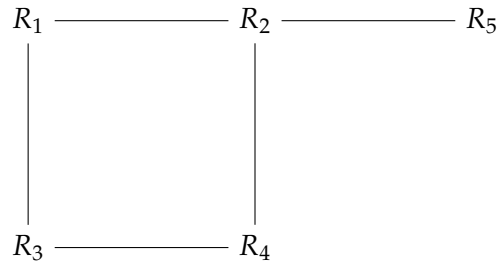


Figure 3.2: An example for a simple drawing.

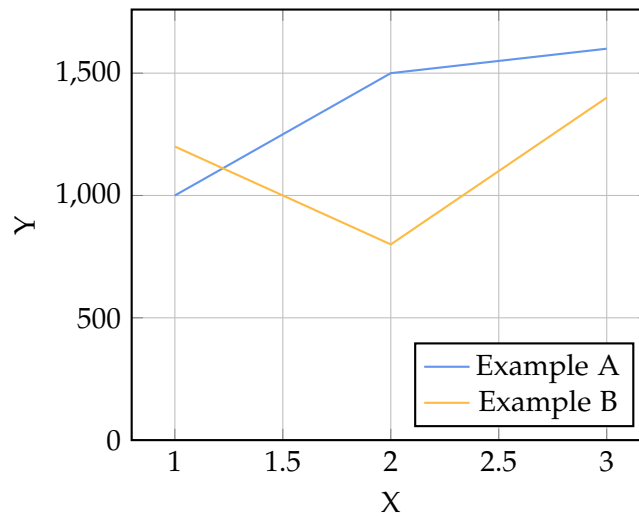


Figure 3.3: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 3.4: An example for a source code listing.

# 4 Deep Learning and NLP: Word Representations and Language Modelling

## 4.1 Section

Citation test [Lam94].

### 4.1.1 Subsection

See Figure 8.1.



Figure 4.1: An example for a figure.

## 4.2 Section

See Table 8.1, Figure 8.2, Figure 8.3, Figure 8.4.

Table 4.1: An example for a simple table.

A	B	C	D
1	2	1	2
2	3	2	3

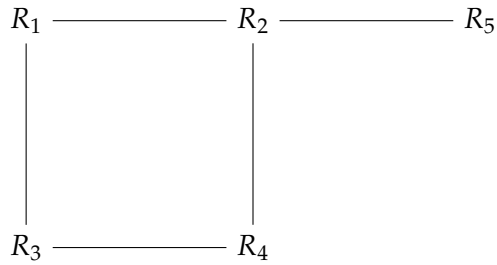


Figure 4.2: An example for a simple drawing.

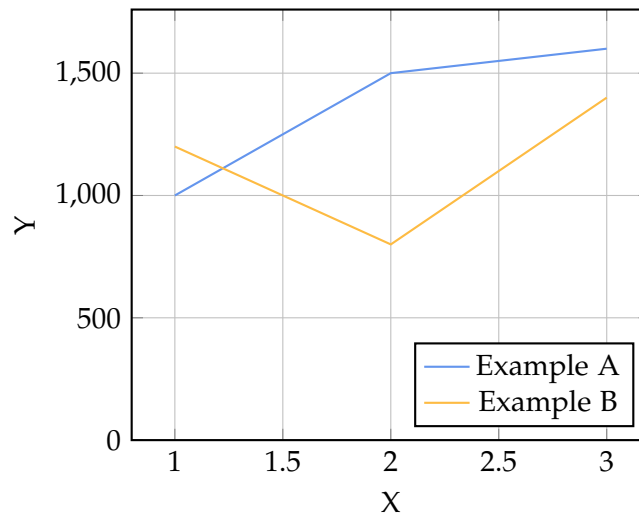


Figure 4.3: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 4.4: An example for a source code listing.

# 5 Deep Learning: Modern Apporaches

## 5.1 Section

Citation test [Lam94].

### 5.1.1 Subsection

See Figure 8.1.



Figure 5.1: An example for a figure.

## 5.2 Section

See Table 8.1, Figure 8.2, Figure 8.3, Figure 8.4.

Table 5.1: An example for a simple table.

