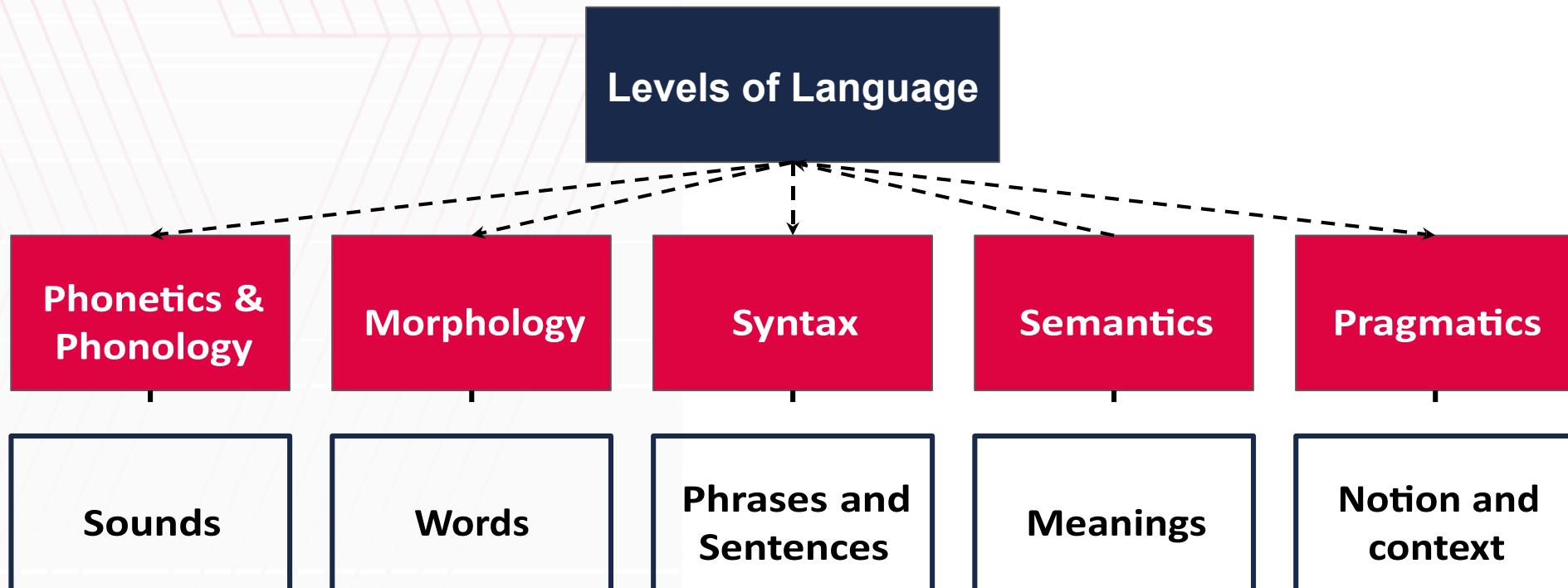


Natural Language Processing

What is NLP?

How does Natural Languages Look Like?

