HARNESSING AI FOR QUALITATIVE DATA ANALYSIS

Ethel Karskens, 19/09/2024

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WHAT YOU'LL LEARN TODAY 🎯

- 👉 The basics of how **NLP** (Natural Language Processing) fits into the picture of qualitative analysis
- 👉 The **3 critical elements** for successful AI-driven qualitative analysis
- 👉 How to **practically apply** this knowledge using tools like APIs, benchmarking models, and ensuring data quality

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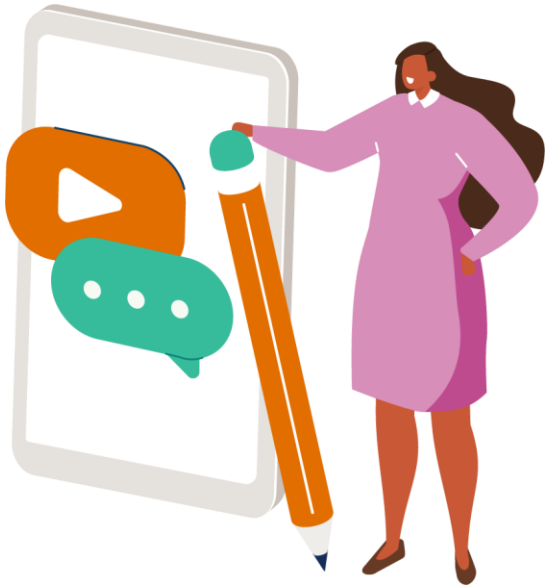
WHAT IS QUALITATIVE ANALYSIS 📜



- 👉 All about interpreting **non-numerical data**—things like interview transcripts, open-ended survey responses, reports, or focus group discussions.
- 👉 It’s a method for **finding patterns**, themes, or insights that numbers alone can’t reveal.

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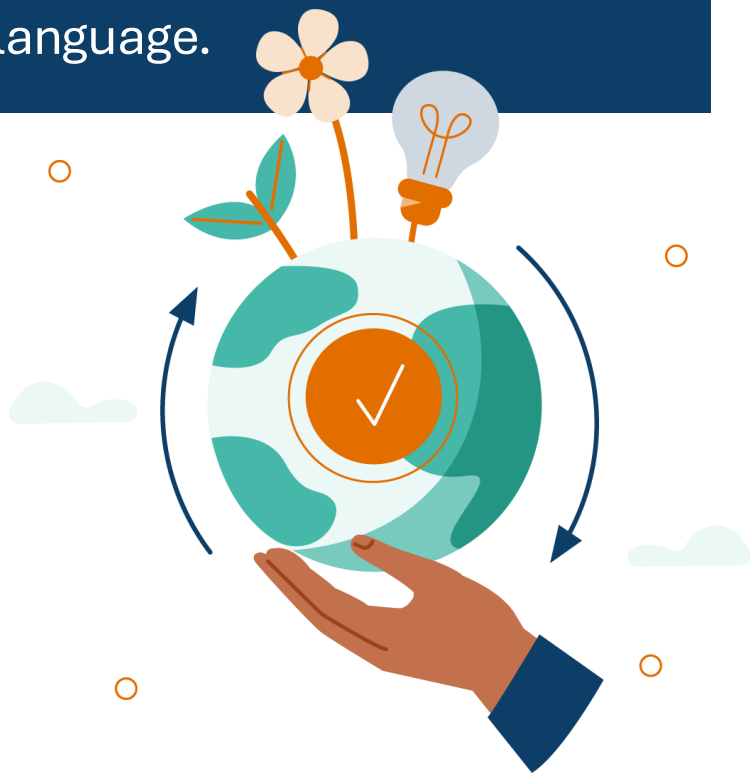
WHAT IS NLP?

Natural Language Processing is a branch of AI that helps machines understand, interpret, and generate human language.



Several NLP methods can be used for qualitative analysis, such as:

- **Text Classification**: Labeling text data into categories.
- **Topic Modeling**: Identifying themes or topics within the text. (difference with classification?)
- **Sentiment Analysis**: Determining the emotional tone behind the data.
- **Summarisation**: Condensing large volumes of text into concise summaries.

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THE POTATO CHIPS CASE 

"There are no chips left. Everyone ate the chips while I was walking the dog. I'm frustrated that there are no chips left—you could have waited for me."

- **Topic modeling**: Chips(, dog)
- **Sentiment analysis**: **- 0.5**
- **Summarisation**: There are no chips left for Ethel.

