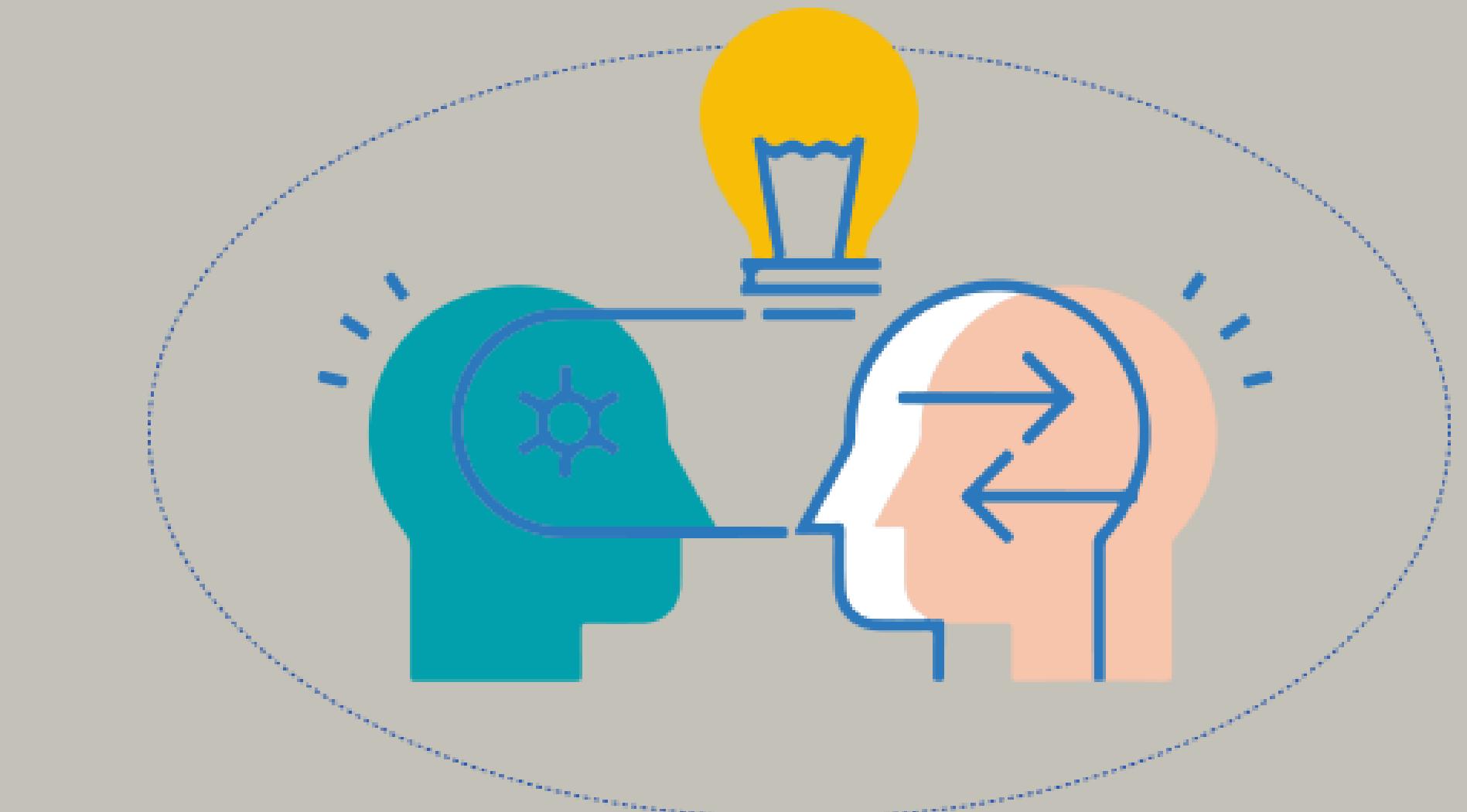


NLP IN HEALTHCARE

Unpacking the 4D Picture Project





PRESENTER

Dr. Daisy Monika Lal

Research Associate - NLP
4D Picture Project
SCC, Lancaster University

POSTDOC?



EARLY CAREER SCIENTISTS



DOCTORAL CANDIDATE

LEAD RESEARCHERS

1. Identify the problem

- Problem to solve
- Project objectives
- Research questions

2. Develop the research plan

- Information needed
- Research & analysis methods
- Responsible parties

3. Conduct research

- Secondary data review
- Primary data collection
- Suitable methods & techniques

4. Analyze and report findings

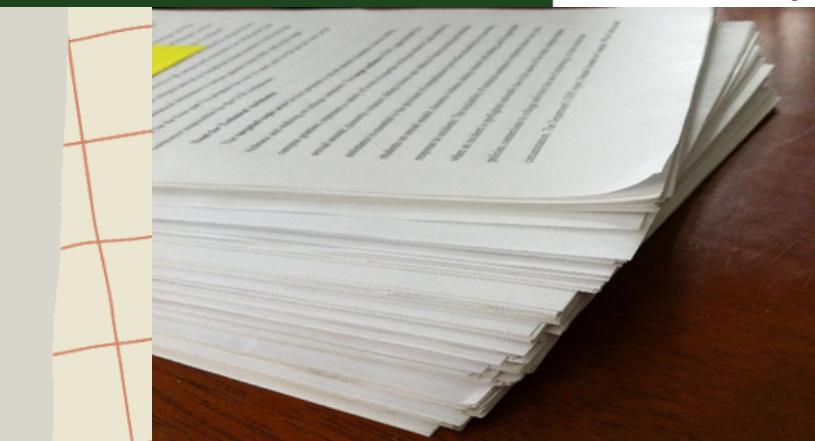
- Data formatting & analysis
- Interpretation of results
- Report & recommendations

5. Take action

- Thought and planning
- Evaluation of options
- Course adjustment & execution



IMPORTANT PART



RESEARCH PUBLICATIONS

<https://upjourney.com/what-do-computer-scientists-do>

https://www.rndexpert.com/phd_admission.php

<https://www.shutterstock.com/image-illustration/important-part-30398662>

<https://mydiagram.online/diagram-of-steps-to-follow-when-planning-a-research-project/>

<https://orthodonticproductsonline.com/practice-management/financial-management/time-right-new-technology-purchase/>