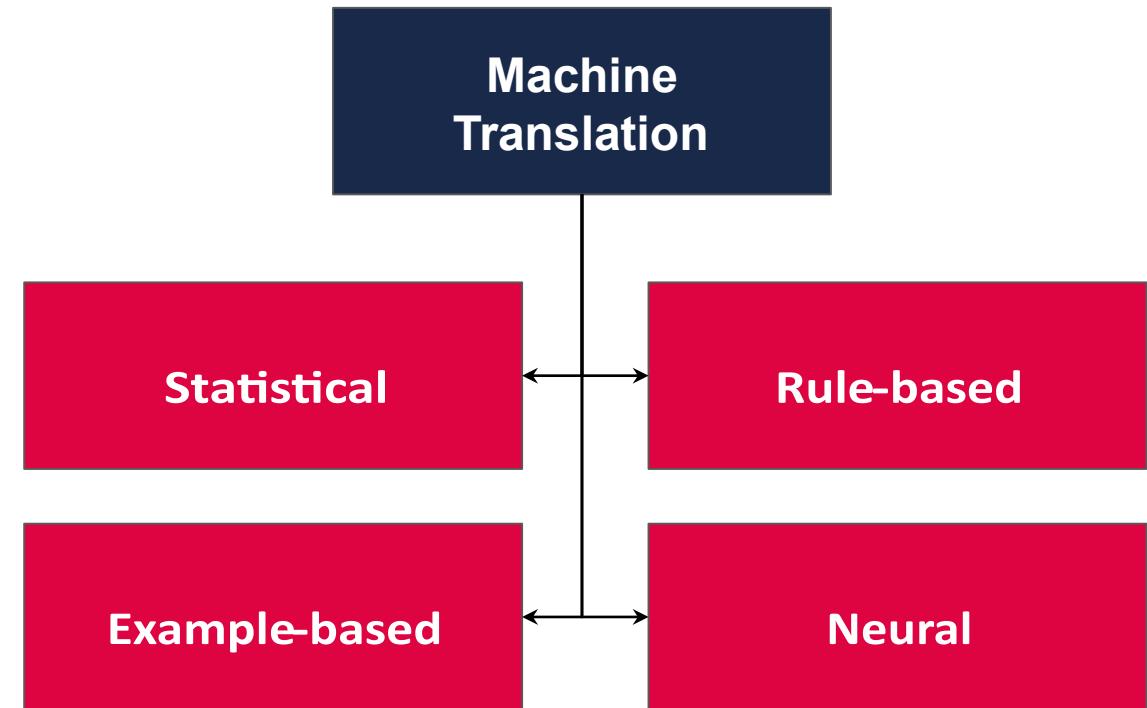


What is Natural Language Processing?

- Natural language processing (NLP) is a field of study concerned with enabling computers and machines to understand human language
- Turing test specified that a computer or machine must have human-like conversational abilities in order to be considered intelligent
- Knowledge and understanding of linguistic system is important in comprehension application of natural language processing technologies.
- NLP is a sub-field of AI which is multidisciplinary: CS (AI) + Mathematics + Linguistics + Psychology

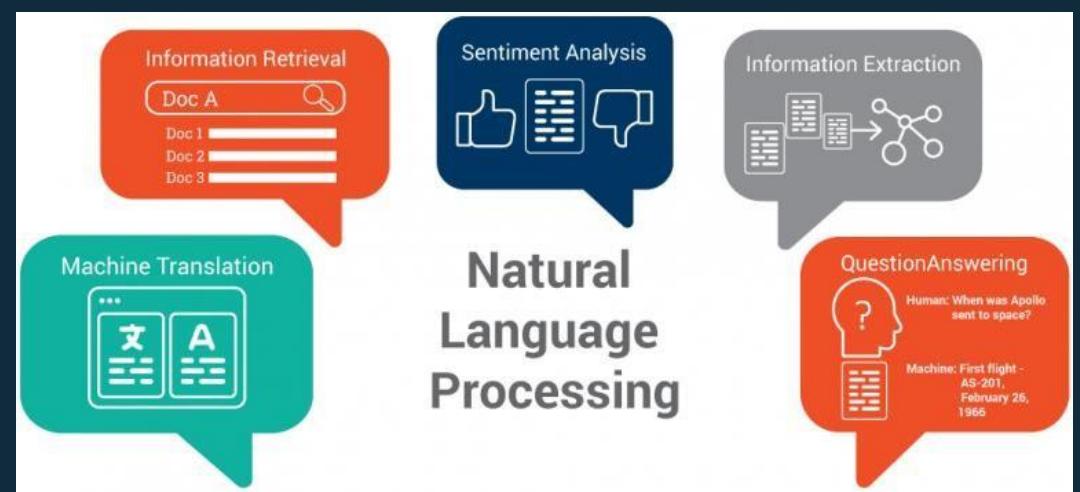
Subdomains in Machine Translation

- Four main types of machine translation models: statistical (SMT), rule-based (RBMT), example-based (EBMT) and neural (NMT)
- Before NMT was invented, SMT was predominantly used, supplanting more classical methods such as rule-based and example-based methods
- Currently, NMT which utilises the neural networks, is the most dominant method in machine translation due to its versatility



Natural Language Processing

Applications



How does natural language processing helps communication?

