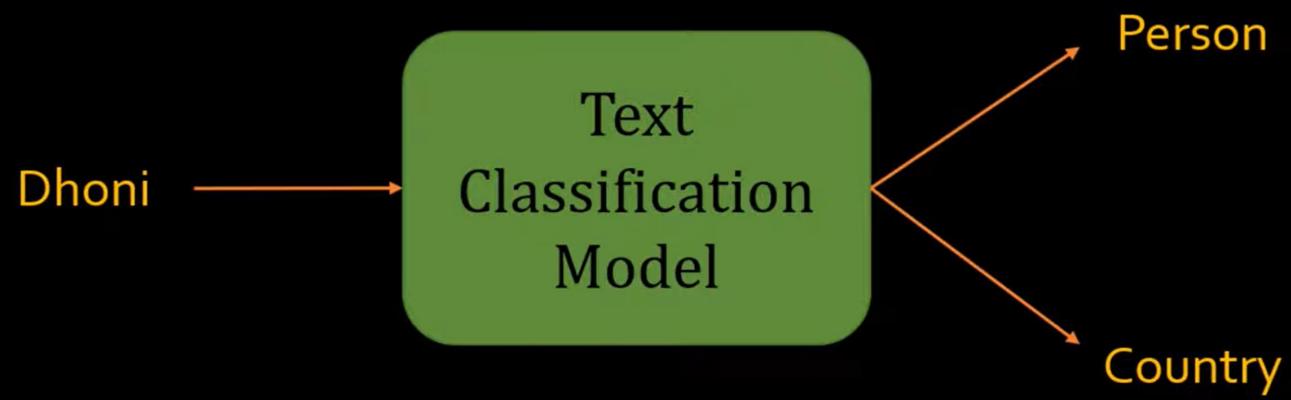
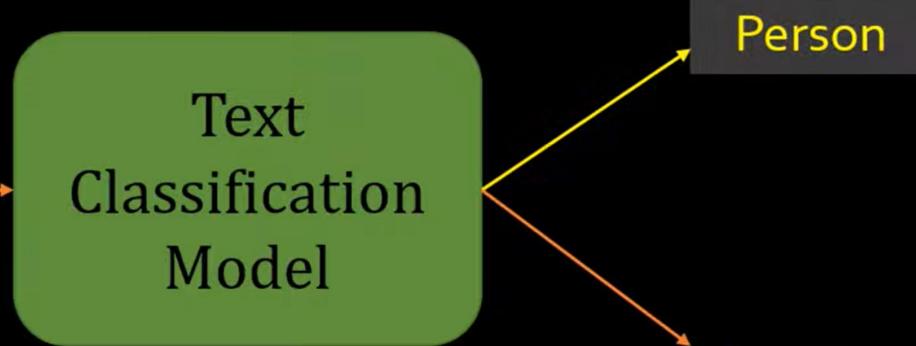


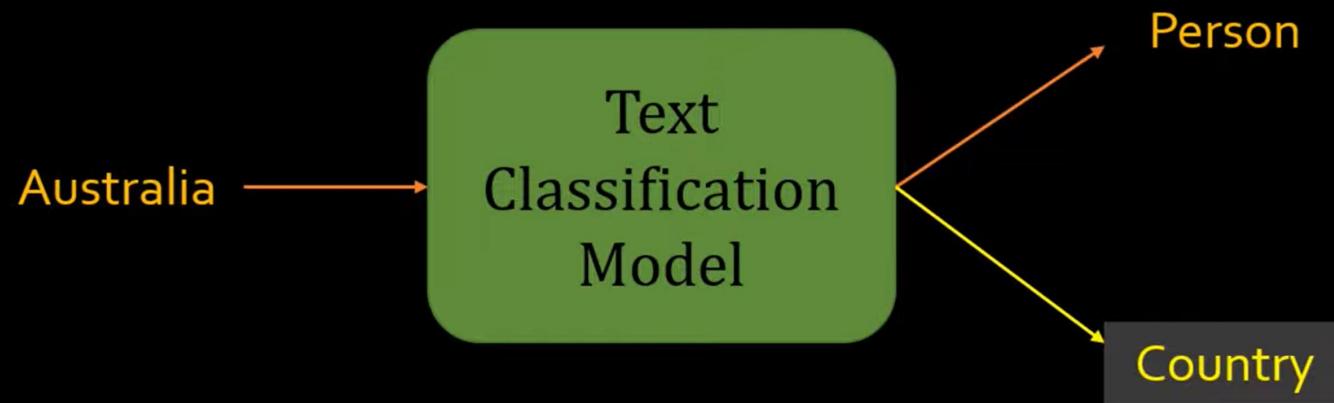
Bidirectional Encoder Representations from Transformers