EVERY DAY TEXT

EMAILS

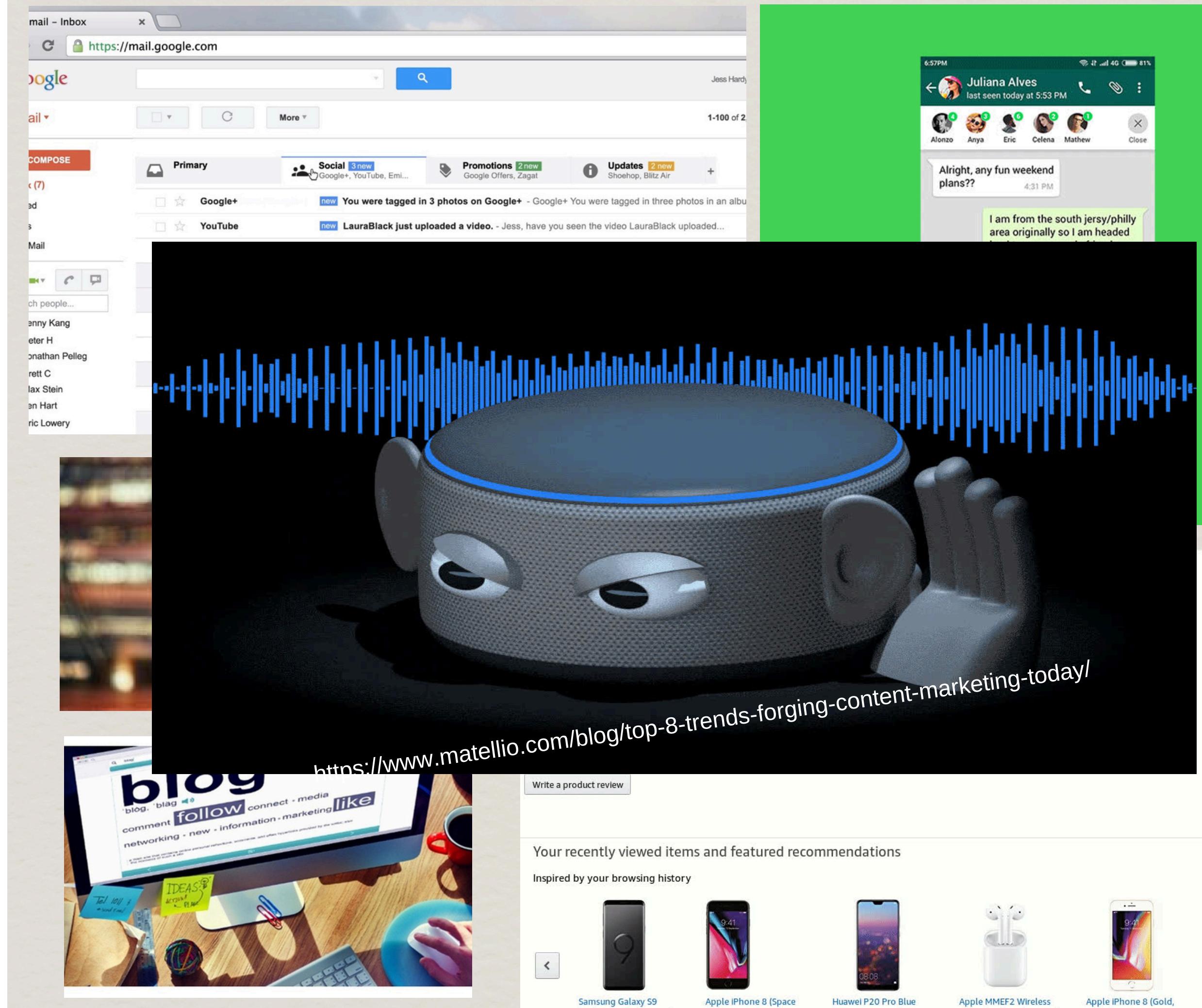
BOOKS

SOCIAL MEDIA

SPEECH
ASSISTANCE

WEBPAGES

PRODUCT
REVIEWS



NLP

INFORMATION RETRIEVAL

Google search results for "what are large language models".

About 856,000,000 results (0.27 seconds)

TechTarget <https://www.techtarget.com/large-language-model-LLM>   **large language models (LLMs)**
A large language model (LLM) is a type of artificial intelligence (AI) algorithm that uses deep learning techniques and massively large data sets to ...

Elastic <https://www.elastic.co/what-is/large-language-models>   **What is a Large Language Model?**
A large language model (LLM) is a deep learning algorithm that can perform a variety of

People also ask :

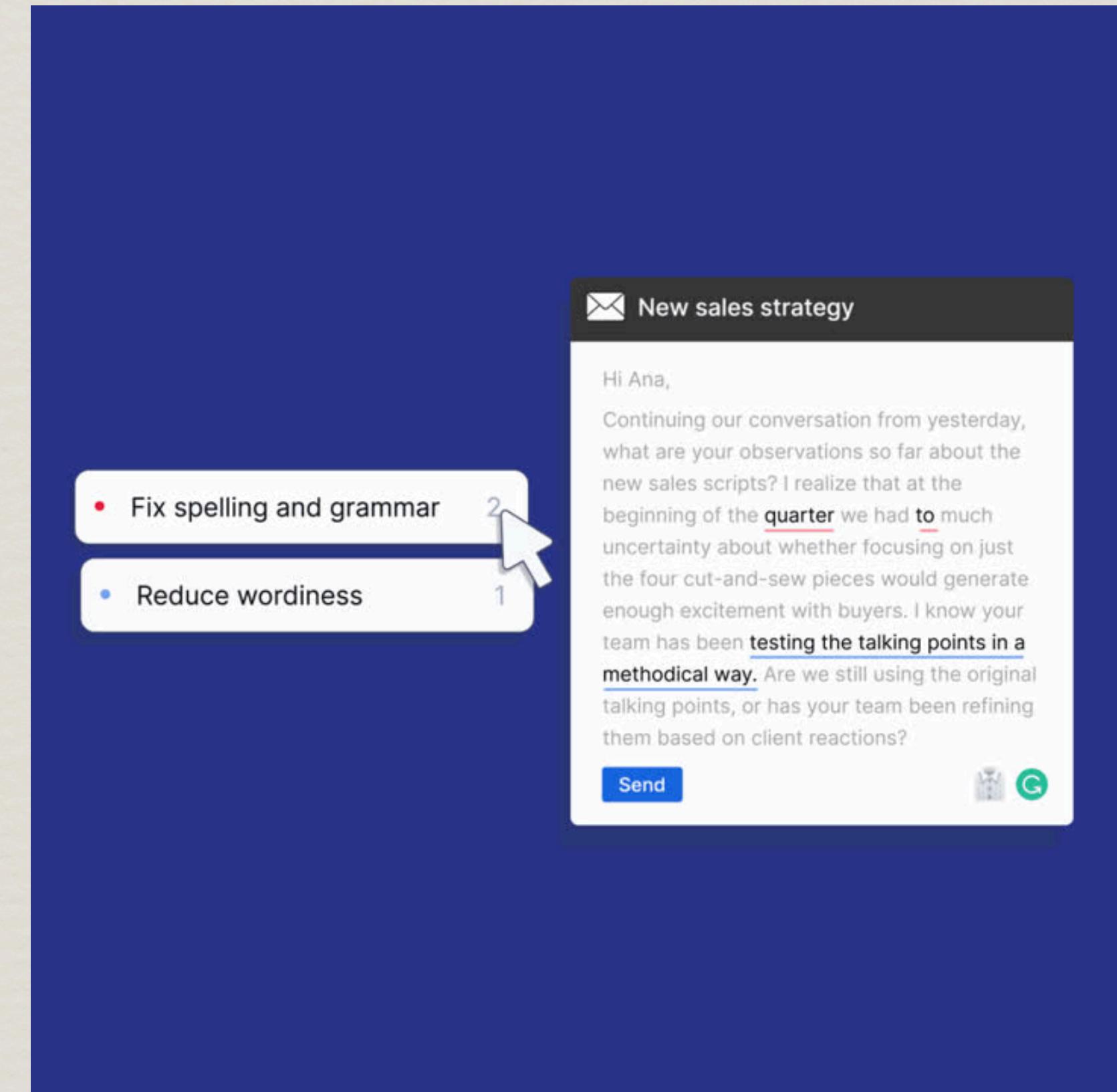
- What is a large language model?
- What is LLM in simple words?
- Is ChatGPT a LLM or NLP?
- What is the difference between LLM and ML?

Large language model 

A large language model is a language model notable for its ability to achieve general-purpose language generation. LLMs acquire these abilities by learning statistical relationships from text documents during a computationally intensive self-supervised and semi-supervised training process. [Wikipedia](#)