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THE POTATO CHIPS CASE II 🥔

"Oh great, there are no chips anymore. Thanks, mate."

- **Topic modeling**: Chips
- **Sentiment analysis**: **0.6**
- **Summarisation**: Ethel is happy there are no chips anymore.

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CHALLENGES OF QUALITATIVE ANALYSIS WITH NLP

(WITH OR WITHOUT GenAI)

- 👉 Lack of nuances in the language
- 👉 Subjectivity
- 👉 Missing more complex interpretation of topics or sentiments

So, what can be done? 🤓

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THREE KEY ELEMENTS FOR SUCCESSFUL AI-POWERED QUALITATIVE ANALYSIS

The Technology

The Model

The User

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THE TECHNOLOGY

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THE TECHNOLOGY

Choosing an Application Programming Interface (API) over a Graphical User Interface (GUI)

Iterations

Transparency

Precision

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DEMO

Interview Transcript: The Potato Chips Case

Evaluator: Hi Ethel, thanks for sitting down with me today. I understand there's been some... difficulty with getting to the potato chips before everyone else eats them?

Ethel: [*laughs*] Oh, yeah. It's become a bit of a running joke in my house, but honestly, it's getting frustrating. The chips always seem to disappear before I even get a chance. I mean, I love chips—who doesn't—but it's like I'm always at the wrong place at the wrong time.

Evaluator: That does sound frustrating. Can you tell me more about what usually happens?

DEMO

1. Summary

In this interview, Ethel shares her frustration over consistently missing out on potato chips during family gatherings. She explains that while there might technically be enough chips, they are always gone before she gets to them. Ethel is often busy with tasks like walking the dog or helping set up for the gathering when the chips are put out, leaving her at a disadvantage. She expresses disappointment that her family doesn't wait for her or save her any chips, despite her requests. Even when she tries to get ahead by sneaking a handful early, the chips still disappear quickly. Ethel feels overlooked and unconsidered, as her efforts to contribute seem to go unnoticed. While she suggests buying more chips, her family dismisses this idea, leaving her feeling frustrated. Ethel believes that more chips or greater consideration from her family would help solve the issue.

DEMO

```
from openai import OpenAI
```

```
# my needs

summary = "Provide a 150-words summary of the following transcript: "
question_1 = "Is there enough potato chips for Ethel?"
question_2 = "What are the key challenges for Ethel to get to the potato chips?"
```

DEMO

```python
# my summary function

def analysis_summary(transcript):

    chat_response = client.chat.completions.create(
          model="gpt-4o",
          messages=[
            {"role": "system", "content": "You are a helpful AI assistant."},
            {"role": "user", "content": summary + transcript}
          ],
        max_tokens=150,
        temperature=0.8,
        top_p=0.9,
        n=2,
        stop=["\n"],
        presence_penalty=0.6,
        frequency_penalty=0.2
        )
    return(chat_response.choices[0].message.content)
```

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THE MODEL

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THE MODEL

Choosing the right model will affect both:

👉 the **quality** of the analysis and

👉 **cost**—both financial and environmental.

Quality

Cost

Resources

BENCHMARKING

Examples of NLP-related benchmarks:

GLUE (General Language Understanding Evaluation) or

SQuAD (Stanford Question Answering Dataset)

Standard Benchmarks	Average	Multilingual	Tool Use	Math	Reasoning	Code	General
Claude 3.5 Sonnet	**82.10%**	**91.60%**	**90.20%**	71.10%	**59.40%**	**92.00%**	**88.30%**
GPT-4o	**80.53%**	**90.50%**	83.59%	**76.60%**	**53.60%**	**90.20%**	**88.70%**
Meta Llama 3.1 405b	**80.43%**	**91.60%**	**88.50%**	**73.80%**	**51.10%**	**89.00%**	**88.60%**
GPT-T Latest	78.12%	88.50%	86.00%	**72.60%**	48%	87.10%	86.50%
Claude 3 Opus	76.70%	**90.70%**	**88.40%**	60.10%	50.40%	84.90%	85.70%
OpenAI GPT-4	75.52%	85.90%	**88.30%**	64.50%	41.40%	86.60%	86.40%
Meta Llama 3.1 70b	75.48%	86.90%	84.80%	68%	46.70%	80.50%	86%

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OpenAI vs Anthropic

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GPT-4o (OpenAI) vs Claude 3.5 Sonnet (Anthropic)

Types of cost	GPT-4o (OpenAI)	Claude 3.5 Sonnet (Anthropic)
Financial	GPT-4o is priced at **$5 per million** tokens for input and $15 per 1 million tokens for output.	priced at **$3 per million** input tokens and $15 per million output tokens
Environmental	Larger environmental cost due to its massive size, training energy, and per-query energy consumption. The energy required to maintain and run GPT-4 results in a **higher carbon footprint** compared to smaller models.	Lower environmental impact due to being smaller and more optimized for efficiency. It consumes less energy per query and likely has a **smaller carbon footprint**, making it more environmentally sustainable in day-to-day usage.