Dhoni







Mahmudullah

Text
Classification
Model

Person

Country



Cummins

Text
Classification
Model

Person

Country

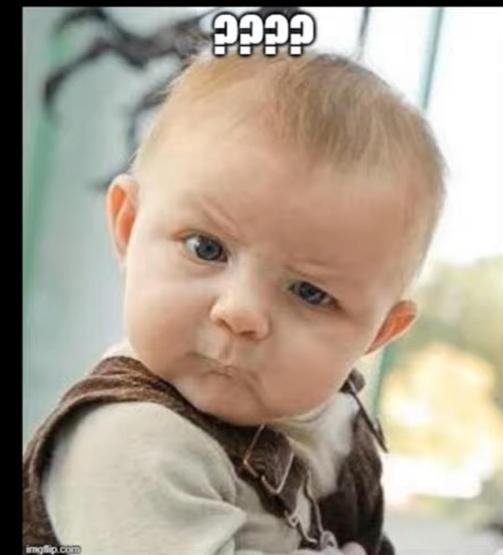


Cummins

Text
Classification
Model

Person

Country



How can we capture
similarities between
two words?



Bedrooms: 3
Area: 1850 **sqr ft**
Bathrooms: 2.5



Bedrooms: 3
Area: 1700 **sqr ft**
Bathrooms: 2



Bedrooms: 10
Area: 7500 **sqr ft**
Bathrooms: 2



Dhoni



Cummins



Australia

Person: 1

Healthy/fit: 0.9

Location: 0

Has two eyes: 1

Has government: 0

Person: 1

Healthy/fit: 0.87

Location: 0

Has two eyes: 1

Has government: 0

Person: 0

Healthy/fit: 0.7

Location: 1

Has two eyes: 0

Has government: 1

Image credits: cnn.com, Britannica.com and outlookindia.com



Dhoni



Cummins



Australia

$$\begin{bmatrix} 1 \\ 0.9 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} & \\ & \end{bmatrix}$$

$$\begin{bmatrix} & \\ & \end{bmatrix}$$

Image credits: cnn.com, Britannica.com and outlookindia.com



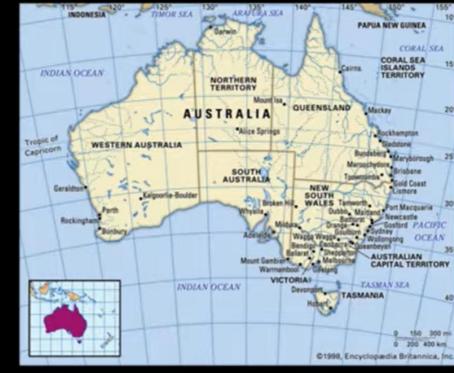
Dhoni

$$\begin{bmatrix} 1 \\ 0.9 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$



Cummins

$$\begin{bmatrix} 1 \\ 0.87 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$



Australia

$$\begin{bmatrix} 0 \\ 0.7 \\ 1 \\ 0 \\ 1 \end{bmatrix}$$

Image credits: cnn.com, Britannica.com and outlookindia.com

	ashes	Australia	Bat	Cummins	cover	Dhoni	World cup	..	Zimbabwe
Person	0	0.02	0.1	0.95	0.03	0.96	0.67	...	0.04
Country	0	0.97	0	0	0	0	0	...	1
Healthy & Fit	0	0	0.3	0.87	0	0.9	0	...	0
Event	1	0.1	0	0	0.4	0	1	...	0
gear	0	0	1	0	0	0	0	...	0

	ashes	Australia	Bat	Cummins	cover	Dhoni	World cup	..	Zimbabwe
Person	0	0.02	0.1	0.95	0.03	0.96	0.67	...	0.04
Country	0	0.97	0	0	0	0	0	...	1
Healthy & Fit	0	0	0.3	0.87	0	0.9	0	...	0
Event	1	0.1	0	0	0.4	0	1	...	0
gear	0	0	1	0	0	0	0	...	0



Issue with word2vec

Fixed embeddings

He didn't receive fair treatment

Fun fair in new York city this summer

fair → $\begin{bmatrix} \cdot \\ \cdot \end{bmatrix}$

Issue with word2vec

Fixed embeddings

He didn't receive fair treatment

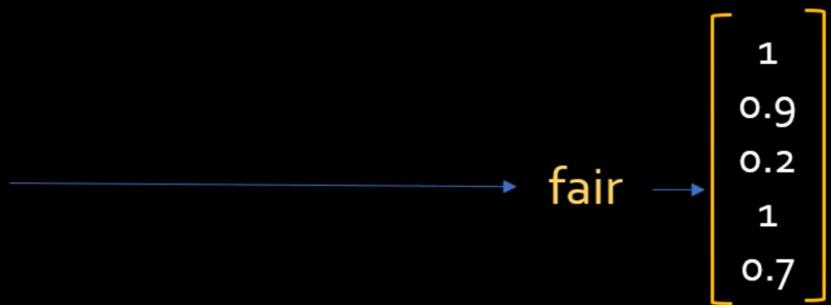
Fun fair in new York city this summer

$$\text{fair} \rightarrow \begin{bmatrix} 1 \\ 0.9 \\ 0.2 \\ 1 \\ 0.7 \end{bmatrix}$$

