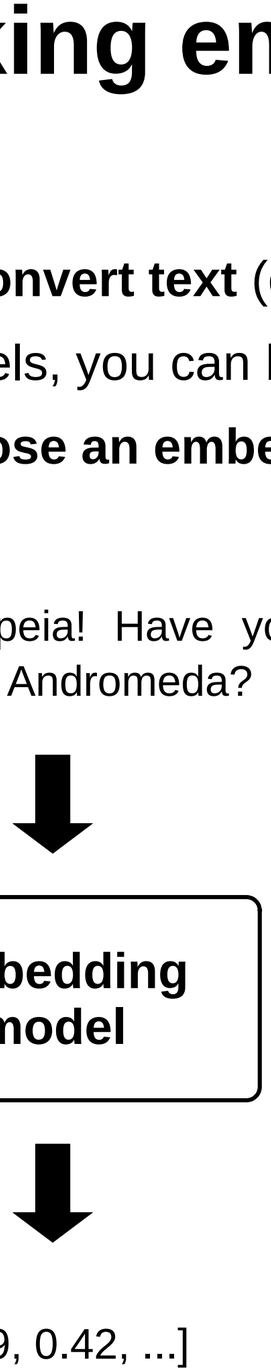
Benchmarking embedding models

Introduction

Benchmarking embedding models

- Embedding models **convert text** (or other modalities) **to a dense vector**.
- With embedding models, you can **build RAG and recommendation systems**.
- But **how do you choose an embedding model**?

Hi Cassiopeia! Have you talked with Andromeda?



[0.69, 0.42, ...]

Benchmarking embedding models

- How do you choose an embedding model?
- You look at **benchmarks**!
- MTEB ranks models based on their performance on **different benchmarks**.

Rank (Bor…	Model	Zero-shot	Memory U…	Number of P…	Embedding D…	Max Tokens	Mean (T…	Mean (TaskT…	Bitext …	Classification	Clustering
1	gemini-embedding-001	99%	Unknown	Unknown	3072	2048	68.37	59.59	79.28	71.82	54.59
2	Qwen3-Embedding-8B	99%	28866	7B	4096	32768	**70.58**	**61.69**	**80.89**	**74.00**	**57.65**
3	Qwen3-Embedding-4B	99%	15341	4B	2560	32768	69.45	60.86	79.36	72.33	57.15
4	Qwen3-Embedding-0.6B	99%	2272	595M	1024	32768	64.34	56.01	72.23	66.83	52.33
5	gte-Qwen2-7B-instruct	⚠ NA	29040	7B	3584	32768	62.51	55.93	73.92	61.55	52.77
6	Linq-Embed-Mistral	99%	13563	7B	4096	32768	61.47	54.14	70.34	62.24	50.60
7	multilingual-e5-large-instruct	99%	1068	560M	1024	514	63.22	55.08	80.13	64.94	50.75
8	embeddinggemma-300m	99%	578	307M	768	2048	61.15	54.31	64.40	60.90	51.17
9	SFR-Embedding-Mistral	96%	13563	7B	4096	32768	60.90	53.92	70.00	60.02	51.84
10	GritLM-7B	99%	13813	7B	4096	32768	60.92	53.74	70.53	61.83	49.75
11	text-multilingual-embedding-002	99%	Unknown	Unknown	768	2048	62.16	54.25	70.73	64.64	47.84

The MTEB leaderboard on 20/09/2025.

Benchmarking embedding models

- Should we **trust** these public benchmarks?
- You can also create **your own benchmark** with your private data.
- The dataset must be **clean, diverse, and in your language** (or multilingual).

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Benchmarking embedding models

In this course, you will:

- Create a **golden dataset**.
- Run **open source** and **proprietary models**.
- Compute **metrics** to grade the models.
- Perform **statistical tests** to prove if a model is better than another.
- **Automate** some steps in the pipeline.
- **Generate tables** to compare the models.

#	Model	mrr	recall@1	recall@5	ndcg@5
a	OpenAI 3-Small	0.780	0.683	0.901	0.804
b	OpenAI 3-Large	0.778	0.681	0.901	0.802
c	Google Gemini-001	0.810 ab	0.725 b	0.927 ab	0.834 ab

Comparing Gemini embedding to OpenAI's embedding models.