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DEMO

```
response = client.messages.create(
    model="claude-3-5-sonnet-20240620",
    max_tokens=1024,
    messages=[{"role": "user", "content": summary + potato_transcript}]
)
```

This transcript presents a conversation between an evaluator and Ethel, who is frustrated about consistently missing out on potato chips during family gatherings. Ethel explains that she's often occupied with tasks like walking the dog or helping with preparations when chips are served, resulting in them being consumed before she can partake. Despite her attempts to ask family members to save her some, they often fail to do so, treating it as a joke. Ethel feels left out and unappreciated, especially since she's often contributing to family activities. She's tried various strategies to secure her share, including suggesting buying more chips, but faces resistance from her parents. The evaluator and Ethel discuss potential solutions, such as increasing the quantity of chips available, implementing a more structured sharing system, or encouraging family members to be more considerate of Ethel's contributions and desires.

THE USER 

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THE USER

Learning with the AI: **your responsibility!**

Context

Quality Data

Privacy/ethical data

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PROVIDING CONTEXT

Help the AI understand the context:

- Background information
- What role should the AI play in answering it
- Examples of how we want the answers

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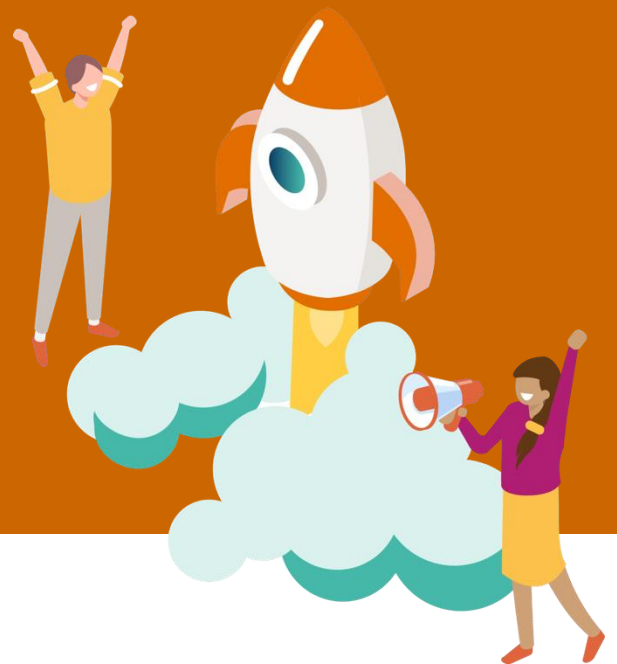
PREPARING YOUR DATA



👉 **Cleaning**

- If transcript, checking for wrong interpretations
- Formatting (weird symbols, etc.)

👉 **Structuring**

- If needed, structuring per question or theme to add more context

👉 **Anonymising**

- Replacing personal information

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PREPARING YOUR DATA

Evaluator: You mentioned you're often doing things when the chips are put out, like walking Jojo. Do you think those activities are a factor in why you miss out?

Ethel: Yeah, but it's not like I'm doing anything unusual. I'll be walking Jojo, which needs to be done. Or sometimes, I'll be setting up for the movie or getting drinks for everyone. The thing is, by the time I'm done with all that, everyone's already demolished the chips. It's like, no one thinks, "Hey, maybe we should wait for Ethel," or "Maybe we should save her a bit."

Evaluator: That seems unfair. Do you ever try to plan ahead or maybe ask them to save you some?

Ethel: Oh, I've tried! [laughs] I'll say, "Hey, don't eat all the chips before I get back!" But you know how it is—they say, "Yeah, sure!" and then *poof*, chips gone. Or they'll leave me the crumbs at the bottom of the bowl, which is basically like salt and regret.

