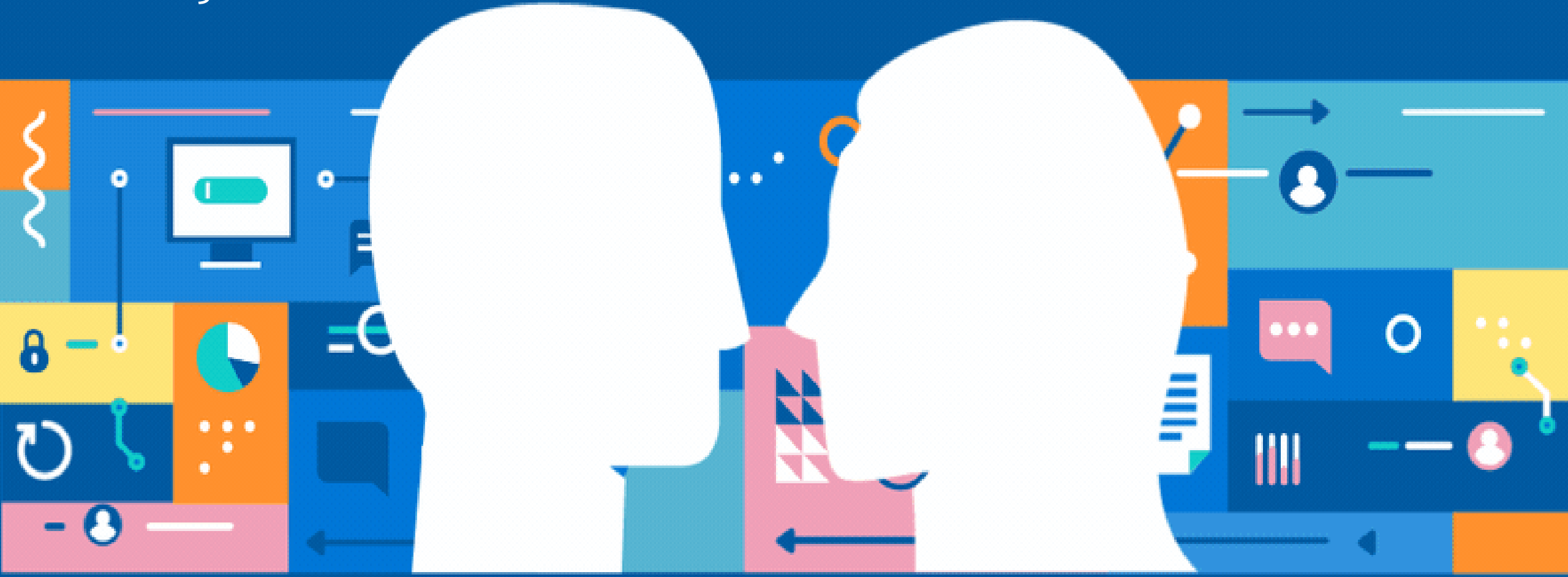


Sentiment Analysis Using Transfer Learning

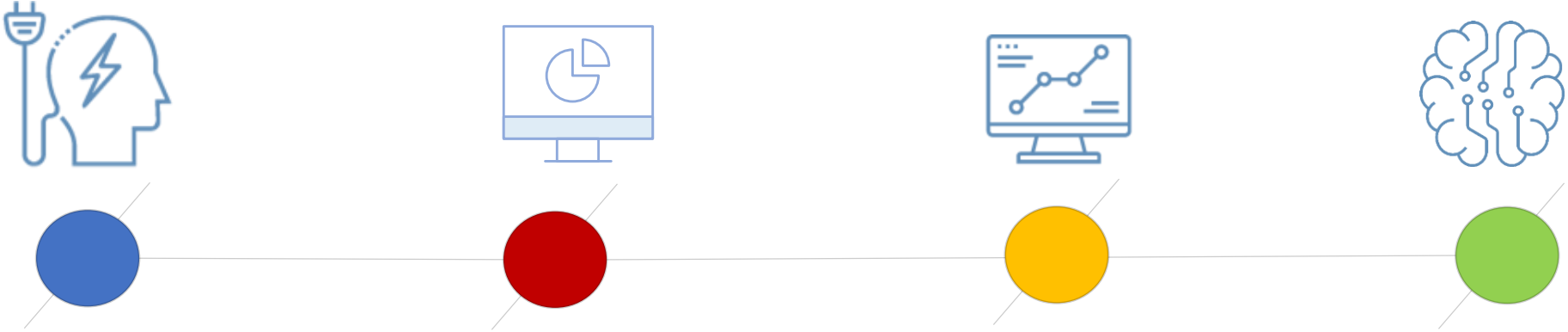
Santoshi Tadanki
Tamoghna Saha



Agenda

- **Evolution of business decisions**
- Need to process natural language
- Applications of NLP
- Process of natural language comprehension
- Pre-processing techniques for natural language
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- Annexure

