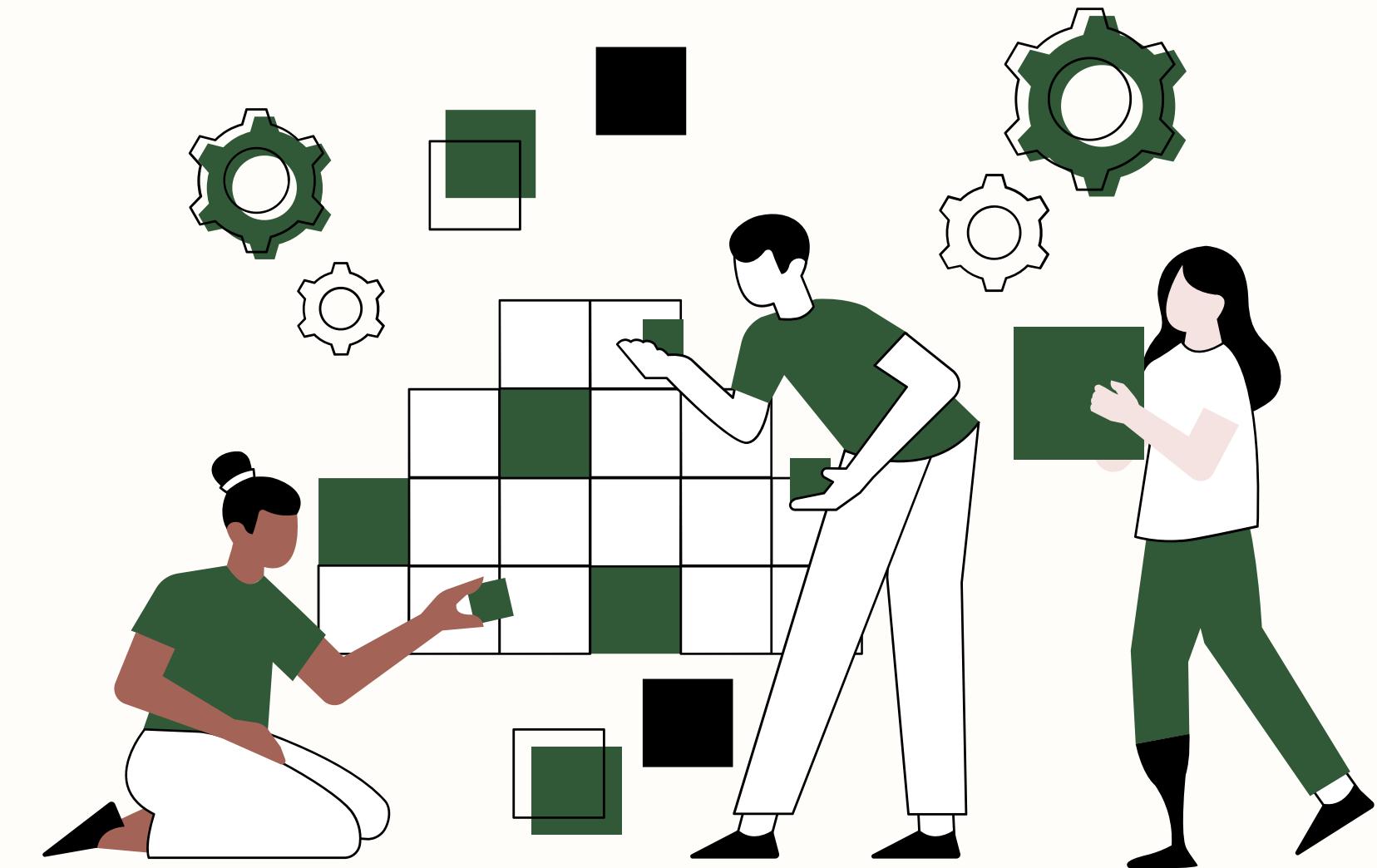


AI-Powered Knowledge Engine for Smart Support & Ticket Resolution

Assignment - 2

1. Real-Time Recommendation
2. Content Gap Detection

Group 2 -
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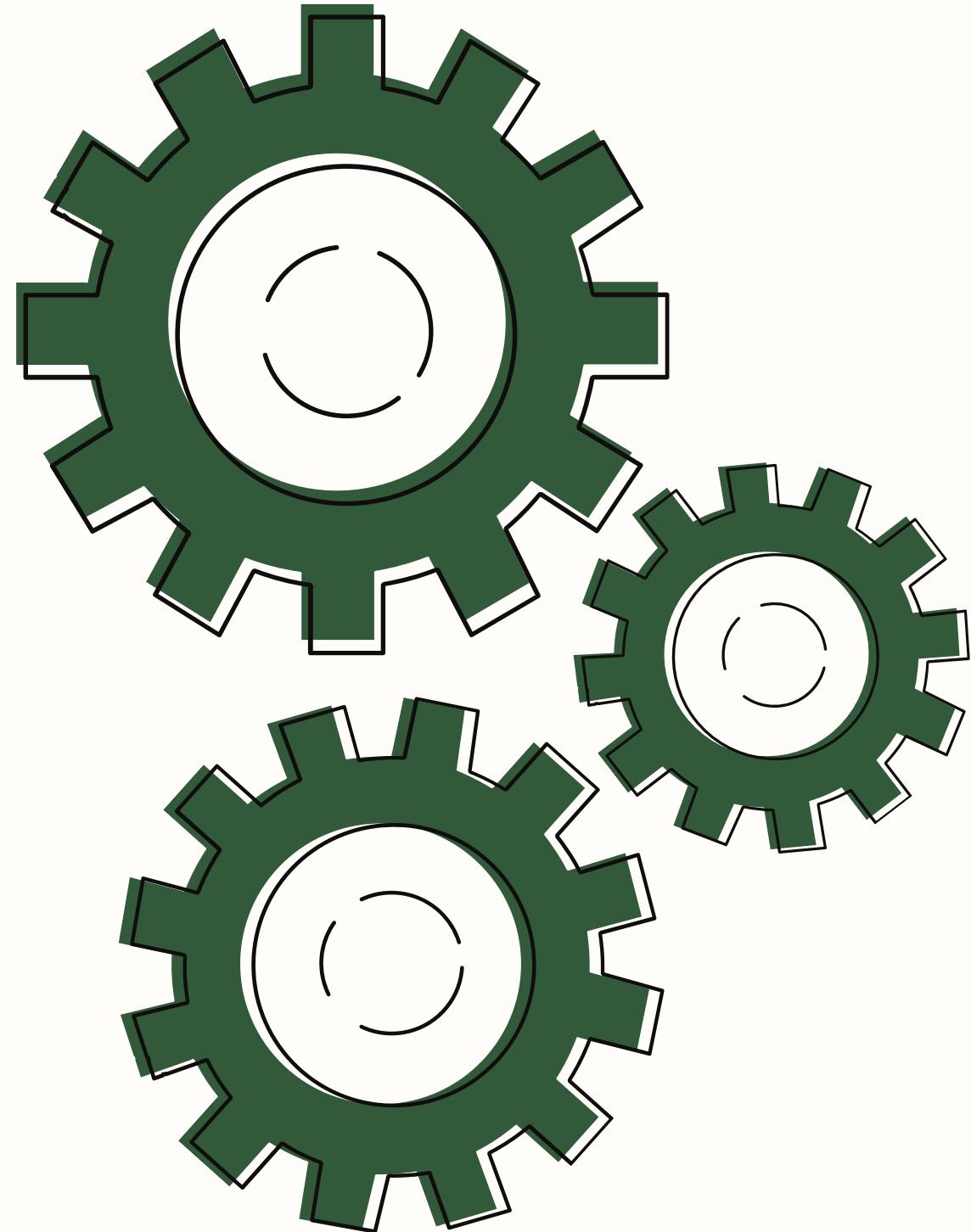
Objective

Goal of Assignment 2:

- To enhance the AI-powered Knowledge Engine by implementing:
- Real-Time Article Recommendation System
- Content Gap Detection & Improvement Module

Purpose:

- To help customer support teams respond faster and improve their knowledge base quality.



Why This Dataset?

Dataset Used: Tobi-Bueck/customer-support-tickets (Hugging Face)

Key Features:

- body: Customer support queries
- answer: Resolved responses from support team
- priority, language: Metadata for analysis

Note:

The ‘answer’ column already contains resolved ticket information , so we used it as our knowledge base.

Real-Time Recommendation Engine

Goal:

To recommend the most relevant solutions for new tickets in real time.

Steps Implemented:

1. Generated embeddings for both ticket body and answer using Sentence Transformers (MiniLM-L6-v2)
2. Stored all answer embeddings in FAISS (vector database)
3. When a new query arrives:
 - Compute its embedding
 - Compare with all stored answers
 - Return top-3 most similar answers

Result:

Instant recommendation of relevant solutions to support agents.

Content Gap Detection Module

Goal:

Identify missing or underrepresented topics in the knowledge base.

