



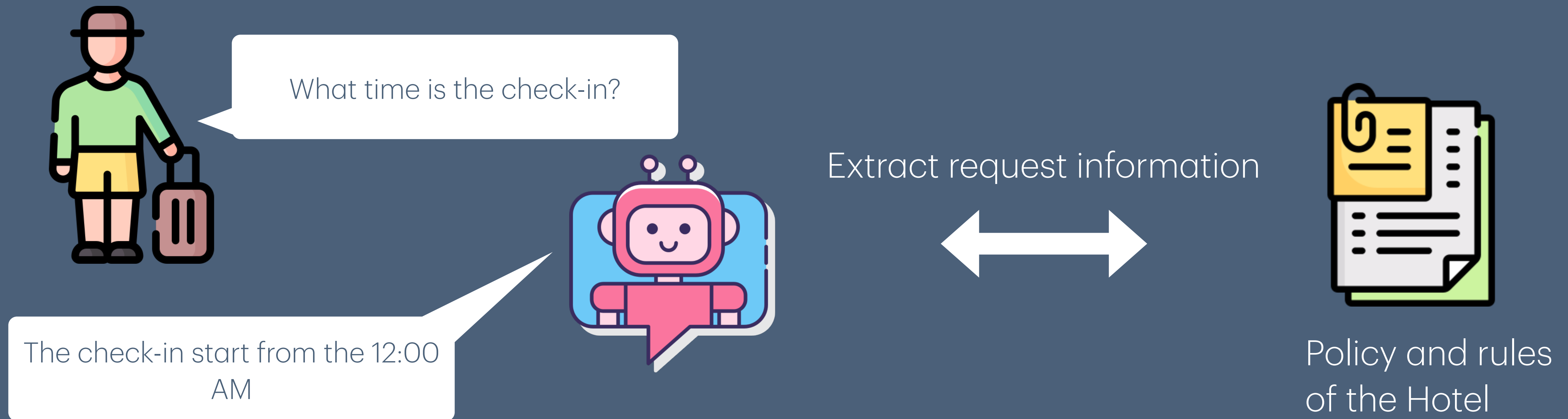
BERT-based questions answering on close domains: Preliminary Report

Authors: Stefano Bistarelli and Marco Cuccarini

Question-Answering on close domain

The user requests some information present in a document:

Case of study->Policy and rules of the hotel



State of the art: LLM



Considering the text: "The Hotel must respond in a timely manner to any accommodation booking request in compliance with...." Can you tell me at what time the check-in is?

The check-in is at
12:00 AM



LLM limitations:

- A. Time and energy consumption
- B. If the prompts are too long and can cause hallucinations
- C. The answer risks being incomplete or too verbose

LLMs hallucinations



Can I leave my children alone
around the hotel?

????

Yes, of course, no problem.



Pipeline

Policy or document of the hotel



Text splitting

Document's sentences



Question



Choose the sentence that is more semantically similar to the question

The sentence provides as answer to the user



Creation of the dataset



Can you generate 20 questions about this document?



Pipeline: Document splitting

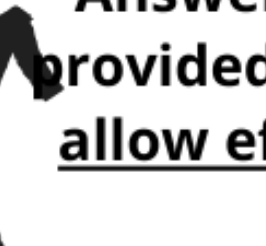
Q: How are the rules and times for the Pool and Fitness Room enforced?

Sentence division

Answer: All rules and times will be enforced to allow efficient operation of the hotel and for the comfort and safety of all guests.

Period division

Answer: Pool and Fitness Room hours and guidelines are provided at check in. All rules and times will be enforced to allow efficient operation of the hotel and for the comfort and safety of all guests.