NLP

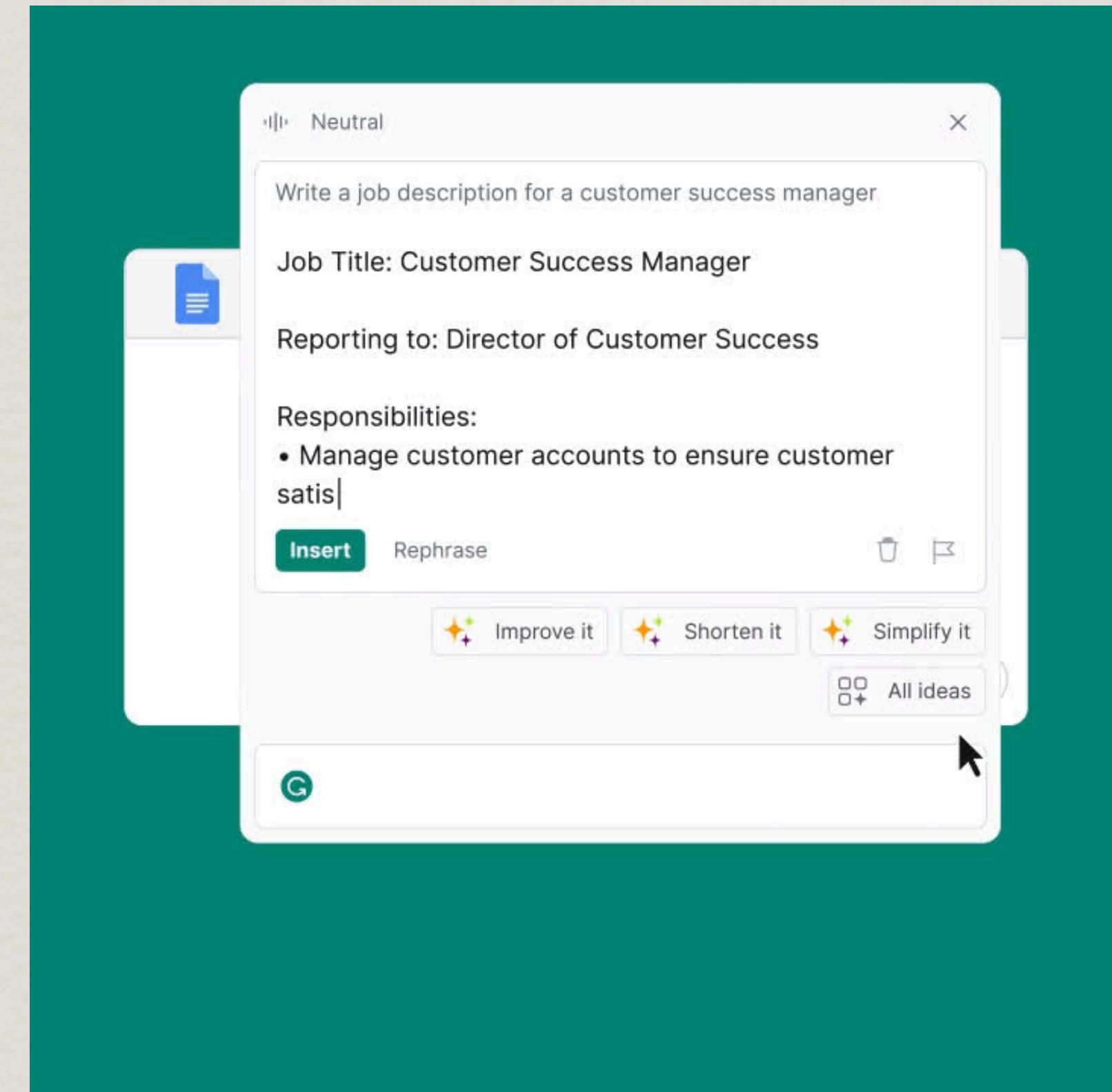
GRAMMAR CHECKER



<https://www.grammarly.com/blog/grammarly-writing-assistant-for-professionals/>

NEED OF NLP

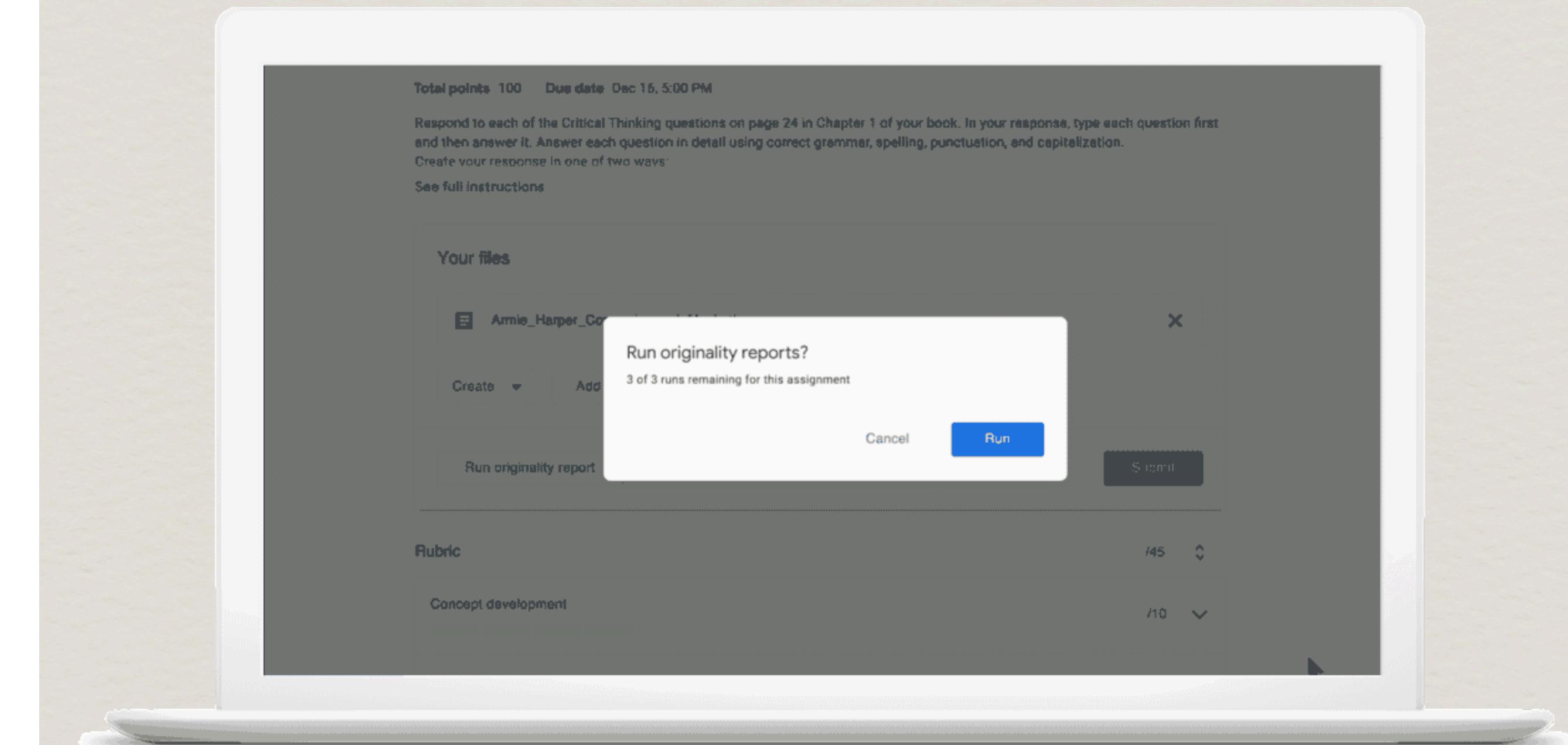
CONTENT GENERATOR



<https://www.grammarly.com/blog/formatting-suggestions/>

NLP

CONTENT MATCHING



<https://philadelphiadaser.weebly.com/google-plagiarism-checker.html>

NLP

TRANSLATION

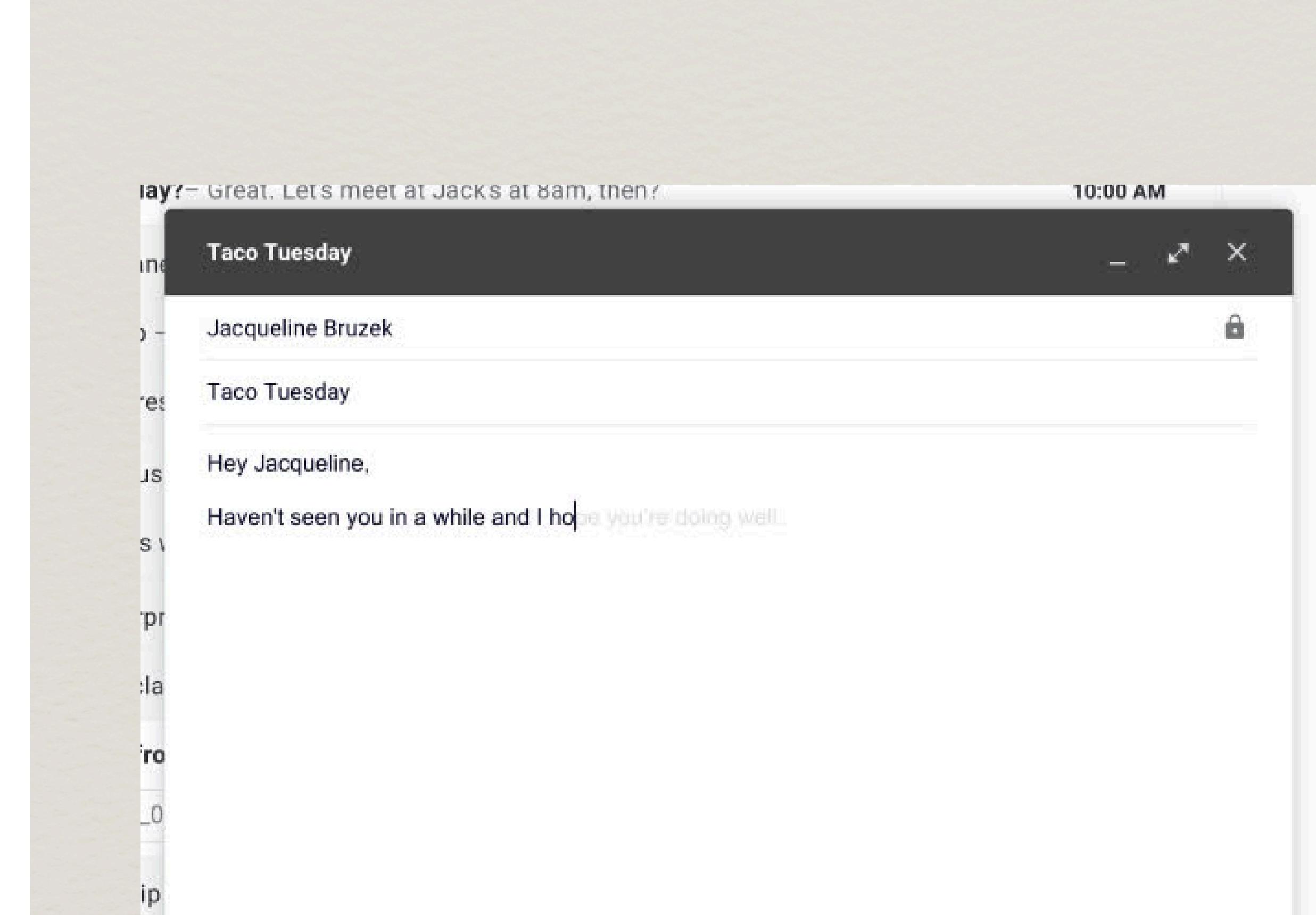
The screenshot shows the Google Translate interface. At the top, there's a navigation bar with 'Google Translate' and a gear icon. Below it is a menu bar with 'Text' (selected), 'Images', 'Documents', and 'Websites'. Underneath the menu, there are dropdowns for 'Detect language' (set to English) and 'Target language' (set to Danish). A small 'G' logo with a '1' is visible next to the target language dropdown.

