Classifying fake news using supervised learning with NLP

INTRODUCTION TO NATURAL LANGUAGE PROCESSING IN PYTHON

Katharine Jarmul
Founder, kjamistan

What is supervised learning?

- Form of machine learning
  - Problem has predefined training data
  - This data has a label (or outcome) you want the model to learn
  - Classification problem
  - Goal: Make good hypotheses about the species based on geometric features

Sepal length	Sepal width	Petal length	Petal width	Species
5.1	3.5	1.4	0.2	I. setosa
7.0	3.2	4.77	1.4	I.versicolor
6.3	3.3	6.0	2.5	I.virginica

Supervised learning with NLP

- Need to use language instead of geometric features
- `scikit-learn` : Powerful open-source library
- How to create supervised learning data from text?
  - Use bag-of-words models or tf-idf as features

IMDB Movie Dataset

Plot	Sci-Fi	Action
In a post-apocalyptic world in human decay, a …	1	0
Mohei is a wandering swordsman. He arrives in …	0	1
#137 is a SCI/FI thriller about a girl, Marla,…	1	0

- Goal: Predict movie genre based on plot summary
- Categorical features generated using preprocessing

Supervised learning steps

- Collect and preprocess our data
- Determine a label (Example: Movie genre)
- Split data into training and test sets
- Extract features from the text to help predict the label
  - Bag-of-words vector built into `scikit-learn`
- Evaluate trained model using the test set

Let's practice!

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Building word count vectors with scikit-learn

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Predicting movie genre

- Dataset consisting of movie plots and corresponding genre
- Goal: Create bag-of-word vectors for the movie plots
    - Can we predict genre based on the words used in the plot summary?

Count Vectorizer with Python

```
import pandas as pd

from sklearn.model_selection import train_test_split

from sklearn.feature_extraction.text import CountVectorizer
df = ... # Load data into DataFrame
y = df['Sci-Fi']
X_train, X_test, y_train, y_test = train_test_split(
                                             df['plot'], y,
                                             test_size=0.33,
                                             random_state=53)
count_vectorizer = CountVectorizer(stop_words='english')
count_train = count_vectorizer.fit_transform(X_train.values)
count_test = count_vectorizer.transform(X_test.values)
```

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Training and testing a classification model with scikit-learn

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Naive Bayes classifier

- Naive Bayes Model
  - Commonly used for testing NLP classification problems
  - Basis in probability
- Given a particular piece of data, how likely is a particular outcome?
- Examples:
  - If the plot has a spaceship, how likely is it to be sci-fi?
  - Given a spaceship **and** an alien, how likely **now** is it sci-fi?
- Each word from `CountVectorizer` acts as a feature
- Naive Bayes: Simple and effective

Naive Bayes with scikit-learn

```python
from sklearn.naive_bayes import MultinomialNB
from sklearn import metrics
nb_classifier = MultinomialNB()

nb_classifier.fit(count_train, y_train)
pred = nb_classifier.predict(count_test)
metrics.accuracy_score(y_test, pred)
```

```
0.85841849389820424
```

Confusion matrix

```
metrics.confusion_matrix(y_test, pred, labels=[0,1])
```

```
array([[6410,  563],
       [ 864, 2242]])
```

	Action	Sci-Fi
Action	6410	563
Sci-Fi	864	2242

Let's practice!