Pipeline: Sentence similarity

The semantic similarity is performed with some contextual embedding methods

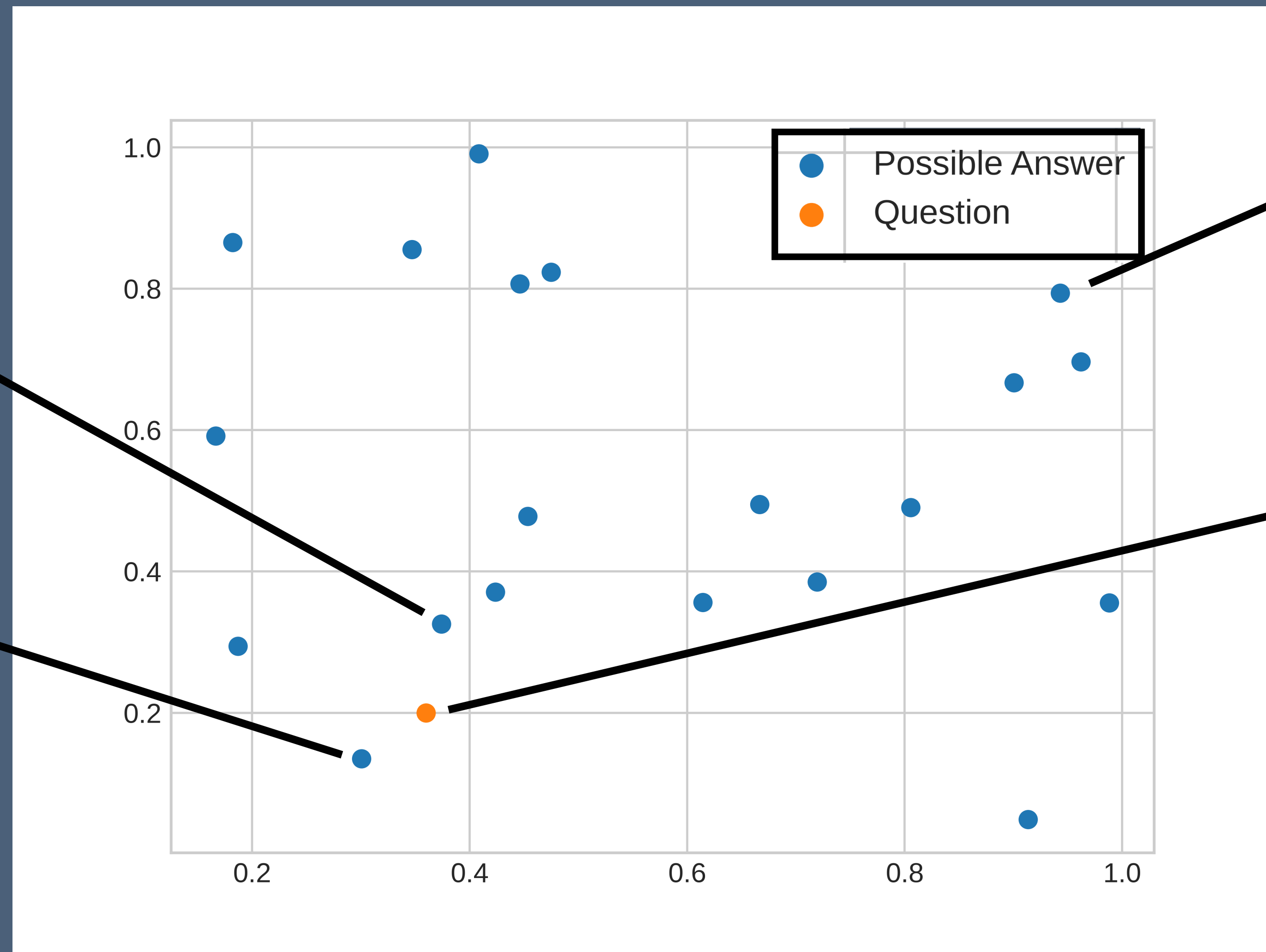
S-BERT model -> a pre-train model for language understanding
It produces a vector that encodes the semantic similarity between two sentences:

More similar are two sentences in terms of meaning; more near will be in terms of spatial position

Pipeline: Sentence similarity

The check-out is before 10:00 AM

The check-in starts at 12:00 AM



The dogs are not allowed in the structure

What time is the check-in?

Pipeline: Distance function

For measuring the distance between two points, there are different solutions:

- A. Euclidean distance: evaluate the spatial distance between two vectors
- B. Cosine distance: evaluate the difference in terms of the angle between the two vectors
- C. Dot product: consider the distance between the two points and the angle of the two vectors

Pipeline: Pre-train model

Pre-train on the semantic similarity between an answer and a question

- A. multi-qa-mpnet-base-dot-v1: optimized on the dot product function, based on BERT, better performance but with more parameters
- B. multi-qa-distilbert-cos-v1: optimise the cosine similarity. Based on DistilBERT, a lighter version of BERT has fewer parameters but the worst performance.