A	B	C	D
1	2	1	2
2	3	2	3



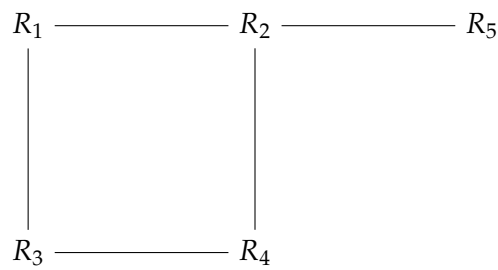


Figure 5.2: An example for a simple drawing.

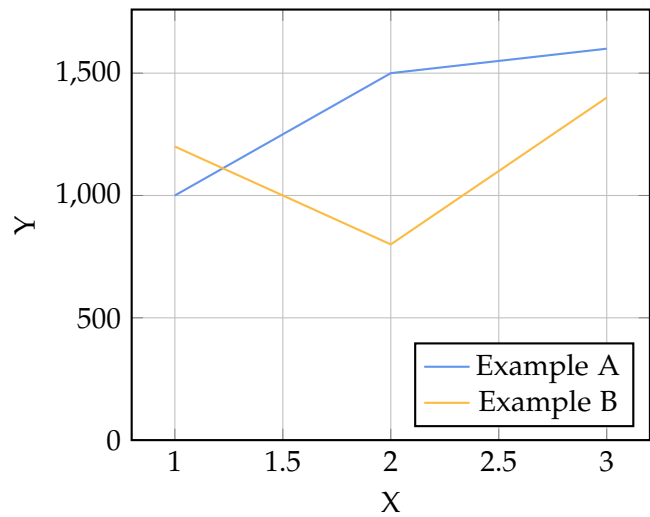


Figure 5.3: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 5.4: An example for a source code listing.

# 6 Concatenated Word Representations for Sentiment Classifications

## 6.1 Section

Citation test [Lam94].

### 6.1.1 Subsection

See Figure 8.1.



Figure 6.1: An example for a figure.

## 6.2 Section

See Table 8.1, Figure 8.2, Figure 8.3, Figure 8.4.

Table 6.1: An example for a simple table.

A	B	C	D
1	2	1	2
2	3	2	3

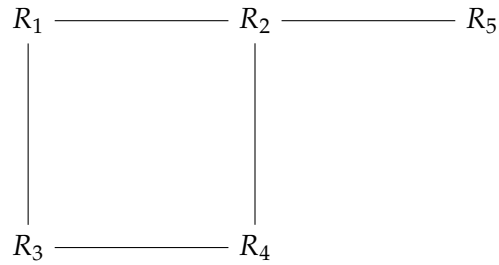


Figure 6.2: An example for a simple drawing.

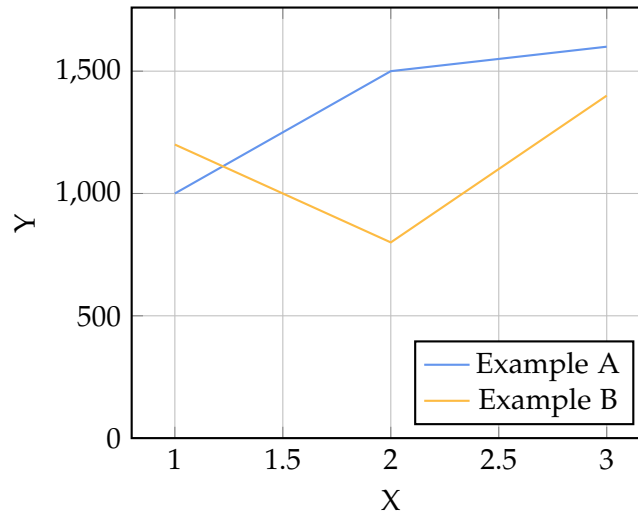


Figure 6.3: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 6.4: An example for a source code listing.

# 7 Moving from Text to Speech: Emotion Recognition

## 7.1 Section

Citation test [Lam94].

### 7.1.1 Subsection

See Figure 8.1.



Figure 7.1: An example for a figure.

## 7.2 Section

See Table 8.1, Figure 8.2, Figure 8.3, Figure 8.4.