Evolution of Business Intelligence



Executive information systems

On premise storage

Real time analysis

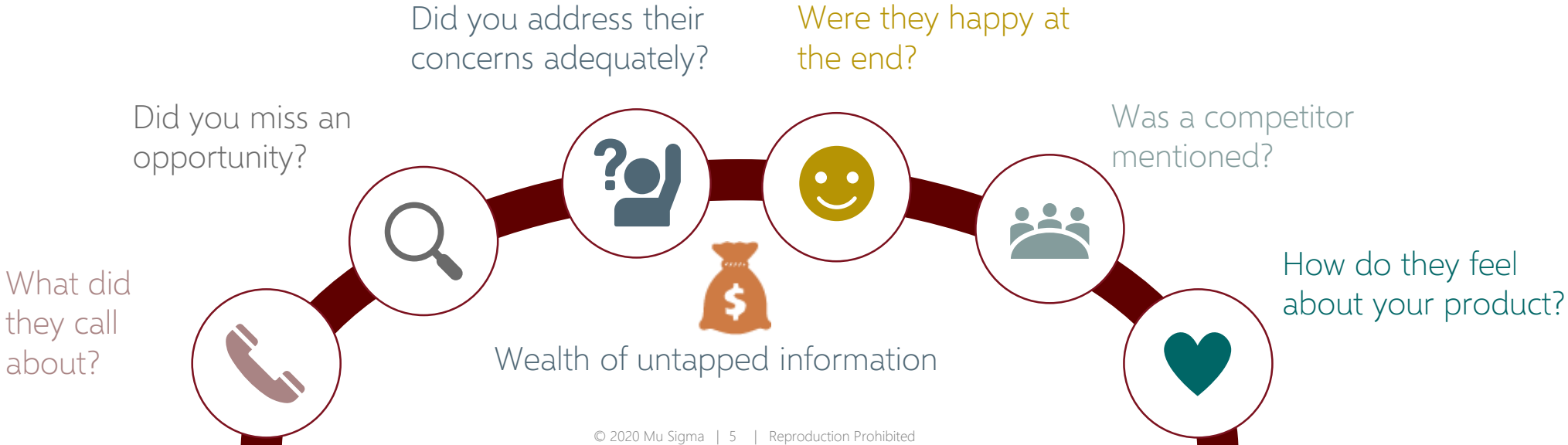
Intelligence

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The majority of the customer touch points after purchase are unstructured

Final customer touch point



One of the big 4 say that to identify market disrupters, we should take an outside-in approach



INSIGHT 

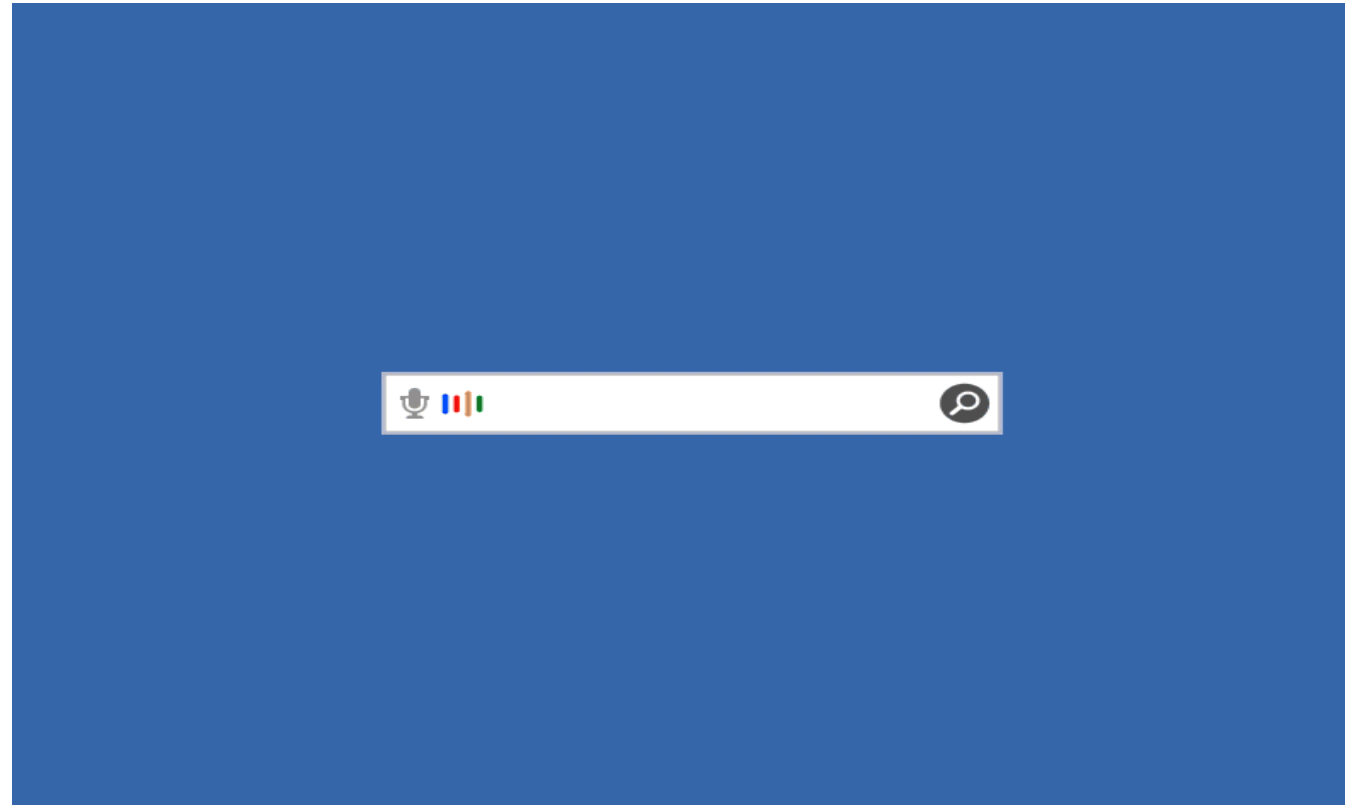
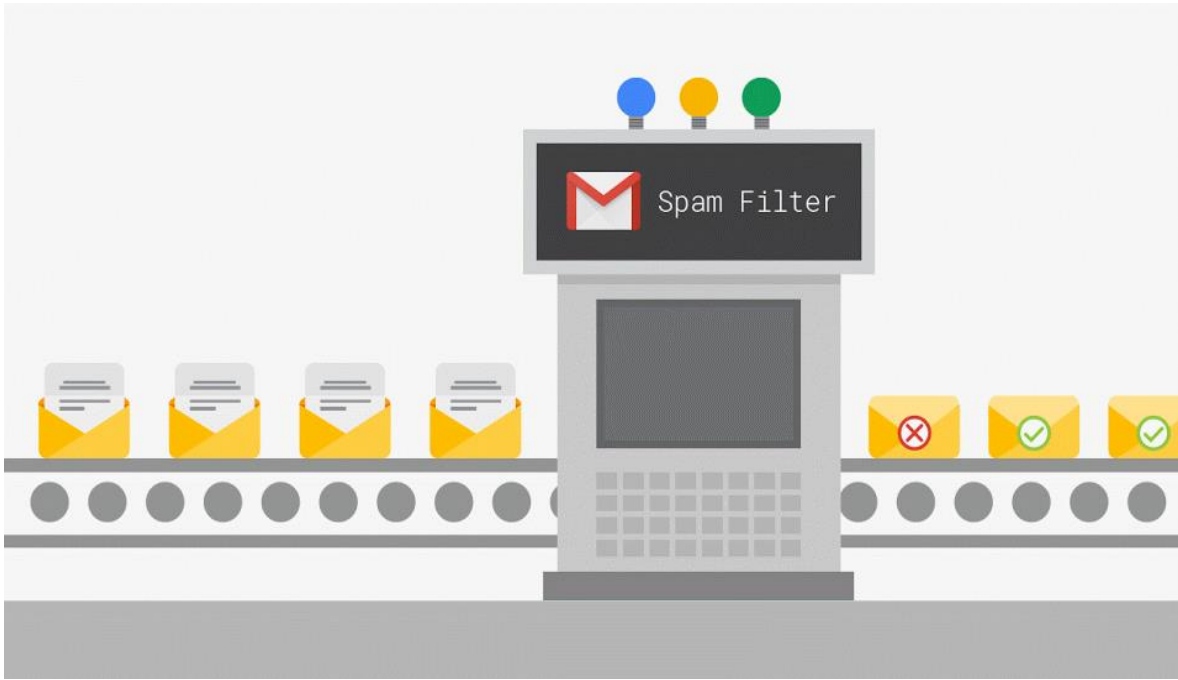
Three steps to anticipate market disruption