Results: accuracy and time

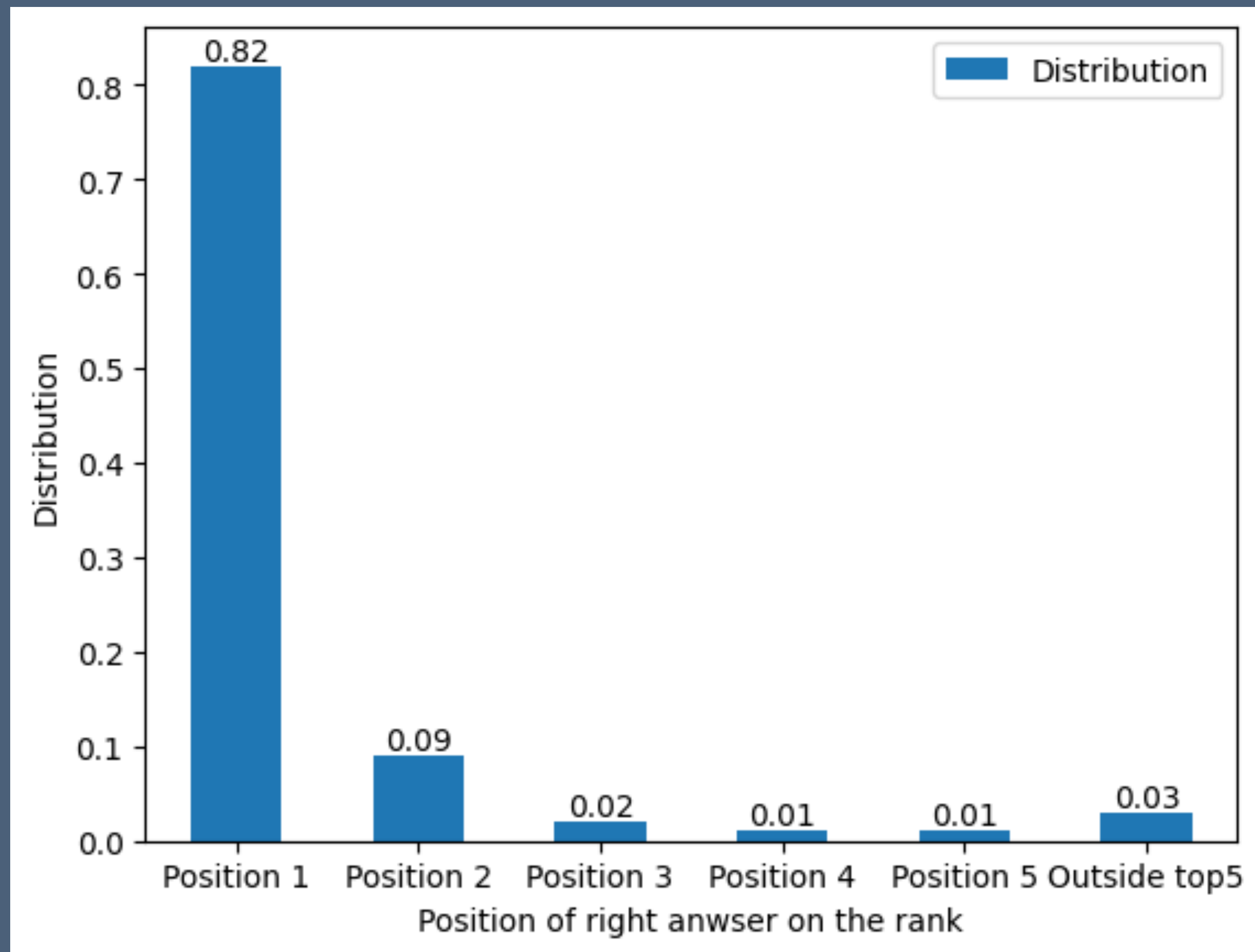
Model	Answer	
ChatBaseBERT	Correct	0.820
	Wrong	0.180
ChatDistilBERT	Correct	0.762
	Wrong	0.237