Table 7.1: An example for a simple table.

A	B	C	D
1	2	1	2
2	3	2	3

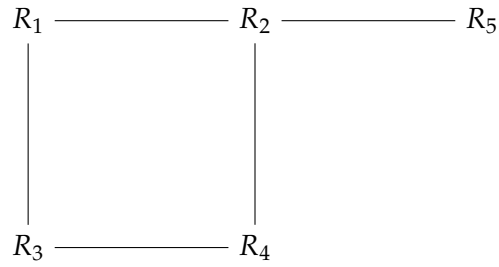


Figure 7.2: An example for a simple drawing.

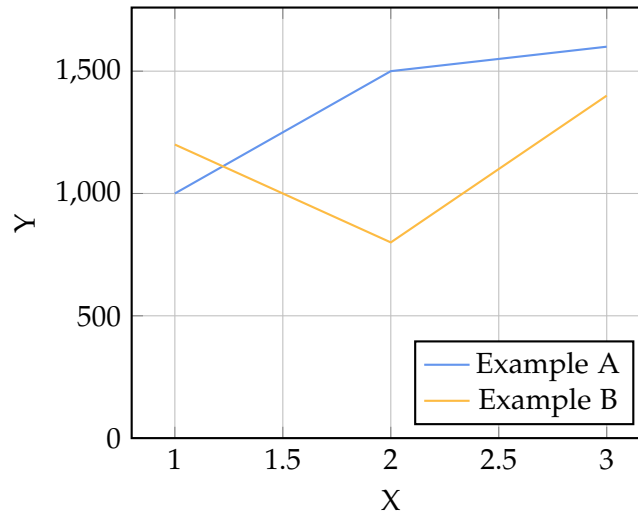


Figure 7.3: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 7.4: An example for a source code listing.

# 8 Conclusion

## 8.1 Section

Citation test [Lam94].

### 8.1.1 Subsection

See Figure 8.1.



Figure 8.1: An example for a figure.

## 8.2 Section

See Table 8.1, Figure 8.2, Figure 8.3, Figure 8.4.

Table 8.1: An example for a simple table.

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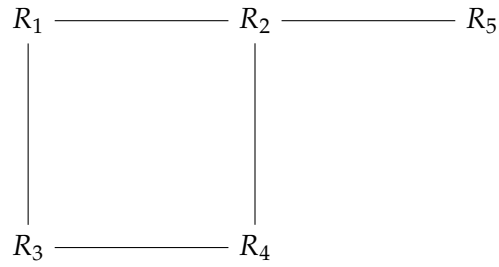


Figure 8.2: An example for a simple drawing.

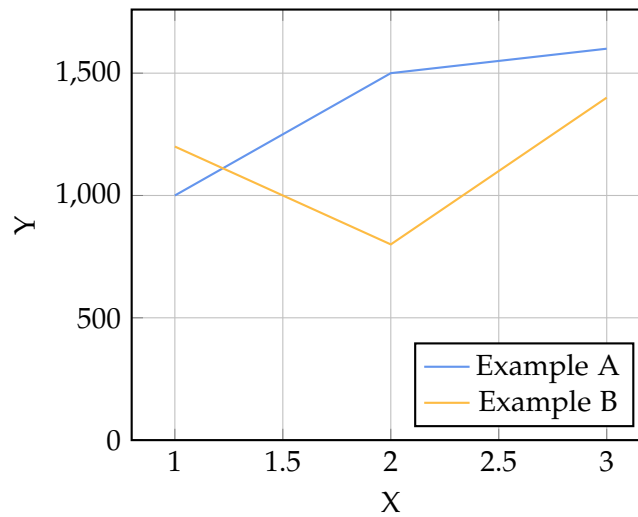


Figure 8.3: An example for a simple plot.

```
SELECT * FROM tbl WHERE tbl.str = "str"
```

Figure 8.4: An example for a source code listing.

# Glossary

**computer** is a machine that...



# Acronyms

**TUM** Technische Universität München.

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# Bibliography

- [Lam94] L. Lamport. *LaTeX : A Documentation Preparation System User's Guide and Reference Manual*. Addison-Wesley Professional, 1994.