

# Visual Product Matching for E-Commerce

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[www.scads.de](http://www.scads.de)



# Entity Resolution (Record Linkage, Matching, ...)

- Do these records describe the same person?

Name	Birth	City
William J. Smith	1/2/73	Berkeley, California
Smith, W. J.	1973.1.2	Berkeley, CA
Bill Smith	Jan 3, 1972	Berkeley, Calif.

Important for

- Data Integration
- De-duplication, Cleaning, Master Data

# Product Matching

Are two product offers referring to the same object?



Apple iPhone X - 64 GB - Space-Grau - Ohne SIM-Lock

**489,00 €** coishop.de | Preisvergleich für mehr als 50 Anbieter

★★★★★ 13.277 Produktrezensionen

Beim **iPhone X** ist das Gerät das Display. Das Super-Retina-Display füllt die ganze Hand aus und lässt die Augen nicht mehr los ...

Apple · iPhone · iPhone X · iOS · 5,8 Zoll Display · Gesichtserkennung · 7 Megapixel Frontkamera · 12 Megapixel · 4G LTE · 21 Stunden Sprechzeit

Weitere Optionen: **64 GB - Silber** (70 €) **256 GB - Space-Grau** (47 €)



Apple X - 64 GB - Space-Grau - Ohne SIM-Lock

**811,00 €** CSMobiles **83 % positiv** (220) | Preisvergleich für 2 Anbieter

★★★★★ 13.277 Produktrezensionen

Beim **iPhone X** ist das Gerät das Display. Das Super-Retina-Display füllt die ganze Hand aus und lässt die Augen nicht mehr los ...

Apple · iPhone · iPhone X · iOS · 5,8 Zoll Display · Fingerabdruck-Scanner · Gesichtserkennung · 7 Megapixel Frontkamera · 12 Megapixel · 4G LTE

# Product Matching Applications

Useful for

- Price comparison/optimization
- Market analysis
- De-duplication of market-places (e.g. eBay, Amazon)
- Logistics
- Trend forecasting

# Product Matching Methods

- Easiest case: EAN, GTIN, MPN
- Classical Solution: Compare fields / Descriptions

## Technische Daten

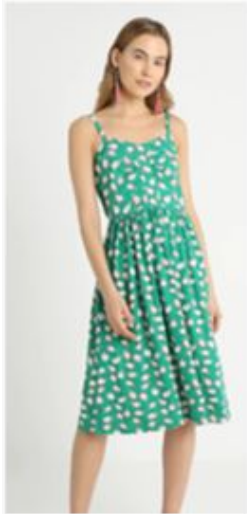
### iPhone X

<b>Display</b>	5,8 Zoll Super Retina HD Display mit HDR und True Tone (14,7 cm Diagonale)
<b>Kapazität</b>	64GB, 256GB
<b>Schutz vor Spritzern, Wasser und Staub</b>	Design aus Glas und Edelstahl, geschützt vor Wasser und Staub (unter IP67 klassifiziert)
<b>Kamera &amp; Video</b>	12 Megapixel Dual-Kamera mit Porträtmodus, Porträtlicht, Auto HDR und 4K Video mit bis zu 60 fps
<b>Front Kamera</b>	7 Megapixel TrueDepth Frontkamera mit Porträtmodus, Porträtlicht und Auto HDR
<b>Stromversorgung und Batterie</b>	Sprechdauer (drahtlos): bis zu 21 Std. Internetnutzung: bis zu 12 Std. Videowiedergabe (drahtlos): bis zu 13 Std.
<b>Lieferumfang</b>	iPhone mit iOS 12, EarPods mit Lightning Connector, Lightning auf USB Kabel, USB Power Adapter (Netzteil), Dokumentation

<b>Höhe</b>	143,6 mm
<b>Breite</b>	70,9 mm
<b>Tiefe</b>	7,7 mm
<b>Gewicht</b>	174 grams
<b>Erscheinungsdatum des Produkts</b>	22.09.2017

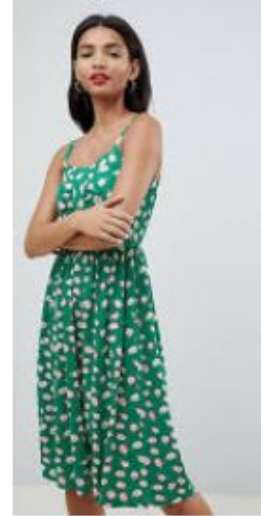
Image: amazon

# Matching of Fashion Items



Edc by Esprit -  
Jerseykleid

equal



Esprit - Grünes Midi-  
Sommerkleid mit Ananas Print

not sufficient

Description insufficient but products are equal



# Matching of Fashion Items



WRANGLER  
RAINBOW - Sweatshirt  
79,95 €

not equal



Wrangler RAINBOW Sweatshirt weiss  
SALE 43,29€

equal

Description is equal but products are different





We need to consider the images





# How to Measure the Similarity of Images?

“Classical” computer vision approaches:

- Image hash (e.g. pHash)
- Feature / keypoint based methods (SIFT, SURF)