- For human-to-human interactions, NLP paved the way for the emergence of **chatbots** and are changing the way customer service agents assist customers
- Hospitals are also benefiting from NLP technologies, with patients able to voice out their needs through **voice assistants**, enabling nurses to prioritise each request according to contexts
- Avid travellers in a foreign land can communicate effectively in real-time using **translators** which capitalise from NLP technologies
- For hardware-to-hardware interactions, ML and DL techniques are easing the burden of researchers on technical designs which involves domain-specific knowledge and expertise

Natural Language Processing Applications

Chatbots

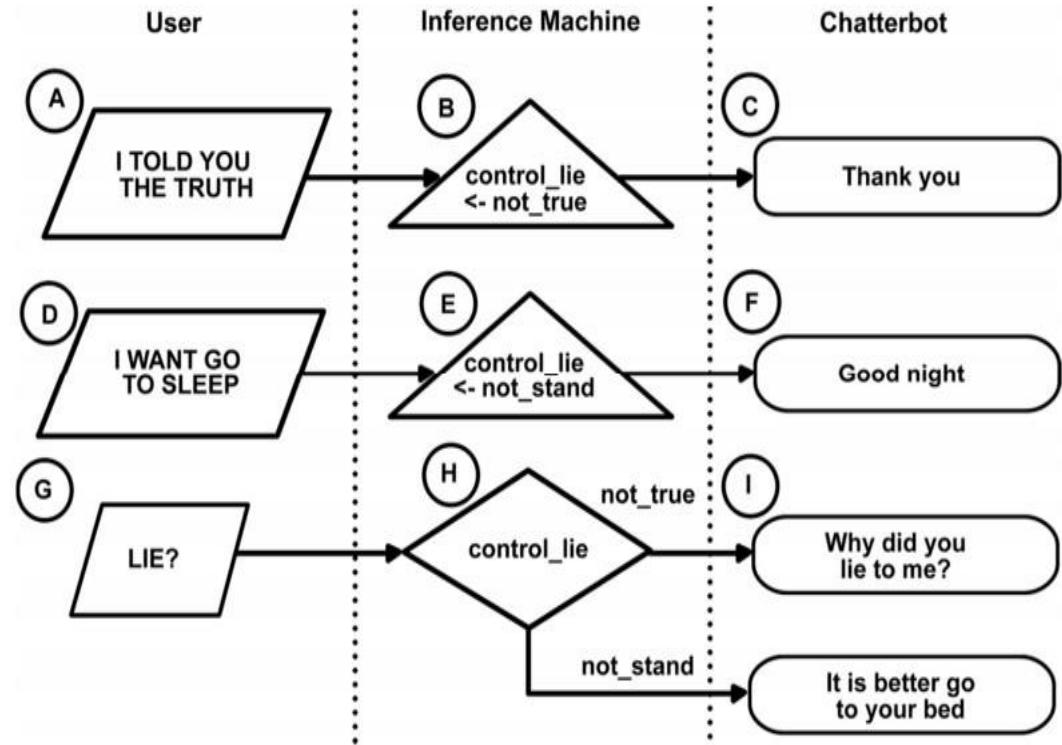
RPA + Deep Learning: Customer Service Chatbot

- Chatbot collect information from customer and pass information to RPA.
- RPA perform fills information to the system, retrieve status from system and etc.
- Information is then passed back to chatbot to continue conversation



Chatting robots

- It is shown that humans are less confident when communication with another human, as opposed to a chatbot
- By using chatbots monitored by a human, messages can be delivered more effectively
- Current chatbots uses decision tree, which is a ML technique
- In recent development, researchers in India uses NLP to process user inputs and assign tags based on the sentiment and meaning
- The algorithm will turn to an Artificial Intelligence Markup Language (AIML) database and look for appropriate responses based on tags



Natural Language Processing Applications

Patient Communication

Knowledge19 - DeloitteAssist answers patient calls for improved care and connection



By **Jessica Twentyman** May 9, 2019

SUMMARY: The management consultancy firm has developed a healthcare product based on Amazon Alexa and ServiceNow that reimagines the hospital bedside call button for the digital age

 0 Comments

For patients on a busy hospital ward - and which hospital wards aren't busy? - the call button next to their beds is a vital piece of kit, enabling them to alert nursing staff to their immediate needs: a glass of water, a bedpan, an extra pillow, a more urgent medical issue. For others, that call button may be totally out of reach, particularly if they have mobility issues



Source:
<https://diginomica.com/knowledge19-deloitteassist-answers-patient-calls-improved-care-and-connection>

Why is Patient Communication Important?