To stay ahead of trends, start by envisioning your worst-case competitor.

Agenda

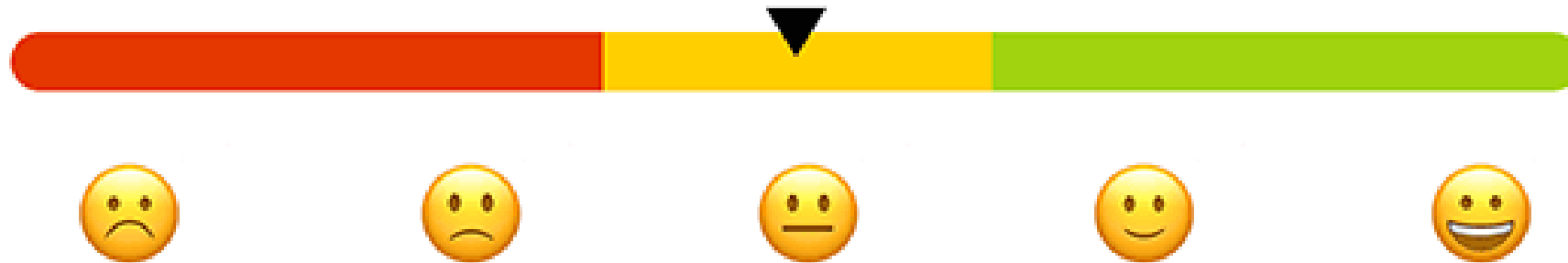
- Evolution of business decisions
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We already know these



We understand these

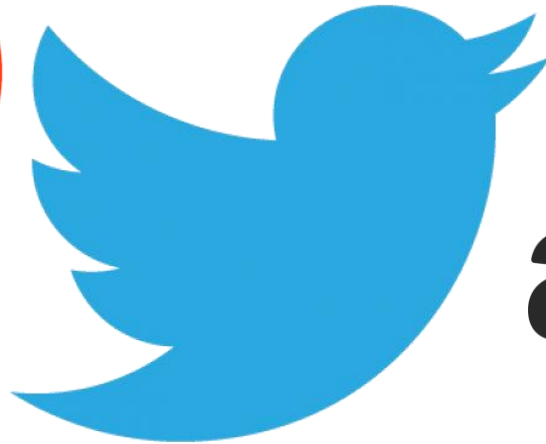
How are YOU measuring
CUSTOMER'S SENTIMENTS?



We already know these



SWIGGY



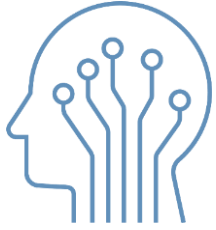
amazon



Google Play

You Tube

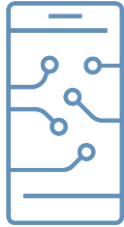
NLP finds applications across businesses