The main area contains a text input box containing the sentence: "I work at Lancaster University as a postdoctoral research associate". To its right is a translation box containing the Danish equivalent: "Jeg arbejder på Lancaster University som en postdoc forskningsmedarbejder". There are also icons for microphone, speaker, and a progress bar indicating 67 / 5,000 characters.

At the bottom right of the interface, there are three small icons: a square, a thumbs-up, and a share symbol. Below these icons is the text "Send feedback".

NLP

PREDICTIVE TEXT



<https://wonderfulengineering.com/gmail-will-help-you-creating-an-email/>

NLP

PRODUCT REVIEW

Read reviews that mention

face features plus display device phones
android ios charging **watch** expensive feature
samsung performance user button front mode

Showing 1-8 of 25 reviews with "expensive" [Clear filter](#)

[See all 25 customer reviews with expensive](#) ›

[See all 409 reviews](#) ›

[Write a product review](#)

Your recently viewed items and featured recommendations

Inspired by your browsing history



'12th Fail' is top-class and a must-watch that will leave you impressed and inspired through almost every scene of its 147 minutes. Full marks to Chopra for ensuring he gets the best out of every character in the movie.

<https://towardsdatascience.com/how-to>

In-depth Analysis

Our overall critic's rating is not an average of the sub scores below.

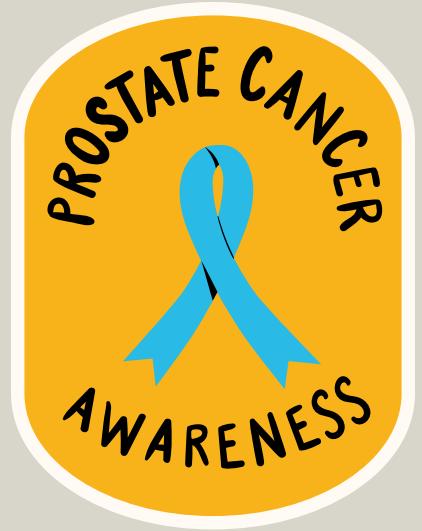


NLP

INTERACTIVE VOICE RESPONSE



https://www.reddit.com/r/amazonecho/comments/6rbv6t/revamp_your_app_with_alexa_skill_development/



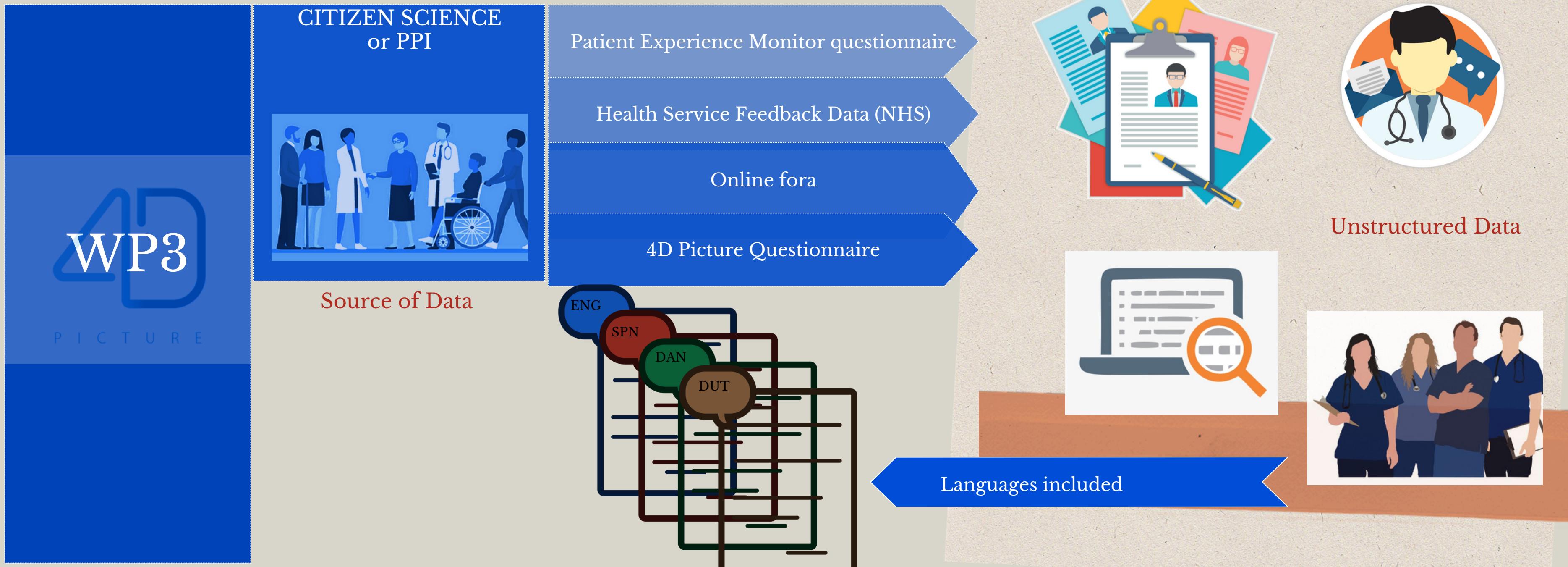
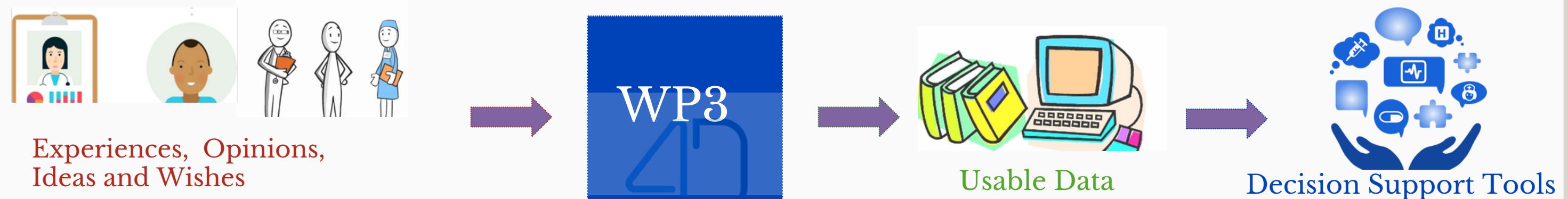
4D PICTURE

Design-based Data-Driven Decision-support Tools
Producing Improved Cancer Outcomes Through User-centred Research



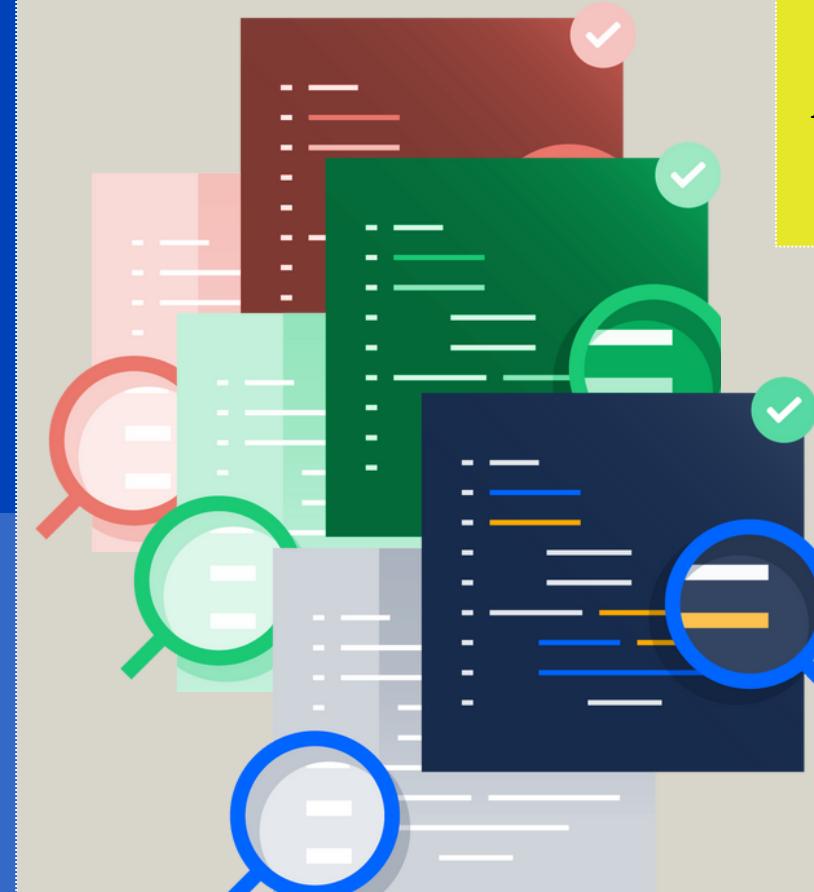
1. Erasmus MC, University Medical Center Rotterdam
2. Academisch Ziekenhuis Leiden
3. Universidad de Zaragoza
4. Lillebaelt University Hospital of Southern Denmark
5. European Cancer Patient Coalition
6. Kolding Design School
7. Lancaster University