- Traditionally, patients inform nurses of their needs using a press of a button
- However, the signal contains no additional information or context
- Often times patient's requests are non-emergency and menial tasks: adjusting pillows; other times, patient might need immediate crucial help

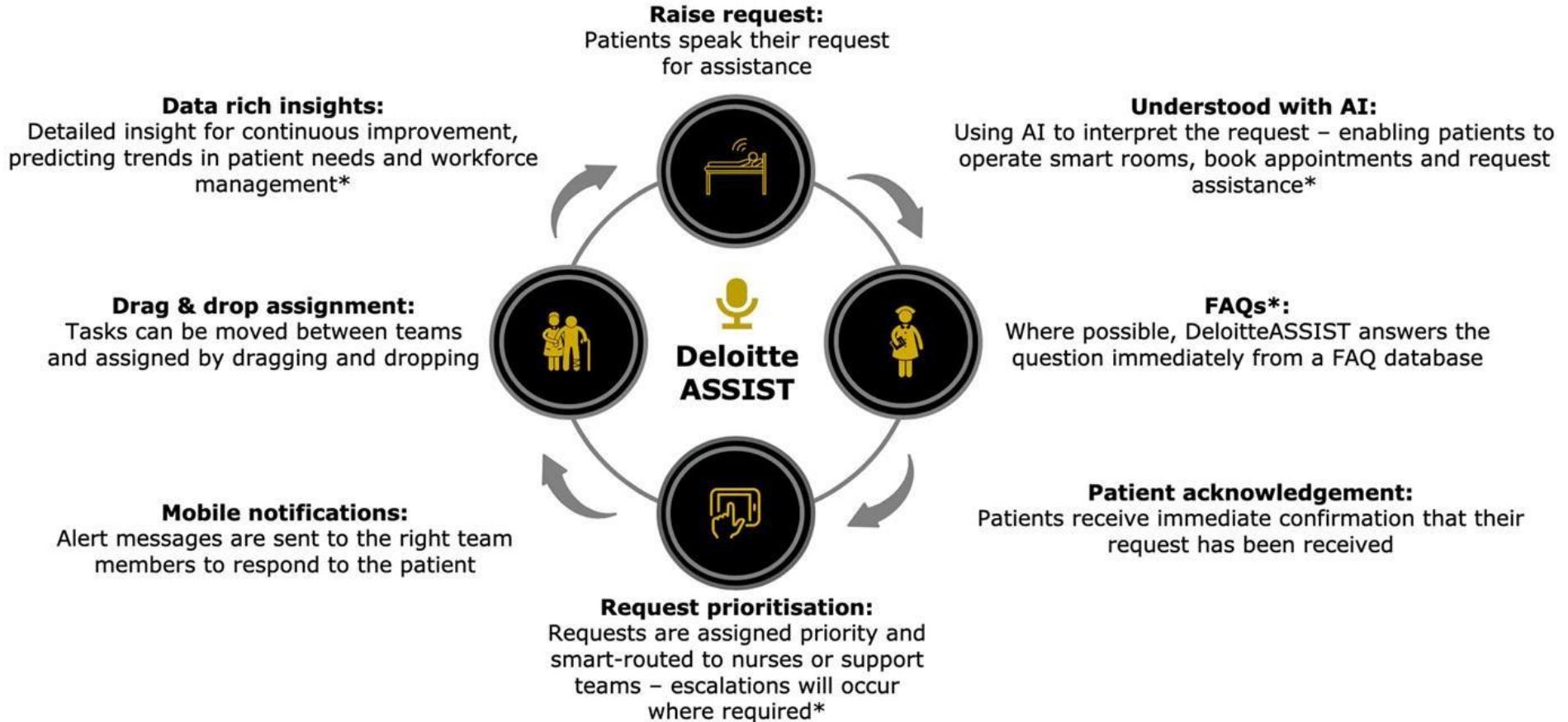
Recent Advances

- Patient can raise requests through Alexa
- With NLP, informational context can be added into signal
- Coupled with path scheduling techniques, these devices can dispatch nurses according to priorities