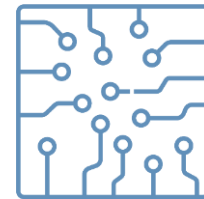
Sentiment analysis



Market intelligence



Chatbots



Intelligent call routing



Customer service

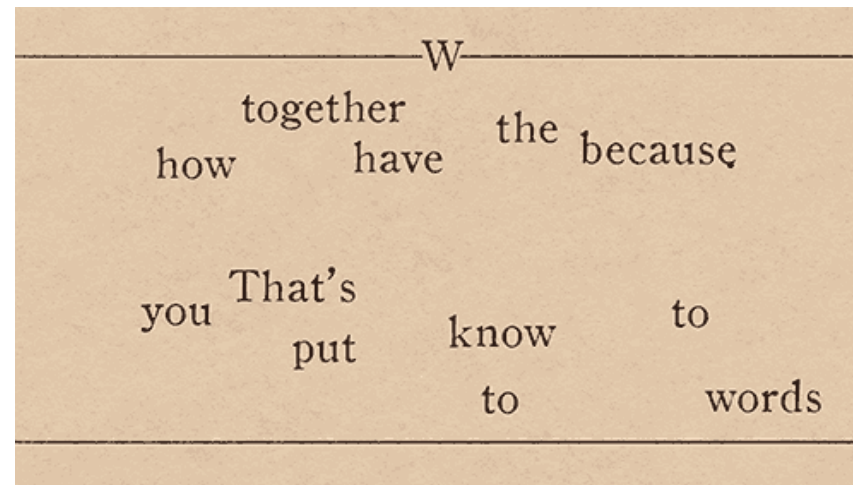
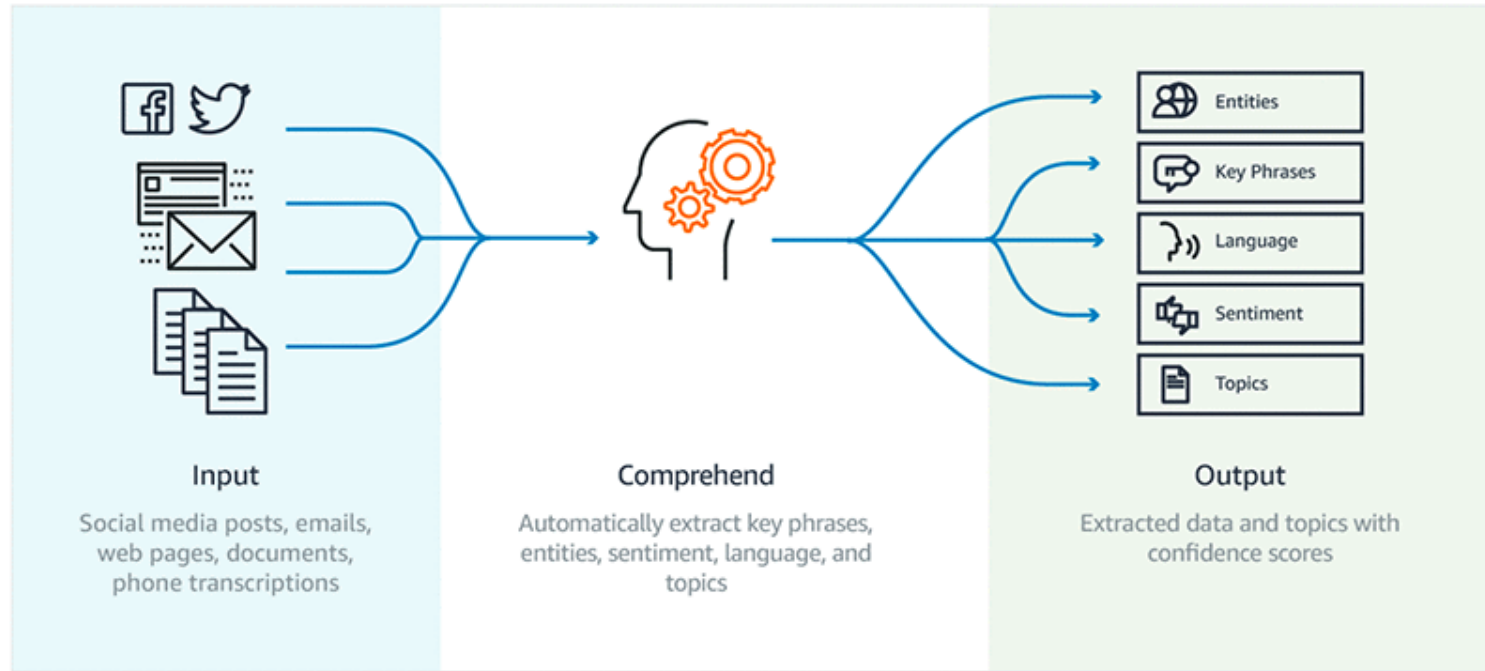


Intelligent reporting

Agenda

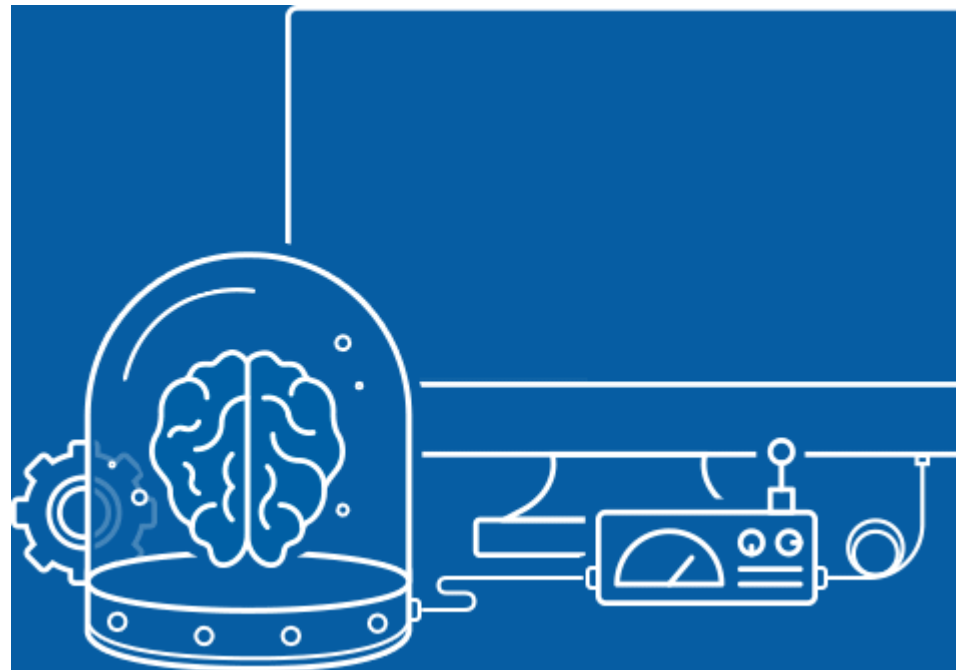
- Evolution of business decisions
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Natural Language is interpreted intuitively by humans but computers require an algorithm to comprehend the data



Capabilities of NLP Span across syntax, semantics, discourse, and speech tasks

- **Text classification** : Web searching, information extraction, language identification, sentiment analysis
 - **Name entity recognition (NER)** : Classify entities (Microsoft, Picaso etc.) into organizations, people, locations, time, dates and so on
 - **Part of speech tagging** : tags nouns, verbs, phrasal verbs and so on. which can be used for text to speech, information extraction etc.