PREPARING YOUR DATA

Questions	Answers
Do you think those activities are a factor in why you miss out?	Yeah, but it's not like I'm doing anything unusual. I'll be walking [placeholder 1], which needs to be done. Or sometimes, I'll be setting up for the movie or getting drinks for everyone. The thing is, by the time I'm done with all that, everyone's already demolished the chips. It's like, no one thinks, "Hey, maybe we should wait for Ethel," or "Maybe we should save her a bit."
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CONCLUSION

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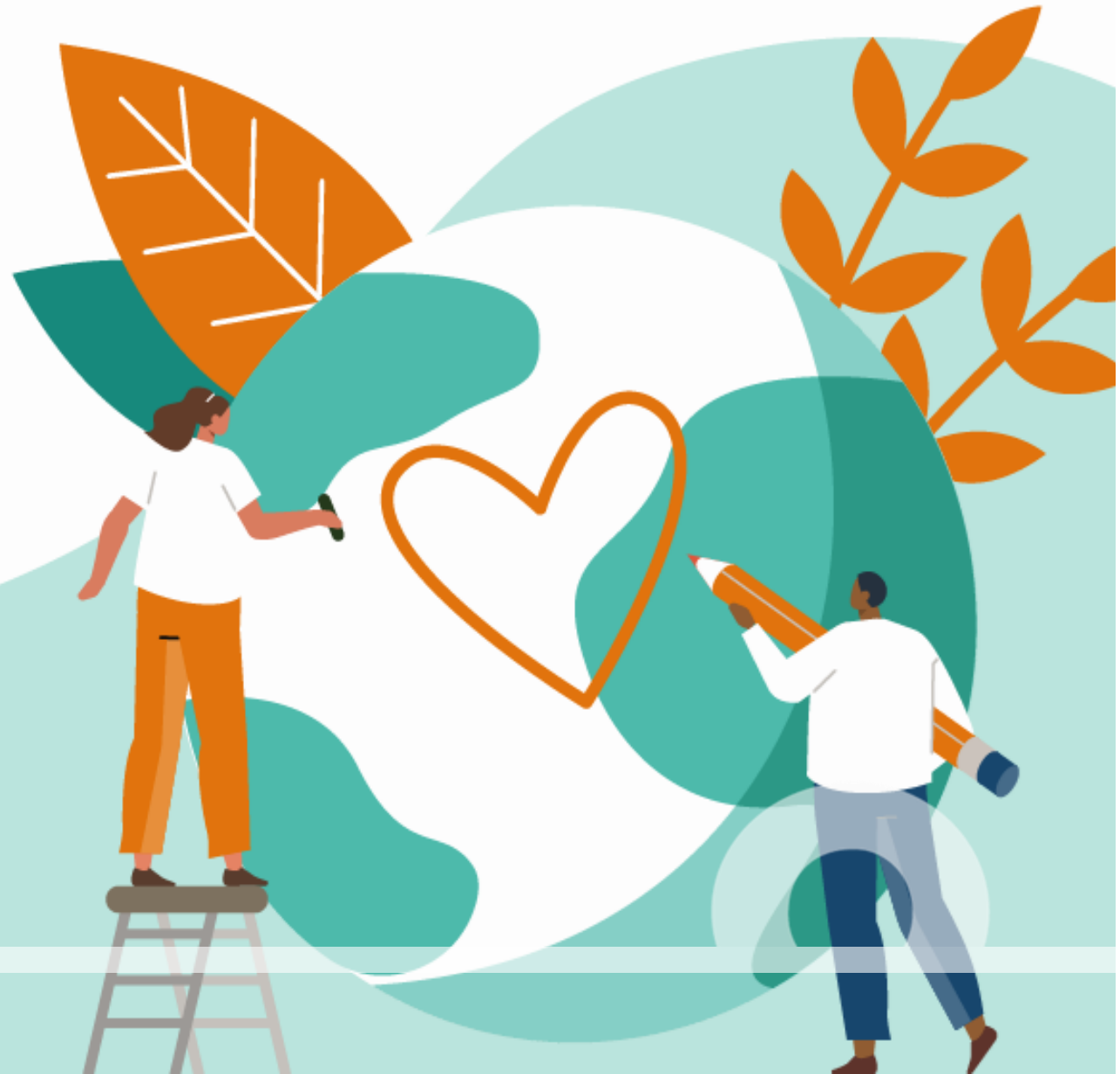
“The real voyage of discovery…consists not in seeking new landscapes but in having new eyes.”

 Marcel Proust



Q&A

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