Simple NLP, complex problems

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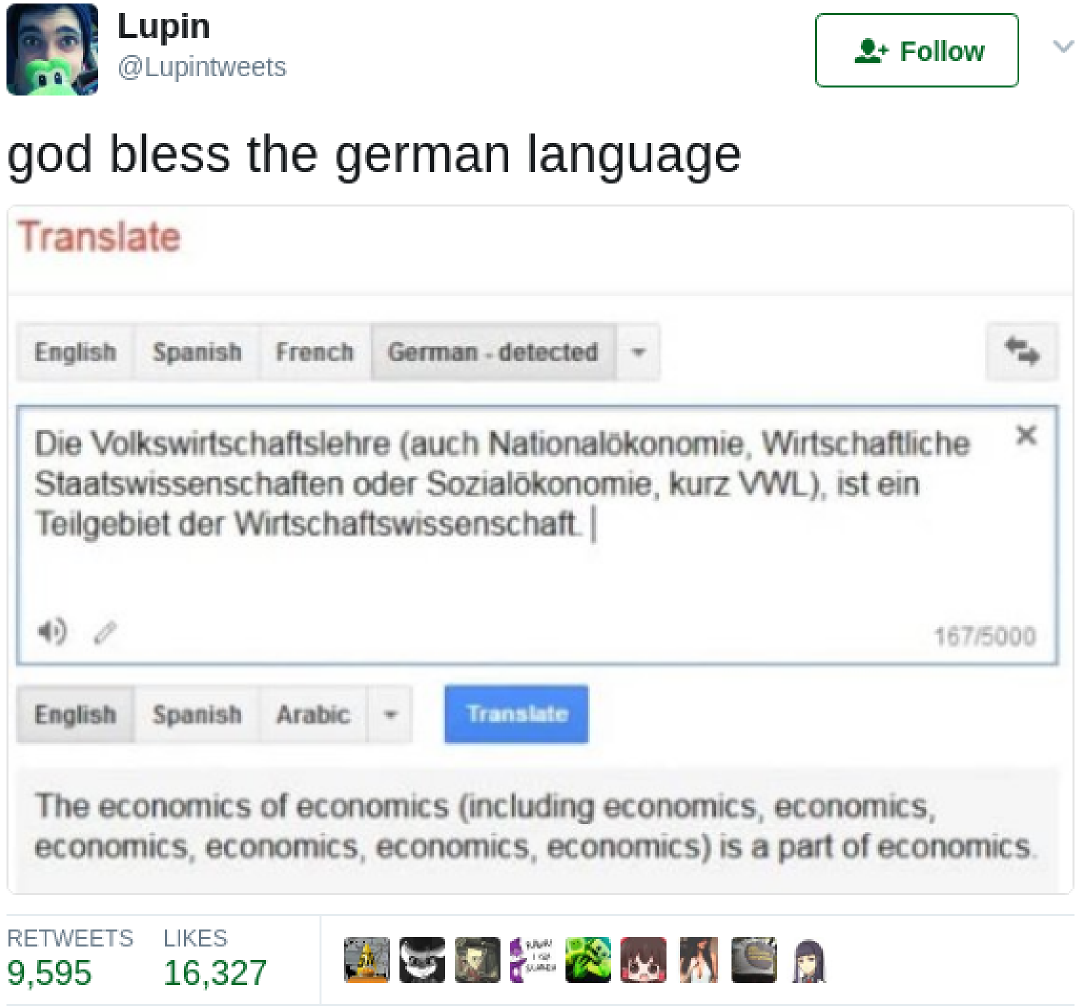
Translation