Capabilities of NLP Span across syntax, semantics, discourse, and speech tasks

- **Semantic phrasing and question parsing** : automatically answering questions asked in natural languages including definition questions, biographical questions, multilingual questions, etc.
- **Paraphrase detection** : Identifies if natural language questions are equivalent. This is used in information extraction
- Language generation and summarization
- Character recognition
- Spell check

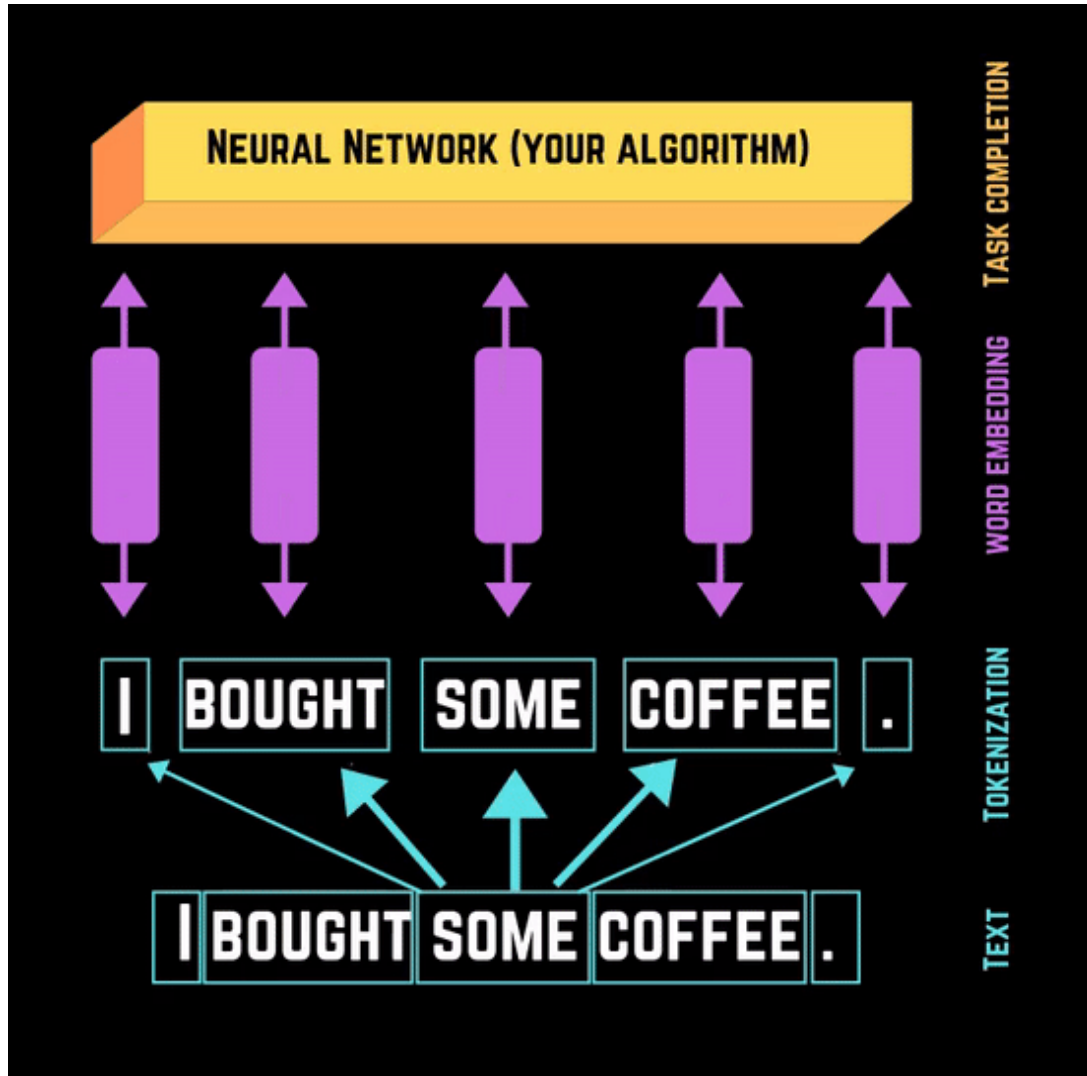
Agenda

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Frequently used pre-processing techniques in NLP

- Bag of words
- Tokenization
- Stop word removal
- Spell-check
- Stemming
- Lemmatization
- Topic Modeling

Tokenization is the process of segmenting running text into tokens of words based on spaces