4D Picture Project





Usable data



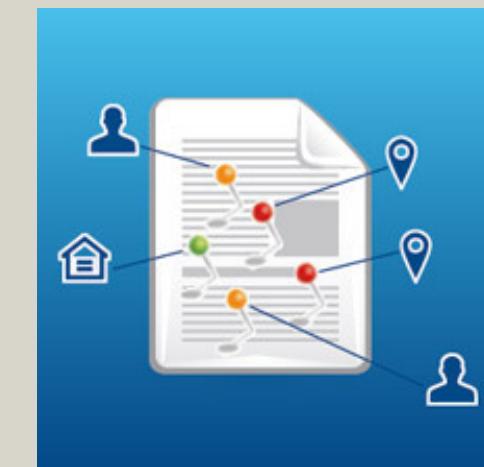
Annotated Corpora

Named entity recognition

Aspect-based sentiment analysis

Extending existing semantic taggers for Dutch and Spanish

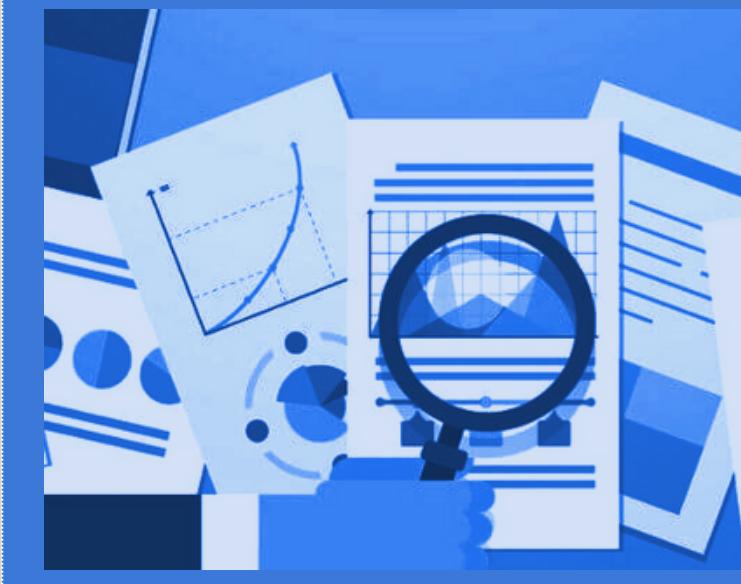
Developing a new semantic tagger for Danish



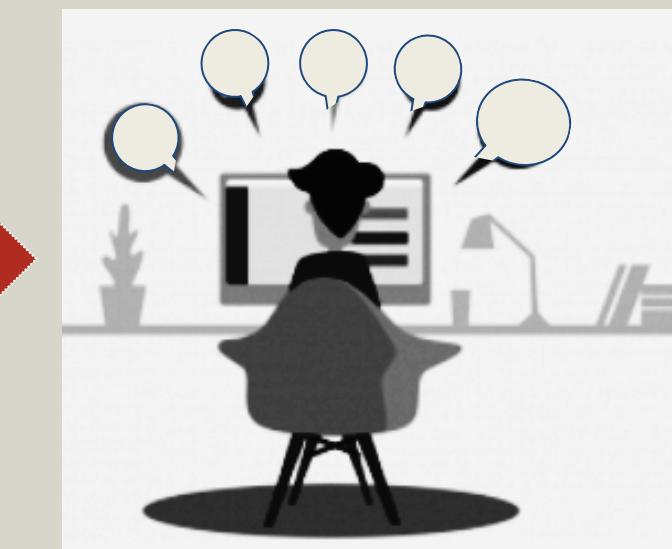
Informal



Formal



Conversational Tool



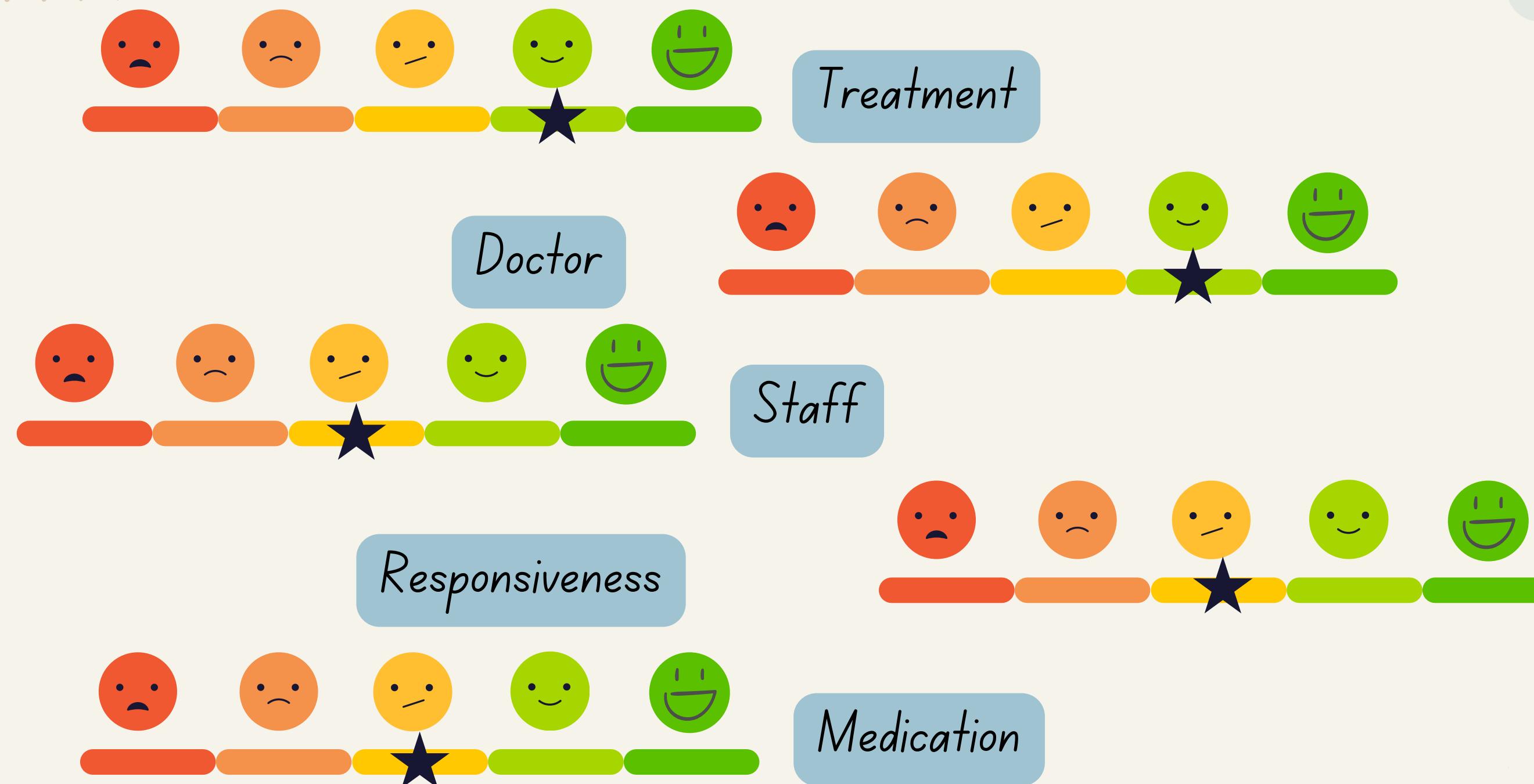
Manual annotation and analysis of Metaphor