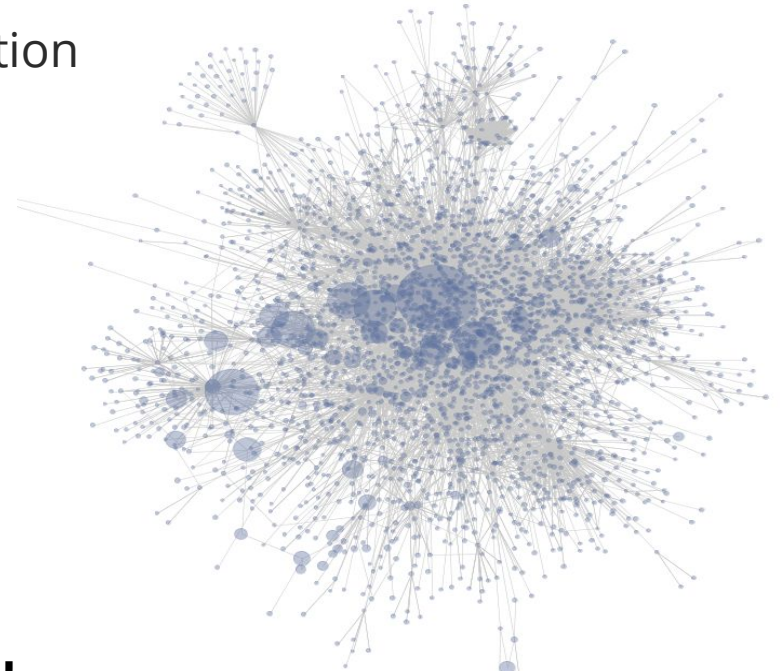
**Not robust enough under invariances**

Deep Learning (CNN) based approaches are a promising alternative.

**Embedding:** Mapping into a smaller-dimensional, continuous valued space.

# What's an Embedding?

- Finding a suitable representation in a lower dimensional space
- 100x100 image = 30,000 dimensions →  
Internal representation of a neural network: e.g. 256 dimensions



To draw a graph means to find a suitable embedding on a 2-dimensional plane.

**Embeddings are a byproduct of each neural network!**

# Creation of Embeddings

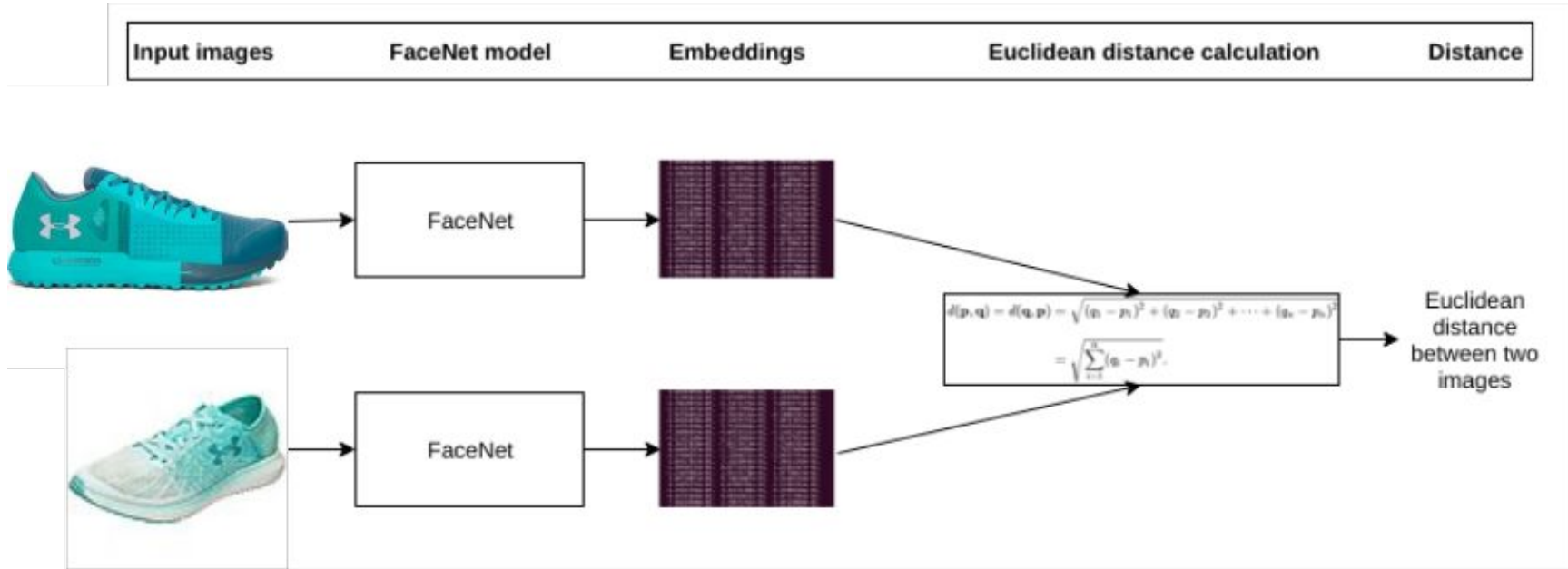


Image: Webdata Solutions

CNN with Triplet Loss Embedding (pretrained ResNet 50)

# Project Steps

## Training:

- Gather image data (DeepFashion2 Dataset)
- (Annotate images and build model for segmentation)
- Train similarity embeddings

## Usage:

- Provide (unknown) query image
- Create embedding
- Retrieve closest embeddings from database of embeddings

# Embedding Visualization



(reduced from 128 to 2 dimensions with t-SNE)

# Goal: Full image API



Type: Shirt

Bounding Box Detection

Attributes:

- Striped
- Color: blue
- Color: white
- No collar
- Long sleeve
- Women

Similar Products



The diagram illustrates a full image API workflow. It starts with a main image of a woman in a striped shirt. A red bounding box is drawn around the shirt, labeled 'Bounding Box Detection'. To the left, a box labeled 'Type: Shirt' and another labeled 'Attributes:' lists characteristics: Striped, Color: blue, Color: white, No collar, Long sleeve, and Women. To the right, a box labeled 'Similar Products' shows three smaller images of similar shirts worn by different models.

Image: Webdata Solutions

# Demonstration



Thank you for your attention.  
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