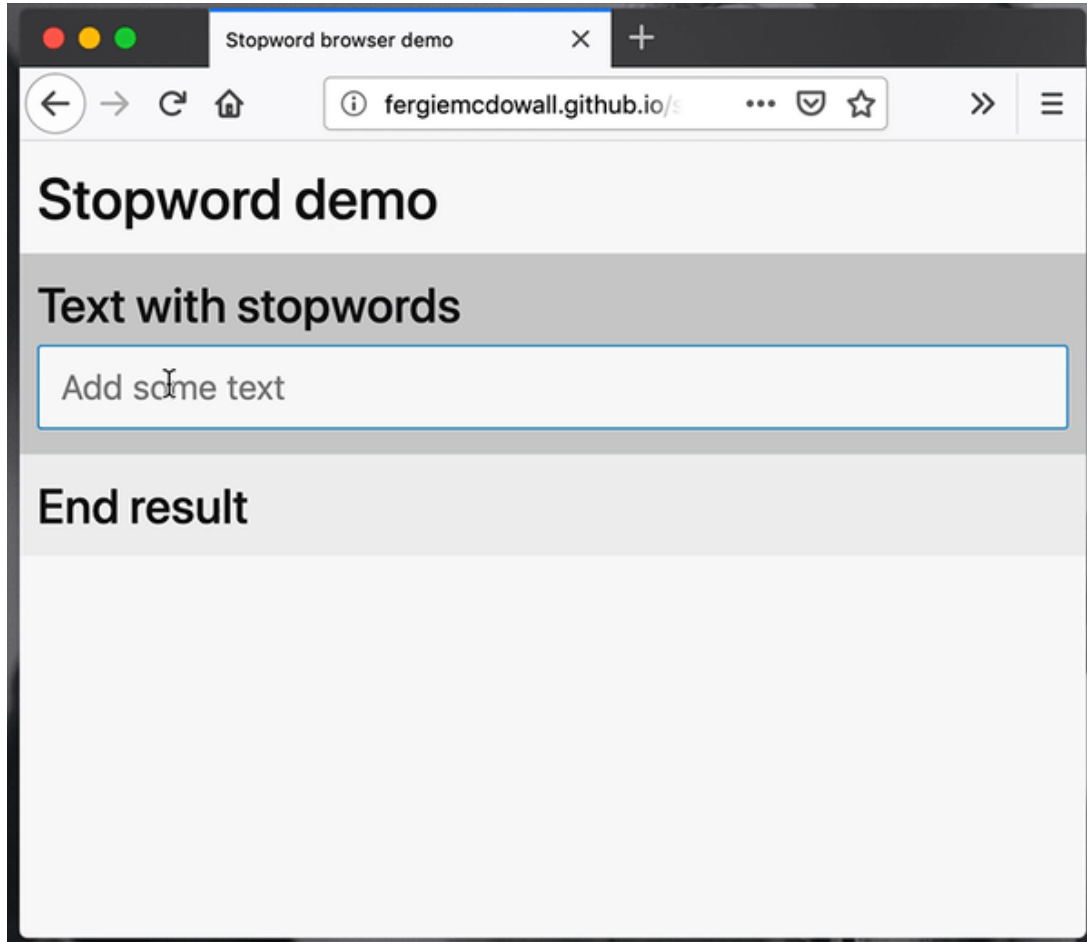


Words are flowing out like endless rain

Words are flowing out like endless rain

- Removes special characters and spaces based on level of tokenization (Low Level and High Level)
- Problematic for **space separated words** like San Francisco or New York, abbreviated words like dr. and biomedical and mathematical data because of hiphens and paranthesis

Stop Words Removal includes getting rid of common language articles, pronouns and prepositions such as “and”, “the” or “to” in English



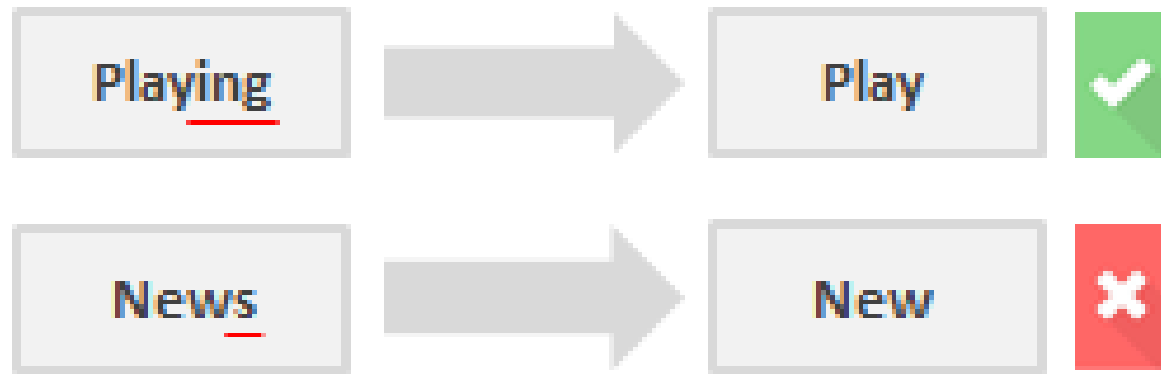
The apple was red in colour
apple, red, colour

- A stop word is a commonly used word (such as “the”, “a”, “an”, “in”) that a search engine has been programmed to ignore, both when indexing entries for searching and when retrieving them as the result of a search query.

Stemming is the process of slicing the end or the beginning of words with the intention of removing affixes (prefixes, suffixes)

Playing ('play' 'ing'), Plays ('play' 's')

Guitarist ('guitar', 'ist')



- Python and R languages have different libraries containing affixes and methods
- Stemming is also used to spell check words
- It is a fast algorithm as it is based on string operations

Lemmatization is more effective & computationally intensive than stemming

Lemmatization extracts root word from different forms (tense, degree of comparison etc.)

Better, best, good -> good

Go, went, gone -> go

Running, runs, ran -> run

Lemmatization can be used with parts of speech to make it more accurate

Bat :