Metaphor-menu for other languages

SENTIMENTS



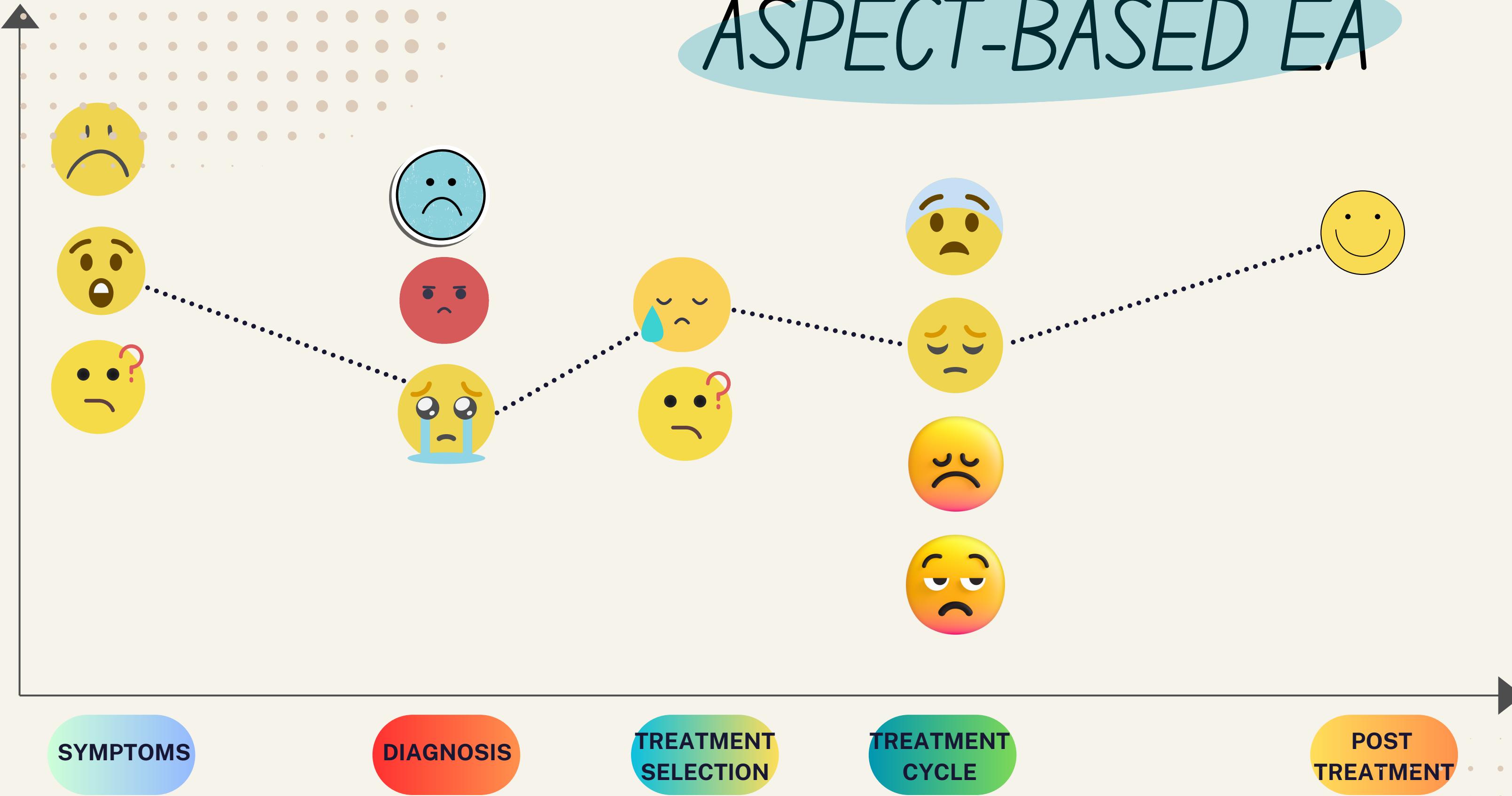
ASPECT-BASED SA



EMOTIONAL ROLLERCOASTER



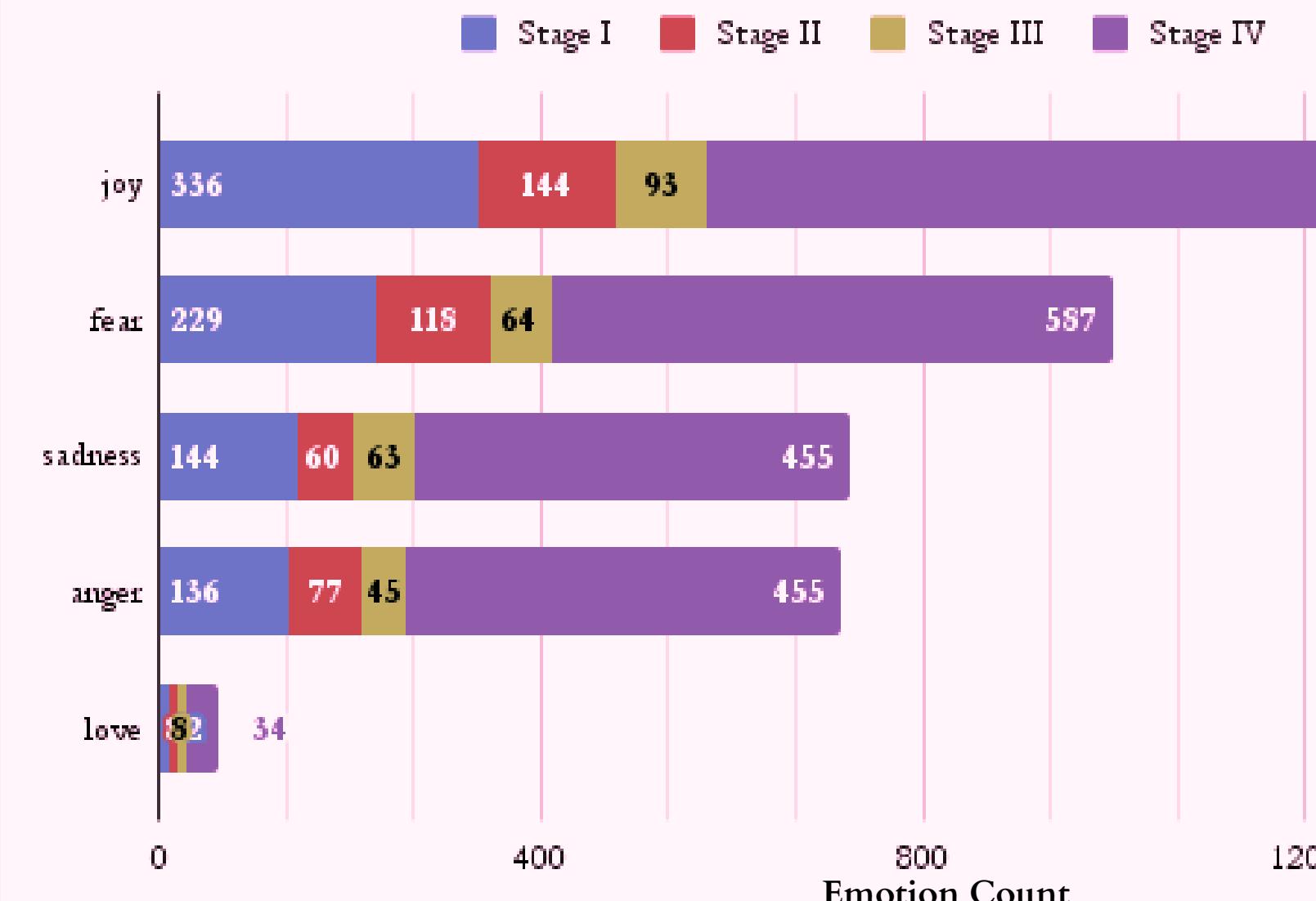
ASPECT-BASED EA



RESULTS

RobertaGo Emotions - Stages of Cancer

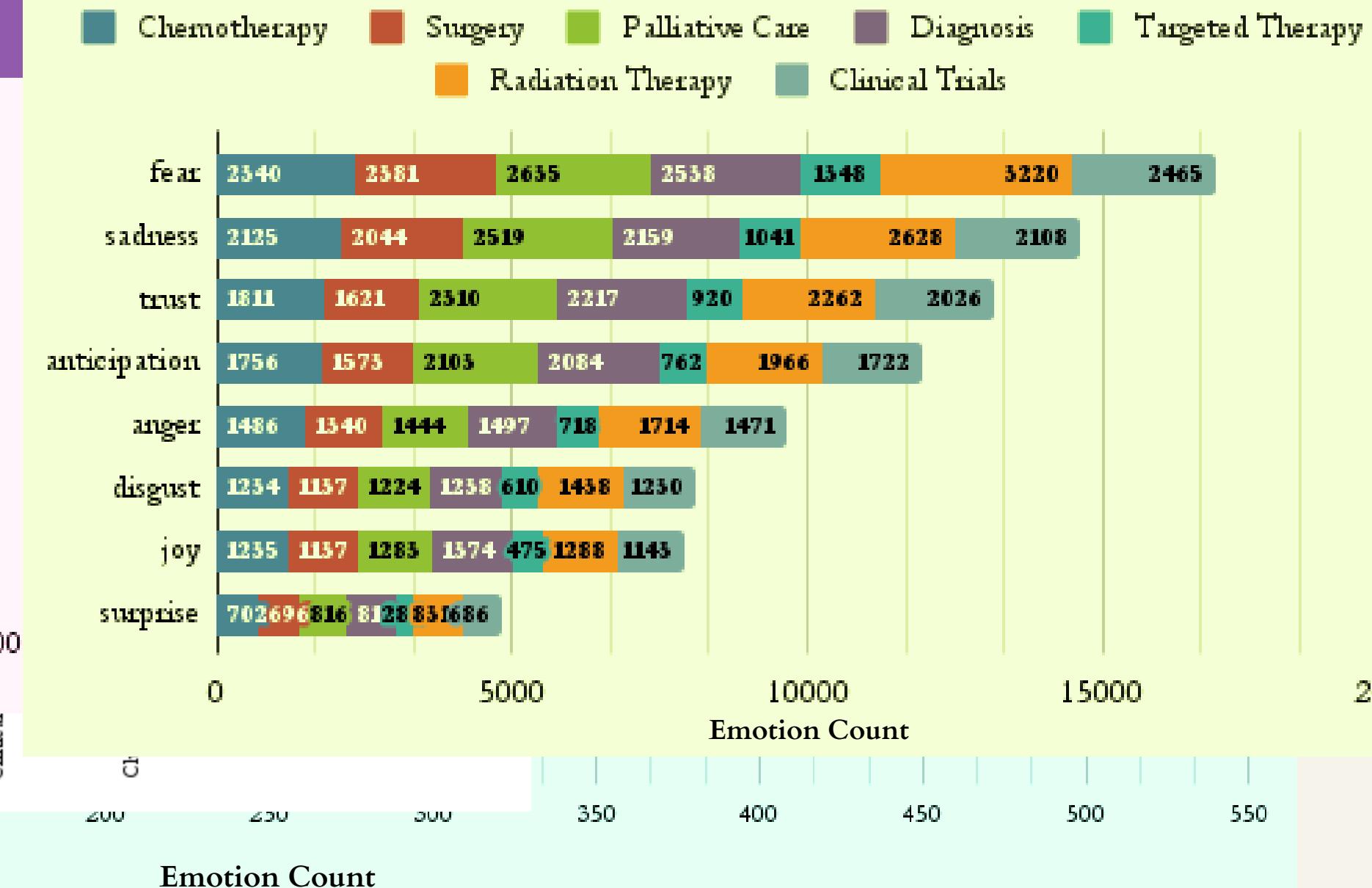
T5 - Stages of Cancer



III Stage IV

264

NRCLex Emotions - Cancer Treatments



COUNTER-INTUITIVE RESULTS

"I'm going to die, and I'm going to do it with as much dignity as possible, and have the best last few months I can possibly have."

T5: joy | RobertaGo: {'label': 'optimism', 'score': 0.6297} | Roberta: positive = 0.8141 |
DistilBERT: POSITIVE | NRCLex: fear = 0.2, trust = 0.2, positive = 0.2, negative = 0.2, sadness = 0.2

"Going into town I will enjoy the delightful offerings from del taco and a Xanax. We dine like kings!"

T5: joy | RobertaGo: {'label': 'joy', 'score': 0.8974} | Roberta: positive = 0.9764 |
DistilBERT: POSITIVE | NRCLex: trust = 0.25, positive = 0.25, joy = 0.25, anticipation = 0.25

"I'm still battling side effects but I'm so relieved to be done! I get to come home to my beautiful wife and loving dog every time."