Source: <https://sloanreview.mit.edu/article/ais-communication-upsides/>
Figure from: <https://which-50.com/deloitte-brings-amazons-alexa-into-wards-to-improve-patient-care/>

AI-enabled Patient Communication



*Not part of currently solution, in design for future releases

Natural Language Processing Applications

Machine Translation

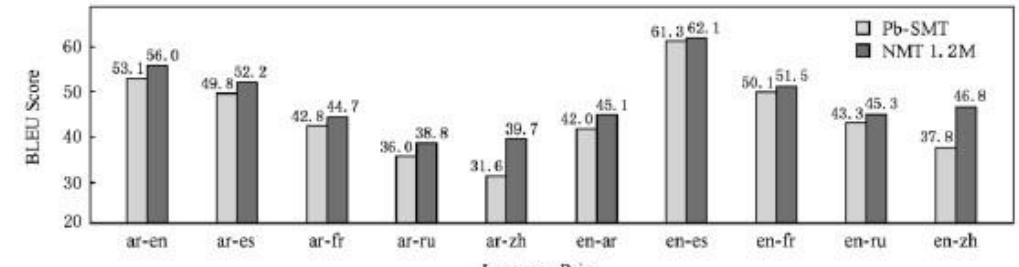
A multi-lingual machine

- In 2016, Google made a breakthrough in machine translation and introduced neural machine translation (NMT), nearly a decade later than its predecessor: phrase-based statistical machine translation (SMT)
- Previously, researchers use SMT to find the most probable translation
- NMT capitalises on the capability of deep learning to implement accurate translations
- Currently, Google deploys NMT in Google Translate, replacing SMT

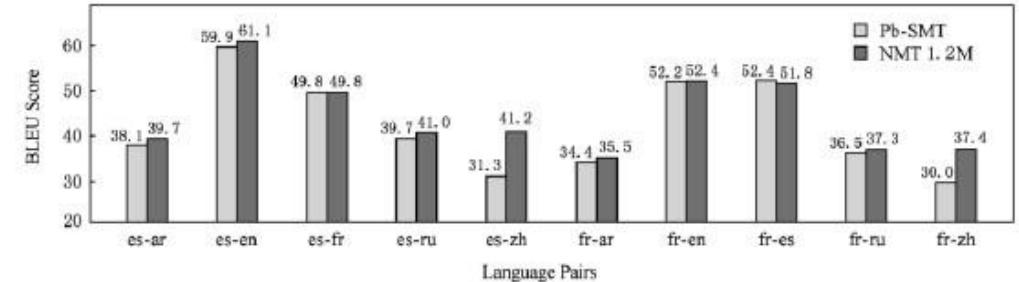


A multi-lingual machine

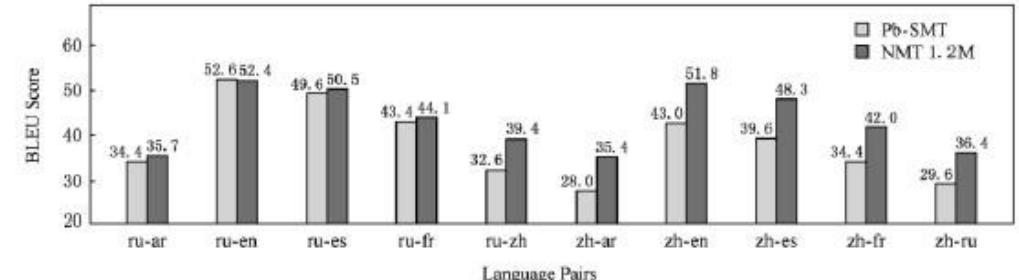
- From the figure, we can see that NMT performs better than SMT in more languages
- NMT is able to produce accurate translations by using a encoder-decoder framework which resembles a deep neural network