verb -> activity of batting

noun -> animal or the object

STEMMING

Caring



Car



LEMMATIZATION

Caring



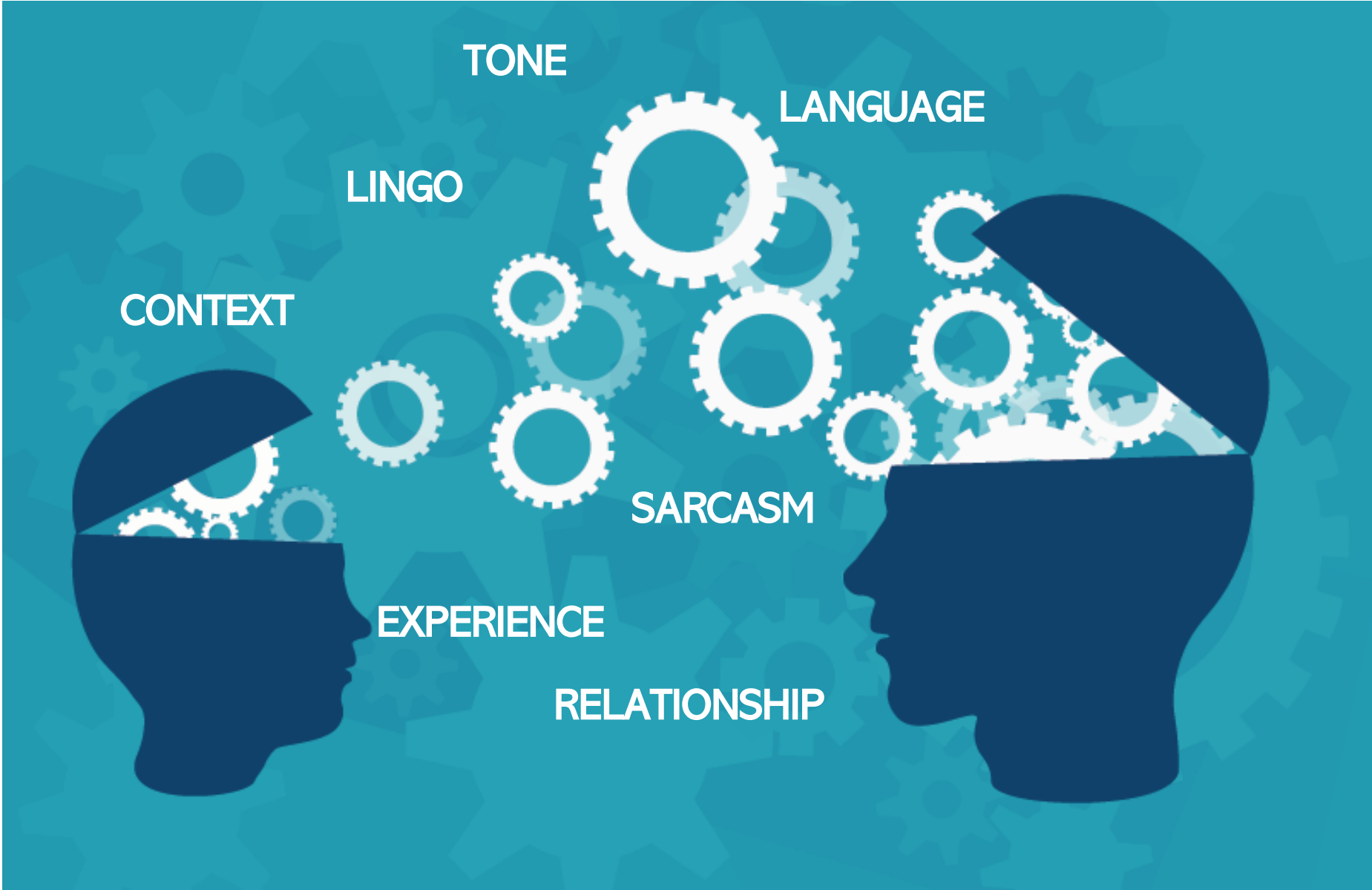
Care



Agenda

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How do humans perceive sentiment?



Building a sentiment comprehension system from scratch is not the most effective approach



Requires large amounts of data, Processing power & Time to be accurate

- Frameworks – PyTorch, Keras, Tensor Flow etc require large amounts of data
- High Data Requirement & resource intensive to build deep learning models from scratch

How does Transfer Learning simplify the process?

Transfers knowledge from one Domain or Task to Another and helps retain several features -

- Typically used when there is less data for Task 2
- Task 1 and Task 2 are similar and utilise similar features

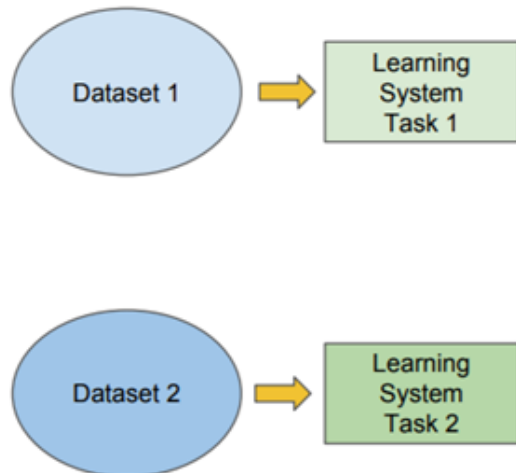
Works very well for unstructured data because many features can be extracted

Traditional ML

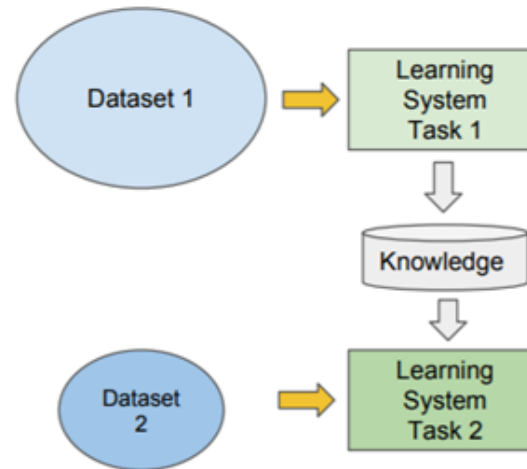
vs

Transfer Learning

- Isolated, single task learning:
 - Knowledge is not retained or accumulated. Learning is performed w.o. considering past learned knowledge in other tasks



- Learning of a new tasks relies on the previous learned tasks:
 - Learning process can be faster, more accurate and/or need less training data



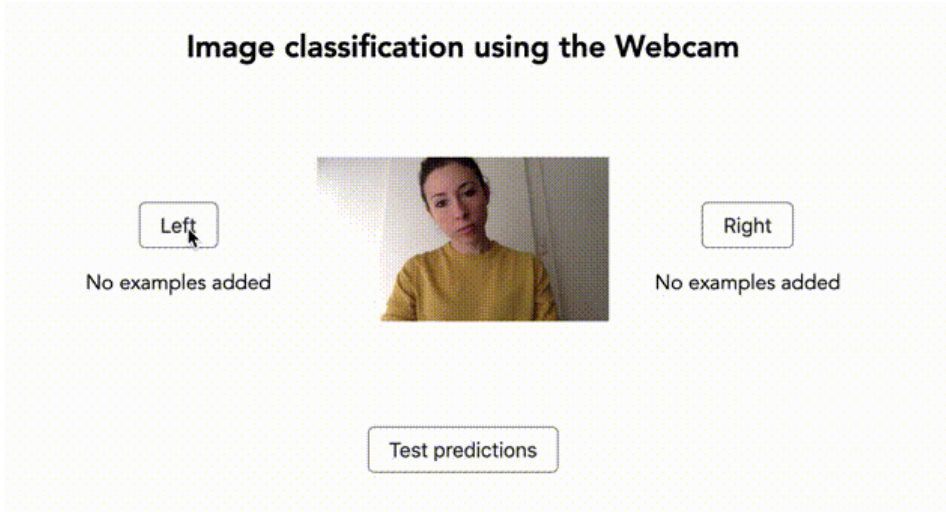
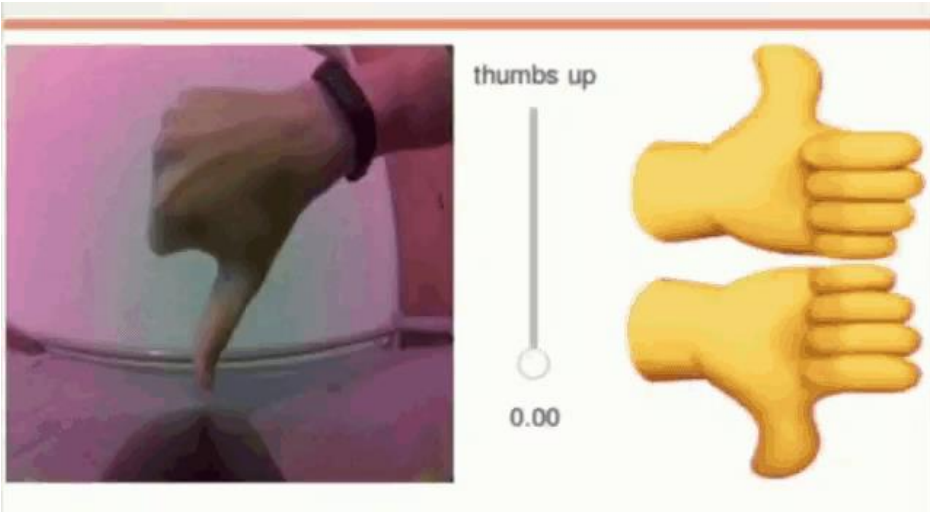
Example:

Task 1 - Generic object detection of 100 object classes

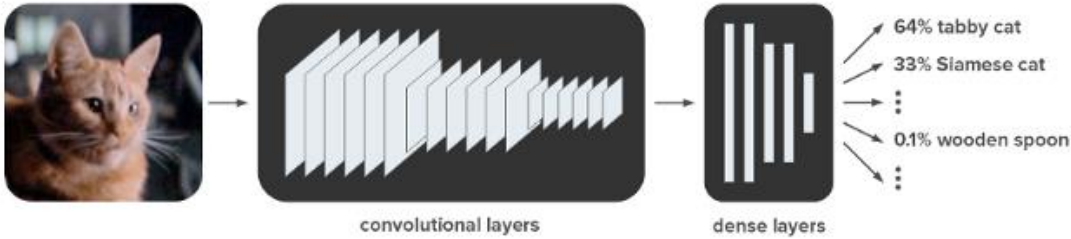
Task 2 - Detection of different types of bags

- Use 'bag' class
- define 3 subclasses 'bag pack', 'handbag', 'suitcase'

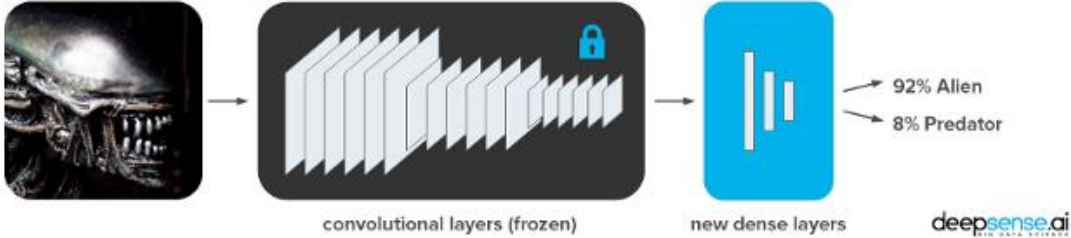
Transfer Learning Examples



Pre-training



Transfer learning



deepsense.ai

Pre-trained Deep-Learning Models

- Trained by Industry experts and Institutes with extensive research by Mathematicians, Scientists etc.
- Made with industry agnostic weights – minimum biases
- Time saving and universal structure

IMAGENET

14,197,122 images, 21841 synsets indexed

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ImageNet is an image database organized according to the [WordNet](#) hierarchy (currently only the nouns), in which each node of the hierarchy is depicted by hundreds and thousands of images. **Currently we have an average of over five hundred images per node.** We hope ImageNet will become a useful resource for researchers, educators, students and all of you who share our passion for pictures. [Click here](#) to learn more about ImageNet, [Click here](#) to join the ImageNet mailing list.



What do these images have in common? *Find out!*

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TensorFlow > Learn > TensorFlow Core > Tutorials

☆☆☆☆☆

Transfer learning with a pretrained ConvNet

[Run in Google Colab](#)

[View source on GitHub](#)

[Download notebook](#)

In this tutorial, you will learn how to classify images of cats and dogs by using transfer learning from a pre-trained network.

A pre-trained model is a saved network that was previously trained on a large dataset, typically on a large-scale image-classification task. You either use the pretrained model as is or use transfer learning to customize this model to a given task.

The intuition behind transfer learning for image classification is that if a model is trained on a large and general enough dataset, this model will effectively serve as a generic model of the visual world. You can then take advantage of these learned feature maps without having to start from scratch by training a large model on a large dataset.

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Bag of words is a commonly used model that allows you to count all words in a piece of text by creating an occurrence matrix

Words are flowing out like endless rain into a paper cup,

They slither while they pass, they slip away across the universe

	words	rain	a	paper	they	slip	the	universe	...
<i>Words are flowing out like endless rain into a paper cup,</i>	1	1	1	1	0	0	0	0	...
<i>They slither while they pass, they slip away across the universe</i>	0	0	0	0	3	1	1	1	...

- Downside is the absence of semantic meaning and context and stop words add noisy data
- The Term Frequency Inverse Document Frequency ([TFIDF](#)) can be created to compensate for the word repetition`

Topic Modelling is as a method to uncover hidden structures texts or documents by clustering topics based on their contents

An unsupervised learning method called Latent Dirichlet Allocation (LDA) is most commonly used



- Topic modelling is extremely useful for classifying texts, building recommender systems (e.g. to recommend you books based on your past readings)

Topic Modelling is as a method to uncover hidden structures texts or documents by clustering topics based on their contents

The user defines the number of topics (n) they want to extract from a text. LDA then assigns words to the most relevant topic by taking into account the probability that it belongs to that topic. This is an iterative process till the best topic clusters are obtained

```
{  
  "predictions": [  
    {"topic_weights": [0.02, 0.1, 0,...]},  
    {"topic_weights": [0.25, 0.067, 0,...]}  
  ]  
}
```

Each number represents the probability of a topic
Predictions for 2 separate documents are represented here

Appendix

- [Sentiment Analysis in Business \(watch Nike's ad with Kolin Kaepernick \)](#)
- [Applications of ANN in NLP](#)
- [Applications of NLP in business](#)
- [Information Extraction using Parts of Speech tagging and Entity Extraction](#)
- [IMPORTANT: Power of Hash tagging \(in context of sentiment analysis\)](#)
- [What is Transfer Learning? Exploring the popular Deep Learning Approach](#)

Thank you