BERT can generate contextualized embeddings

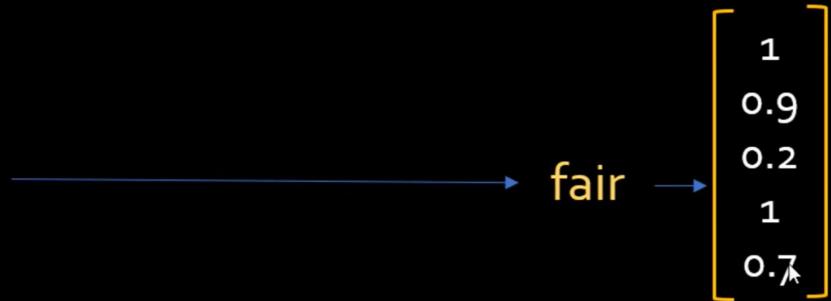
BERT can generate contextualized embeddings

He didn't receive fair treatment

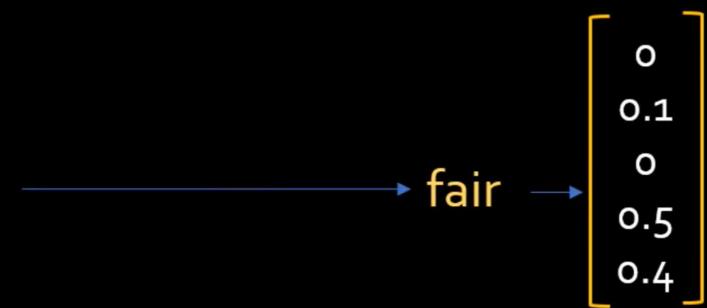


BERT can generate contextualized embeddings

He didn't receive fair treatment

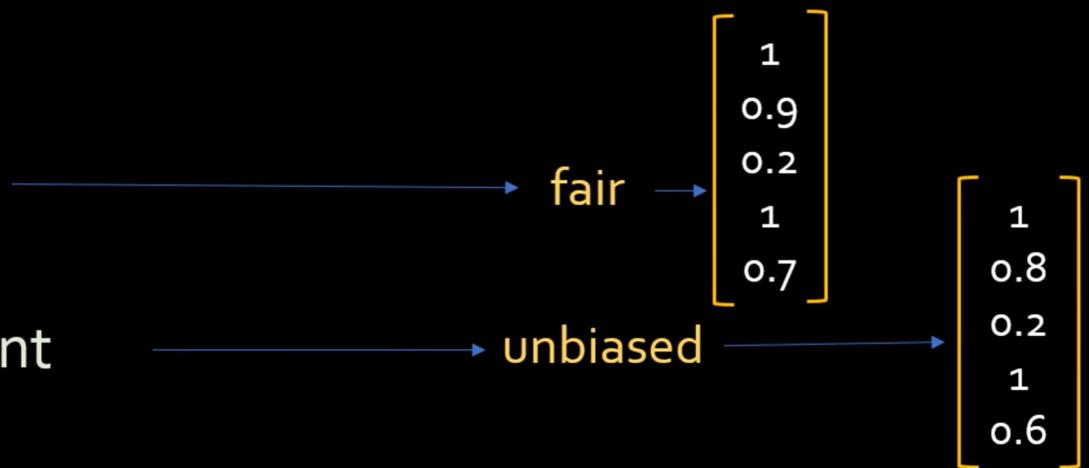


Fun fair in new York city this summer



BERT can generate contextualized embeddings

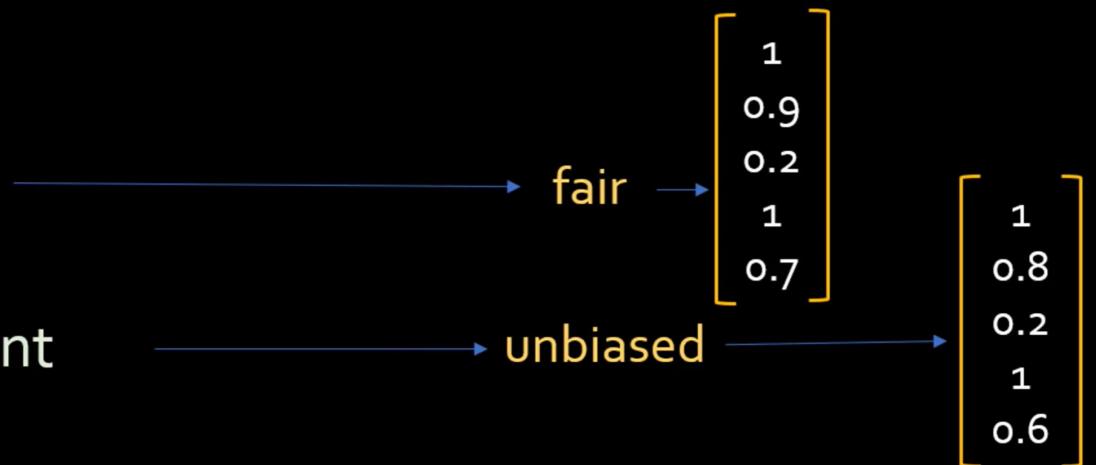
He didn't receive fair treatment



Fun fair in new York city this summer

BERT can generate contextualized embeddings

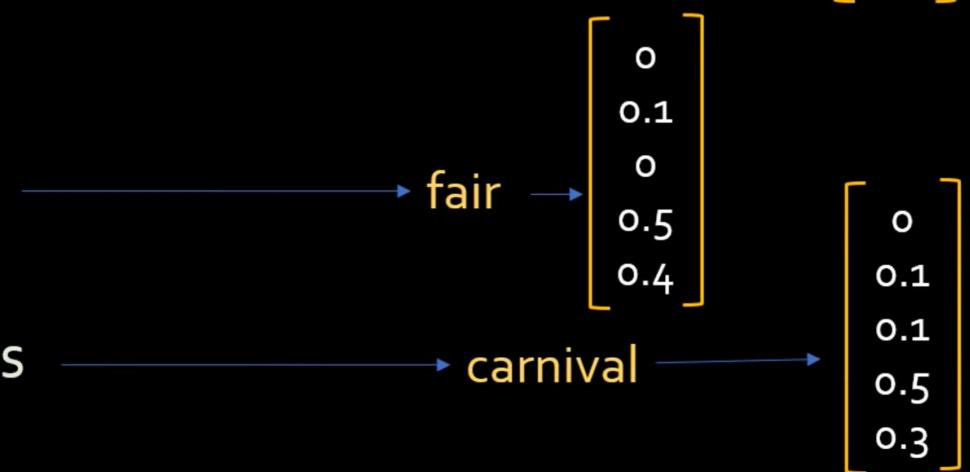
He didn't receive fair treatment



Tom deserves unbiased judgement

Fun fair in new York city this summer

Carnival was packed with fun activities



BERT can generate embeddings for entire sentence

Amazing movie, I couldn't blink an eye for initial 45 minutes. It was that intense and interesting at the same time

BERT can generate embeddings for entire sentence

Amazing movie, I couldn't blink an eye for initial 45 minutes. It was that intense and interesting at the same time

$$\begin{bmatrix} 1 \\ 0.9 \\ 0.2 \\ 1 \\ 0.7 \\ \dots \\ 0.1 \end{bmatrix}$$

BERT can generate embeddings for entire sentence

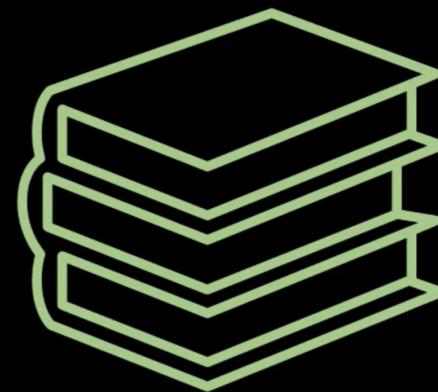
Amazing movie, I couldn't blink an eye for initial 45 minutes. It was that intense and interesting at the same time

$$\begin{bmatrix} 1 \\ 0.9 \\ 0.2 \\ 1 \\ 0.7 \\ \dots \\ 0.1 \end{bmatrix} \text{ 768 length}$$

Trained on



2500 M words



800 M words

How was it trained?

Mased Language Model

Elon Reeve Musk is an entrepreneur and business magnate. He is the founder of Tesla Inc. Musk is one of the richest people in the world. Musk was raised in Pretoria, South Africa. He briefly attended the University of Pretoria before moving to Canada aged 17 to attend Queen's University.

How was it trained?

Mased Language Model

Elon Reeve Musk is an and business magnate. He is the founder of Musk is one of the richest people in the world. Musk was raised in Pretoria, He briefly attended the University of Pretoria before moving to aged 17 to attend Queen's University.

How was it trained?

Mased Language Model

Elon Reeve Musk is an and business magnate. He is the founder of Musk is one of the richest people in the world. Musk was raised in Pretoria, He briefly attended the University of Pretoria before moving to aged 17 to attend Queen's University.

Next sentence prediction

I am hungry → I would like to have pizza ✓
→ Table has four legs X