(a) The first group



(b) The second group



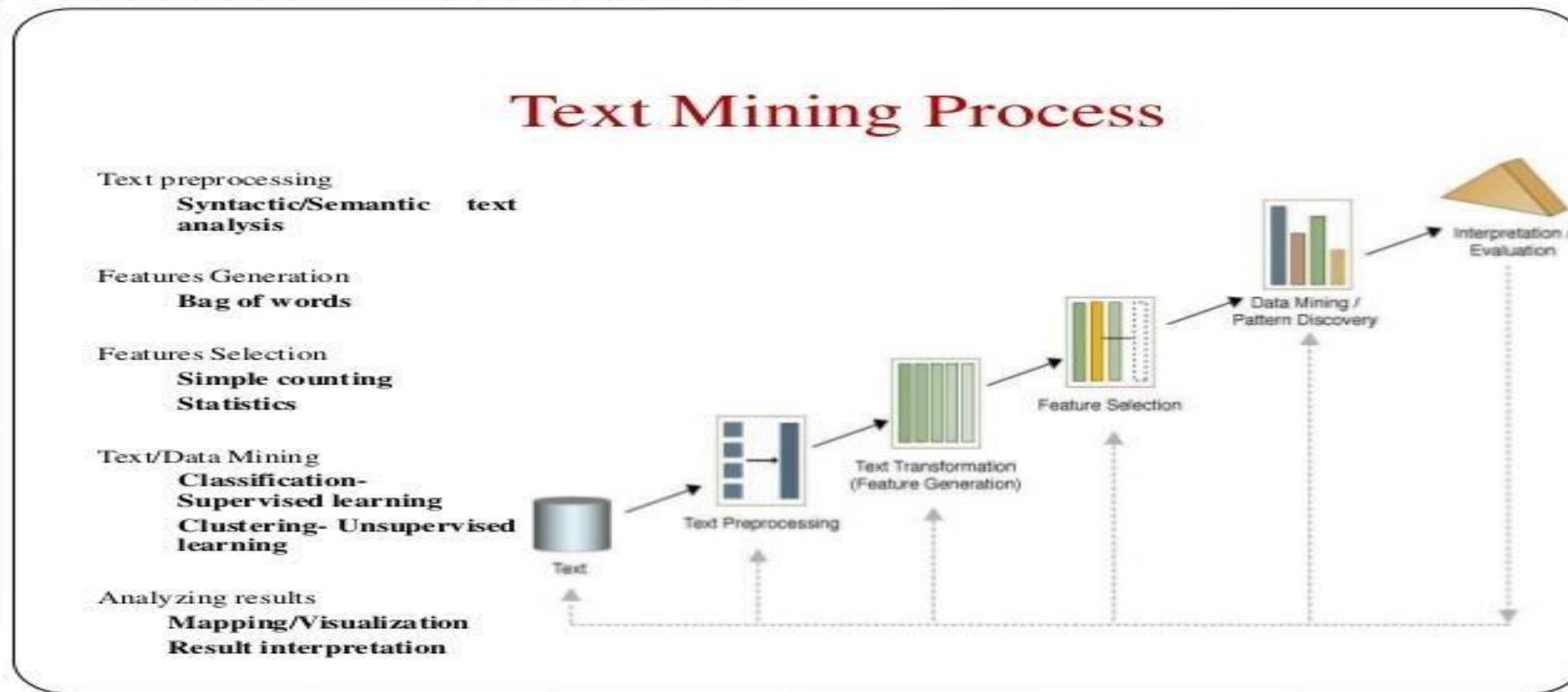
(c) The third group

Natural Language Processing Applications

Text Processing / Mining

Text Mining

- Refers to extraction of relevant information from textual sources.
- Processing of unstructured information in text and transforming it into a suitable format for analysis



Contemporary challenges of TM

- Interpretation of unstructured content is complex for machines caused by
 - Presence of ambiguity in natural languages
 - Meaning to heavily rely on context and background knowledge
- Commonly uses Supervised ML approach which is often computationally expensive as large number of annotated documents required
- High dimension of attribute space

Problems Text Mining is used to solve

- Two main tasks of TM are
 - Information patterns search
 - Matching structure identification
- Examples of tasks:

Text summarization	Produce condensed representation of the input
Information retrieval	Identify and return most relevant documents given a collection of documents according to user's query
Text categorization	Assign a predefined category according to the content
Document clustering	Groups of documents are sought by creating links between similar documents

Example: Query-focused Summarization – Google Search

- Create snippets, summarizing a web page for a query.
- Google provides summary of the page – snippets
- 156 characters (about 26 words) plus title and link

The screenshot shows a Google search results page for the query "hang tuah". The search bar at the top has "hang tuah" circled in red. Below the search bar, there are tabs for All, Images, Maps, Videos, News, and More. The "All" tab is selected. A snippet for the Wikipedia page on Hang Tuah is displayed, showing the title "Hang Tuah - Wikipedia" and a brief summary: "Hang Tuah (Jawi: حنگ تواه) was a warrior who lived in Malacca during the reign of Sultan Mansur Shah in the 15th century. He was supposedly the most powerful of all the laksamana, or admirals, and is considered by the Malays to be one of history's greatest silat masters." To the right of the snippet, there is a large image of Hang Tuah and several smaller images related to him. Red arrows point from the summary text to the image area. At the bottom of the snippet, there is a "snippets" section with the text: "Hang Tuah was a warrior who lived in Malacca during the reign of Sultan Mansur Shah in the 15th century. He was supposedly the most powerful of all the laksamana, or admirals, and is considered by the Malays to be one of history's greatest silat masters." Below this, there are sections for "Wikipedia" and "Twitter".

Natural Language Processing Applications

Sentiment Analysis

Sentiment Analysis

- Also known as opinion mining
- The study analyzing people's opinions towards a certain item such as products, services, issues, or topics.
- Opinions can be an important piece of information to arrive to a decision
- Due to its potential influence, more attention is being put towards opinion mining

Motivation of study

- Diverse commercial applications
- Growth of social media content

Sentiment Analysis

- Determine if the expression towards a particular topic, product, etc. is positive, negative, or neutral
- Example: Reviews, Tweets, Facebook posts, Comments

Charu Agrawal @CharuAg68478676 · Feb 14
Replies to @AirAsia
Stop giving guidelines during holiday to help prevent Coronavirus. Start refunding people hard earned money as we are scared to travel.
@narendramodi @HardeepSPuri sir pls help us!!@goibibo @aayush89
6 4 15

goibibo @goibibo · Feb 15
We regret it's taking longer than the expected time frame, however, we are working on the concern to get it resolved in the best possible manner and we'll update you accordingly. We would humbly request your patience in the interim. Thanks, JS
1 1 1 1 more reply

Wening @weningeling · Feb 27
Replies to @AirAsia
If no one from @AirAsia or @AirAsiaSupport or @AirAsiaGold get in contact with me regarding my payment status ASAP, then I would say that buying AirAsia ticket is pretty much nightmare-ish experience for me.
4 4 4

21 Comments Sort by Oldest
Add a comment...
Marysa Labrone
High quality product and customer service is extra quick!
Like · Reply · 12 · 12h

3.5 ★★★★☆ 1,560 reviews Sort by: Most relevant
All take away 10 toast 287 boiled eggs 81 nasi lemak 79 +6
Local Guide · 64 reviews · 116 photos
★★★★★ a month ago - Classic spot in the city for eggs on toast. Simple, fast, efficient and cheap. We had lemon iced tea also and it was good. Enjoy
Like
Firdaus Bachik
Local Guide · 50 reviews · 125 photos
★★★★★ 2 months ago
Came here on Monday about 9AM, it wasn't that crowded but still had to queue.
Sadly, there is nothing special about this place, totally overrated. The food is ... More
Like 1

Why Sentiment Analysis?

- *Movie*: is this review positive or negative?
- *Products*: what do people think about the new iPhone?
- *Politics*: what do people think about this candidate or issue?

Types of Tasks

- Simplest task: Classify the statement using polarity positive or negative.
- More complex: Classify the statement using scales such as from 1 to 5 or polarity very positive, positive, neutral, negative and very negative.
- Advanced: Identify the emotions from the statements.

Natural Language Processing

THANK YOU