T5: joy | RobertaGo: {'label': 'joy', 'score': 0.7250} | Roberta: positive = 0.9543 |
DistilBERT: POSITIVE | NRCLex: positive = 0.3333, joy = 0.3333

"I told her I loved her and held her hand while they ended life support."

T5: love | RobertaGo: {'label': 'love', 'score': 0.9029} | Roberta: positive = 0.7132 |
DistilBERT: POSITIVE | NRCLex: "

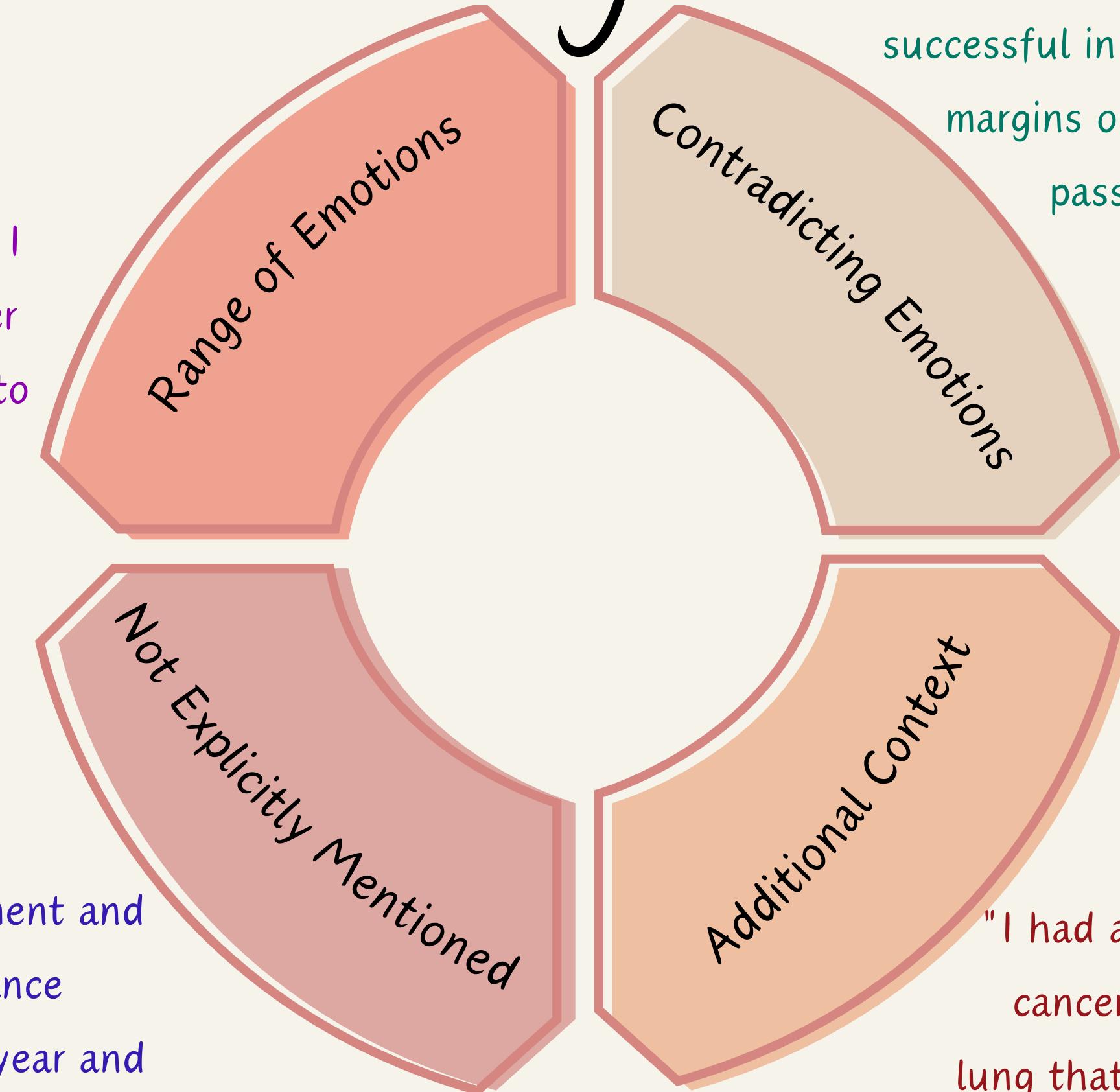
"But hearing the phrase, 'you no longer have cancer' makes me feel invincible again."

T5: joy | RobertaGo: {'label': 'joy', 'score': 0.3020} | Roberta: positive = 0.7231 |
DistilBERT: POSITIVE | NRCLex: fear = 0.2857, negative = 0.2857

Challenges

"I have been told I will never be cancer free, I have learnt to accept that."

"Finished a year of treatment and continued on maintenance chemotherapy for another year and was cancer free for a while until I relapsed at 22."



"They were able to cut out the tumor but weren't successful in getting clean margins on the first pass,"

"I had an aggressive cancer in my left lung that spread to my lymph nodes quickly."