Lupin
@Lupintweets

god bless the german language

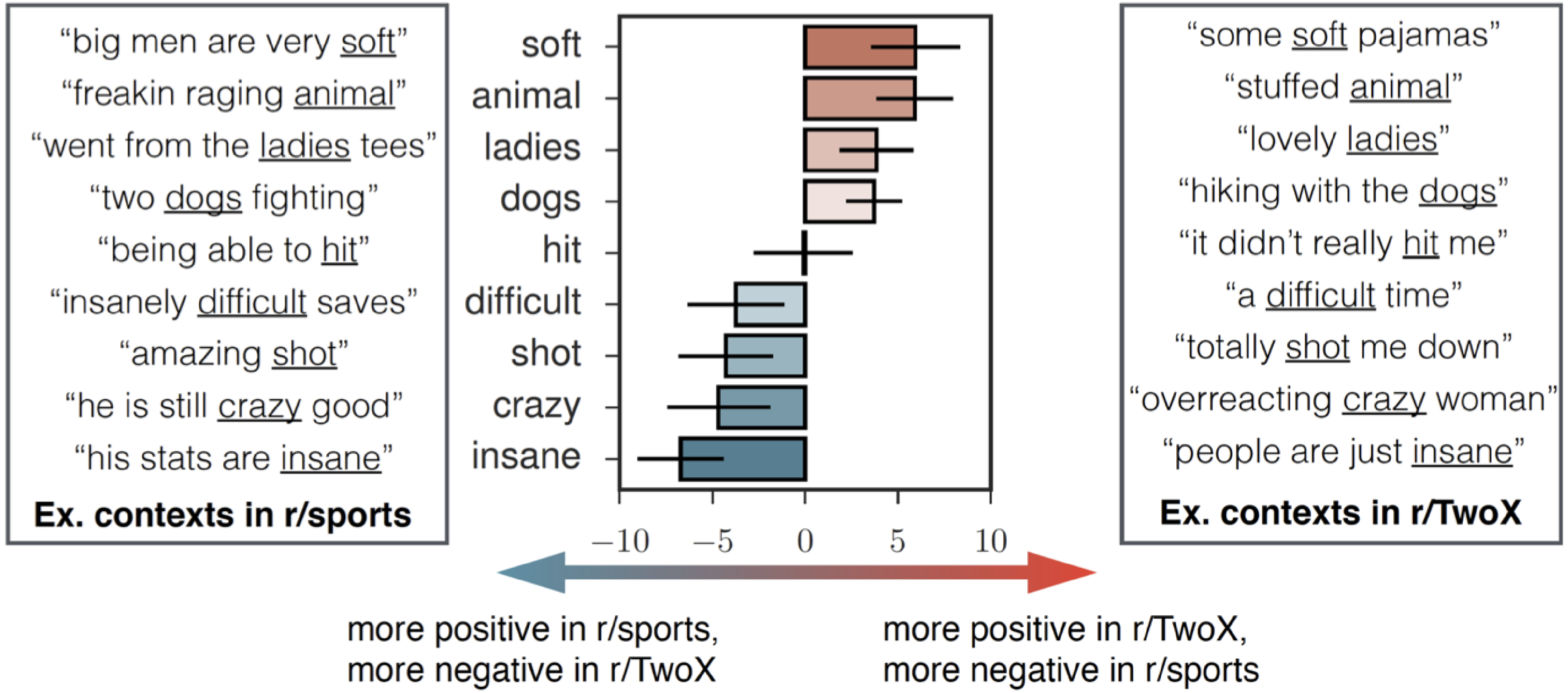
Translate

Die Volkswirtschaftslehre (auch Nationalökonomie, Wirtschaftliche Staatswissenschaften oder Sozialökonomie, kurz VWL), ist ein Teilgebiet der Wirtschaftswissenschaft.

The economics of economics (including economics, economics, economics, economics, economics, economics) is a part of economics.

source:
(https://twitter.com/Lupintweets/status/865533182455685121)

Sentiment analysis



“big men are very soft”
“freakin raging animal”
“went from the ladies tees”
“two dogs fighting”
“being able to hit”
“insanely difficult saves”
“amazing shot”
“he is still crazy good”
“his stats are insane”

Ex. contexts in r/sports

“some soft pajamas”
“stuffed animal”
“lovely ladies”
“hiking with the dogs”
“it didn’t really hit me”
“a difficult time”
“totally shot me down”
“overreacting crazy woman”
“people are just insane”