Steps Implemented:

1. Tracked most frequently recommended answers
2. Used BERTopic to detect main ticket themes
3. Visualized results using Plotly bar charts

Insight:

- Frequently used articles = high coverage topics
- Rarely used articles = potential content gaps



Tools & Technologies Used

- Sentence Transformers → Embedding generation
- FAISS → Fast similarity search
- Plotly → Visualization
- BERTopic → Topic modeling & clustering
- Pandas, NumPy, scikit-learn → Data handling & analysis



Visualization / Results

Query: My payment failed and I need a refund immediately

	body	answer	similarity
44127	I recently encountered a problem with a failed... Dear <name>, I apologize for the payment failu...		0.658
44427	I recently ran into an unanticipated payment p... Hello <name>, we are sorry to hear that you ar...		0.699
33915	Recently, I faced an unexpected payment proces... Dear <name>, I regret to learn that you are fa...		0.744

```
# Visualize most frequently used answers
fig = px.bar(usage.head(10), x="answer", y="count", title="Most Recommended Articles")
fig.show()
```



Visualization / Results

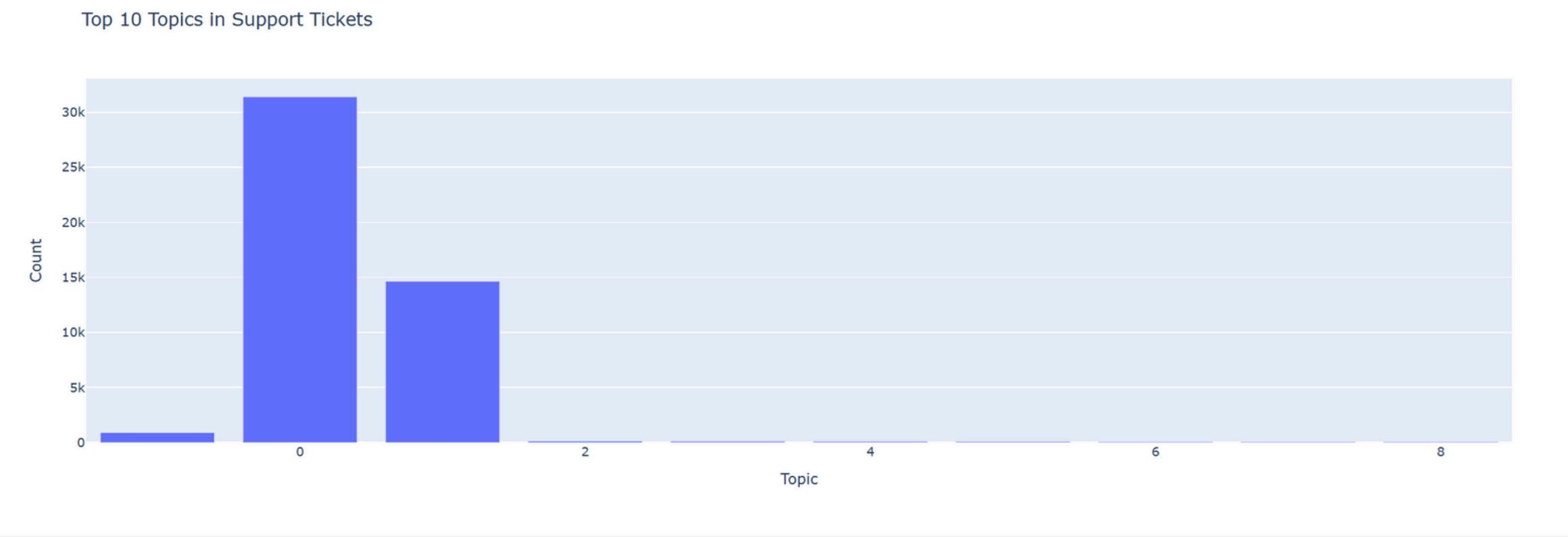
```
topic_freq.head(10)

→ Detecting topics in ticket bodies... (safe single-core mode)
✓ Detected 43 topics successfully!

  Topic  Count
  1      0  31408
  0      1  14650
  7     -1   898
  8      2   128
  15     3   110
  4      4   101
  13     5    95
  33     6    80
  9      7    78
  12     8    76
```

Visualize Topic Coverage

Visualization / Results



Evaluation Metrics:

Average Recommendation Time: 0.022 seconds
Total Knowledge Base Articles: 48574

SUMMARY:
Total Tickets Processed: 48574
Topics Identified: 43
Top Recommended Answers:

	answer	count
0	Wir haben Ihre E-Mail über die Datenverletzung...	2
1	Acknowledged receipt of your email concerning ...	2
2	We have received an email regarding the handli...	2
3	To integrate Elasticsearch 7.13 into a SaaS pr...	2
4	Fehler gründlich untersuchen	2



Thank you!