Leveraging Large Language Models to Extract Cancer Patient Experiences

THEMES

HEALTHCARE
VALUES

PATIENT
CONCERNS

PATIENT
PREFERENCES



PROMPT ENGINEERING

01.
GENERIC PROMPT

02.
GIVE CONTEXT

03.
SPECIFY FORMAT

OUTPUT

04.
OUTPUT
CONSTRAINTS

01. GENERIC PROMPT

PROMPT	RESPONSE	VALUES
<p>Identify the values expressed in the cancer narrative through the lens of value-based healthcare principles.</p> <p>Narrative: " "</p>	<p>The values expressed in the cancer narrative through the lens of value-based healthcare principles include:</p> <ol style="list-style-type: none">1. Empathy and Compassion: The narrative highlights the importance of empathy and compassion in healthcare interactions, particularly between the patient and their loved ones. The mother's calm and supportive response to the diagnosis demonstrates empathy and compassion, contributing to the patient's emotional well-being.2. Patient-Centered Care: The focus on the patient's emotional experience and well-being reflects the principle of patient-centered care. The patient's feelings and concerns are central to the narrative, emphasizing the importance of addressing not only the physical aspects of illness but also the emotional and psychological needs of the patient.3. Supportive Relationships: The narrative underscores the significance of supportive relationships, both within the family and broader social networks. The patient's relationship with their mother serves as a source of emotional support and comfort during a challenging time, highlighting the value of supportive relationships in healthcare.4. Communication and Trust: Effective communication between the patient and their loved ones, characterized by honesty and trust, is evident in the narrative. The patient's decision to share their diagnosis with their mother in a compassionate and supportive manner fosters trust and open communication, which are essential components of value-based healthcare. <p>Overall, the narrative reflects the core values of empathy, patient-centered care, supportive relationships, and effective communication, all of which are</p>	<ol style="list-style-type: none">1. Empathy and Compassion2. Patient-Centered Care3. Supportive Relationships4. Communication and Trust

02. GIVE CONTEXT

PROMPT	RESPONSE	VALUES
<p>Value in healthcare is the measured improvement in a patient's health outcomes for the cost of achieving that improvement. The goal of value-based care transformation is to enable the health care system to create more value for patients. By focusing on the outcomes that matter most to patients, value aligns care with how patients experience their health. Value-based health care is about putting the patient at the center, with clinicians competing to produce the best outcomes for patients. Just like any other industry, health care exists to meet the needs of its customers—that is, patients. From a patients perspective they include meaningful inclusion in the treatment, prolonged life, resuming everyday activity, functional and psychosocial outcomes.</p> <p>Identify the values expressed in the cancer narrative through the lens of value-based healthcare principles.</p> <p>Narrative: " "</p>	<p>In the cancer narrative, the following values are expressed through the lens of value-based healthcare principles:</p> <ol style="list-style-type: none">1. **Patient-Centered Care**: The narrative emphasizes the importance of patient-centered care by highlighting the patient's experience and emotional well-being as central to the healthcare interaction. The patient's concerns about how their diagnosis will affect their mother demonstrate a focus on addressing the patient's needs and preferences.2. **Meaningful Inclusion in Treatment Decisions**: The patient's decision to involve their mother in the diagnosis conversation reflects the value of meaningful inclusion in treatment decisions. By actively involving their loved one in the discussion, the patient acknowledges the importance of their family's support and input in the treatment process.3. **Psychosocial Outcomes**: The emotional support provided by the patient's mother, as well as the patient's expression of gratitude for her presence, highlight the significance of psychosocial outcomes in healthcare. The patient's emotional response and the therapeutic effect of their mother's support contribute to the overall well-being of the patient, beyond purely medical outcomes.4. **Resuming Everyday Activity**: The patient's desire to maintain normalcy and continue everyday activities, such as welcoming their mother with a smile and making coffee, underscores the importance of resuming everyday activity as a value in healthcare. Despite the diagnosis, the patient strives to maintain a sense of normalcy and routine, which can contribute to their overall quality of life.	<ol style="list-style-type: none">1. Patient-Centered Care2. Meaningful Inclusion in Treatment3. Psychosocial Outcomes4. Resuming Everyday Activity5. Compassionate Communication

03. SPECIFY FORMAT

PROMPT	RESPONSE	VALUES
<p>Value in health care is the measured improvement in a patient's health outcomes for the cost of achieving that improvement. The goal of value-based care transformation is to enable the health care system to create more value for patients. By focusing on the outcomes that matter most to patients, value aligns care with how patients experience their health. Value-based health care is about putting the patient at the center, with clinicians competing to produce the best outcomes for patients. Just like any other industry, health care exists to meet the needs of its customers—that is, patients. From a patients perspective they include meaningful inclusion in the treatment, prolonged life, resuming everyday activity, functional and psychosocial outcomes.</p> <p>Identify themes in the cancer narrative.</p> <p>Identify the values expressed in the cancer narrative through the lens of value-based healthcare principles.</p> <p>Narrative: " "</p> <p>Return the results as a list of identified value categories.</p> <p>Values:</p>	<p>Values:</p> <ul style="list-style-type: none">1. Patient-Centered Care2. Meaningful Inclusion in Treatment3. Psychosocial Outcomes4. Resuming Everyday Activity5. Compassionate Communication	<ul style="list-style-type: none">1. Patient-Centered Care2. Meaningful Inclusion in Treatment3. Psychosocial Outcomes4. Resuming Everyday Activity5. Compassionate Communication

04. OUTPUT CONSTRAINTS

PROMPT	RESPONSE	VALUES
<p>Value in health care is the measured improvement in a patient's health outcomes for the cost of achieving that improvement. The goal of value-based care transformation is to enable the health care system to create more value for patients. By focusing on the outcomes that matter most to patients, value aligns care with how patients experience their health. Value-based health care is about putting the patient at the center, with clinicians competing to produce the best outcomes for patients. Just like any other industry, health care exists to meet the needs of its customers—that is, patients. From a patients perspective they include meaningful inclusion in the treatment, prolonged life, resuming everyday activity, functional and psychosocial outcomes.</p> <p>Identify the values expressed in the cancer narrative through the lens of value-based healthcare principles.</p> <p>Narrative: ""</p> <p>Return the results as a JSON object in the following format:</p> <p>Label: value category</p> <p>Evidence: [a comma separated list of supporting sentences from the narrative]</p> <p>Values:</p>	<pre>{ "Values": [{ "Label": "Patient-Centered Care", "Evidence": ["I couldn't tell my mum over the phone so I was waiting for last night when she was due over.", "Rather than the expected shock and tears, she calmly listened, explaining that she already suspected what it was, and told me everything would be fine."] }, { "Label": "Compassionate Communication", "Evidence": ["When she arrived last night, I welcomed her with a smile, made a coffee and we chatted for a bit when she asked about my tests.", "I couldn't stop crying and she hugged me for ages."] }] }</pre>	<p>1. Patient-Centered Care 2. Compassionate Communication</p>

NAMED ENTITY RECOGNITION

I am a 20 year old AGE guy that just got done with immunotherapy TREATMENT for stage 3 STAGE melanoma. CANCER_TYPE I'm more or less fine now but dealing with cancer DISEASE has caused me a lot more problems mentally than physically. Even as a little kid I would be absolutely terrified EMOTION ANALYSIS of dying which is probably very common. I used to wake up having constant nightmares EMOTION ANALYSIS of dying and they have stuck with me through life. I used to comfort myself EMOTION ANALYSIS saying that when I was a lot older I would have made peace EMOTION ANALYSIS with it and more or less accepted it. EMOTION ANALYSIS But during the heat of my cancer DISEASE experience I had to get a MRI INVESTIGATIONS on my head PART_OF_BODY since a decently sized SIZE melanoma CANCER_TYPE was found in my lymph node. PART_OF_BODY I had made the mistake of looking up what it meant if the melanoma CANCER_TYPE had reached my brain PART_OF_BODY and I totally broke down. EMOTION ANALYSIS I'm pretty healthy now but the idea of dying young became really real to me. My mental has totally gone downhill and I have no idea

My mom was diagnosed with Stage 4 STAGE Metastasized Lung Cancer CANCER_TYPE at age 55. AGE It was bad. She had tumors INVESTIGATIONS in her spine PART_OF_BODY , lungs PART_OF_BODY , and pancreas PART_OF_BODY , and who knows where else. After lots of surgery TREATMENT and chemo TREATMENT , the doctors PEOPLE found that there was nothing they could do , her cancer DISEASE was not going away. However , they told her about a clinical trial TREATMENT that had some promising results for Lung Cancer CANCER_TYPE patients , and she immediately signed up. What did we have to lose ?



Deploy ⋮

Extracting LENS Entities

Choose a file to work with

Select file... ▾

Show original text

NoInputText: No input text to analyse...

How do you want to input your text?

Use an example file

Paste copied text

Upload data file

Mappings

Lens

Snomed CT

MedCAT



TIME FOR Q & A