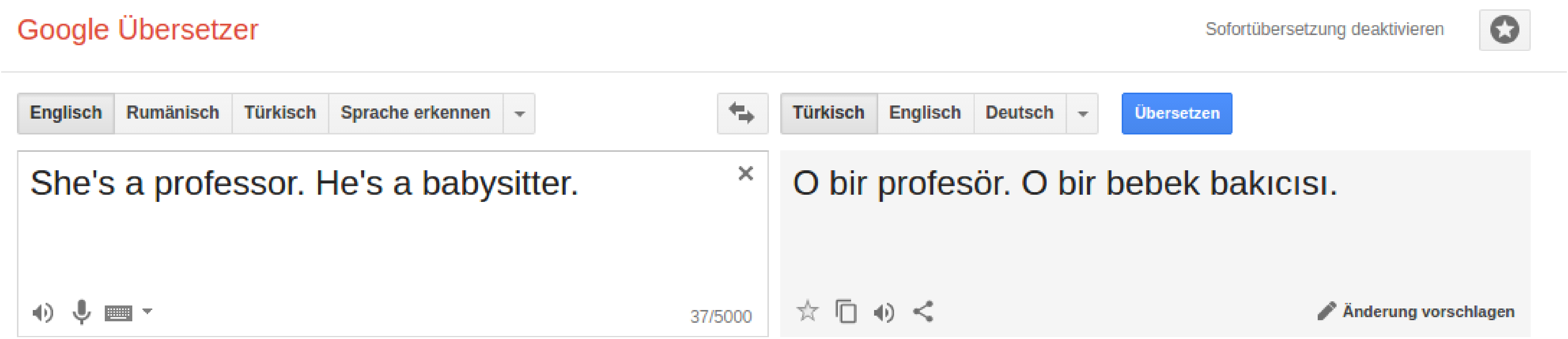
Ex. contexts in r/TwoX

more positive in r/sports,
more negative in r/TwoX

more positive in r/TwoX,
more negative in r/sports

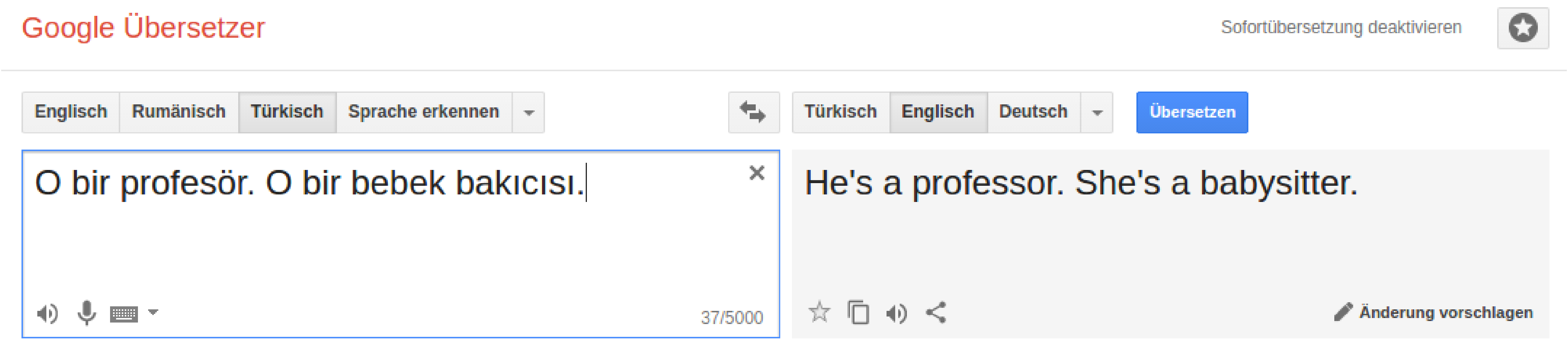
(source: https://nlp.stanford.edu/projects/socialsent/)

Language biases


Google Übersetzer
Sofortübersetzung deaktivieren
Englisch | Rumänisch | Türkisch | Sprache erkennen
Türkisch | Englisch | Deutsch
Übersetzen
37/5000
Änderung vorschlagen

She's a professor. He's a babysitter.

O bir profesör. O bir bebek bakıcısı.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(related talk: https://www.youtube.com/watch?v=j7FwpZB1hWc)

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