(b) Accuracy performance

Model	Answer	
Time comparison	OpenAI GPT-3.5	35ms
	Azure GPT-3.5	28ms
	OpenAI GPT-4	94ms
	Anyscale Llama-2-7B	19ms
	Anyscale Llama-2-70B	46ms
	ChatBaseBERT	4ms
	ChatDistilBERT	2ms

(a) Time performance

Results: top 5 answers



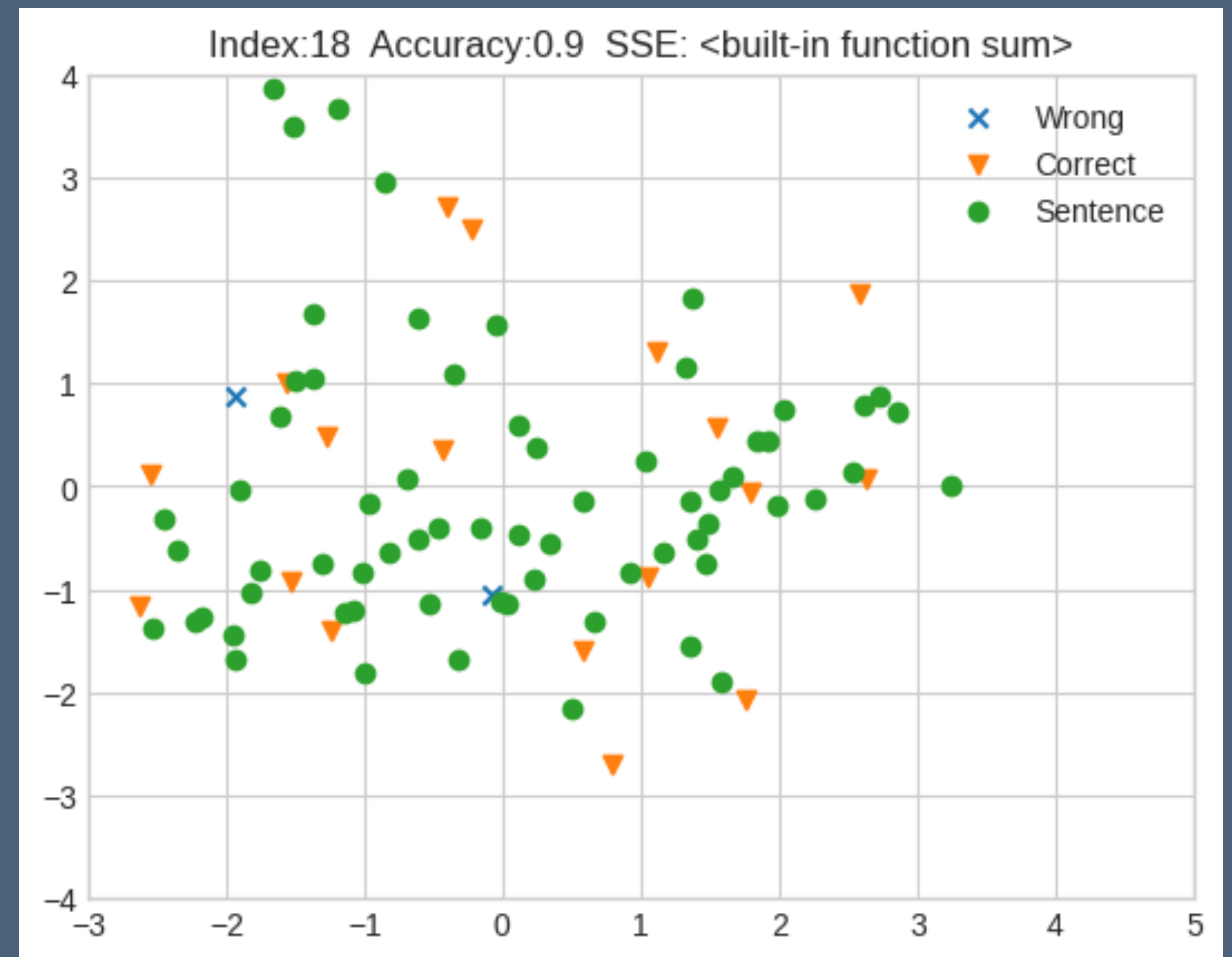
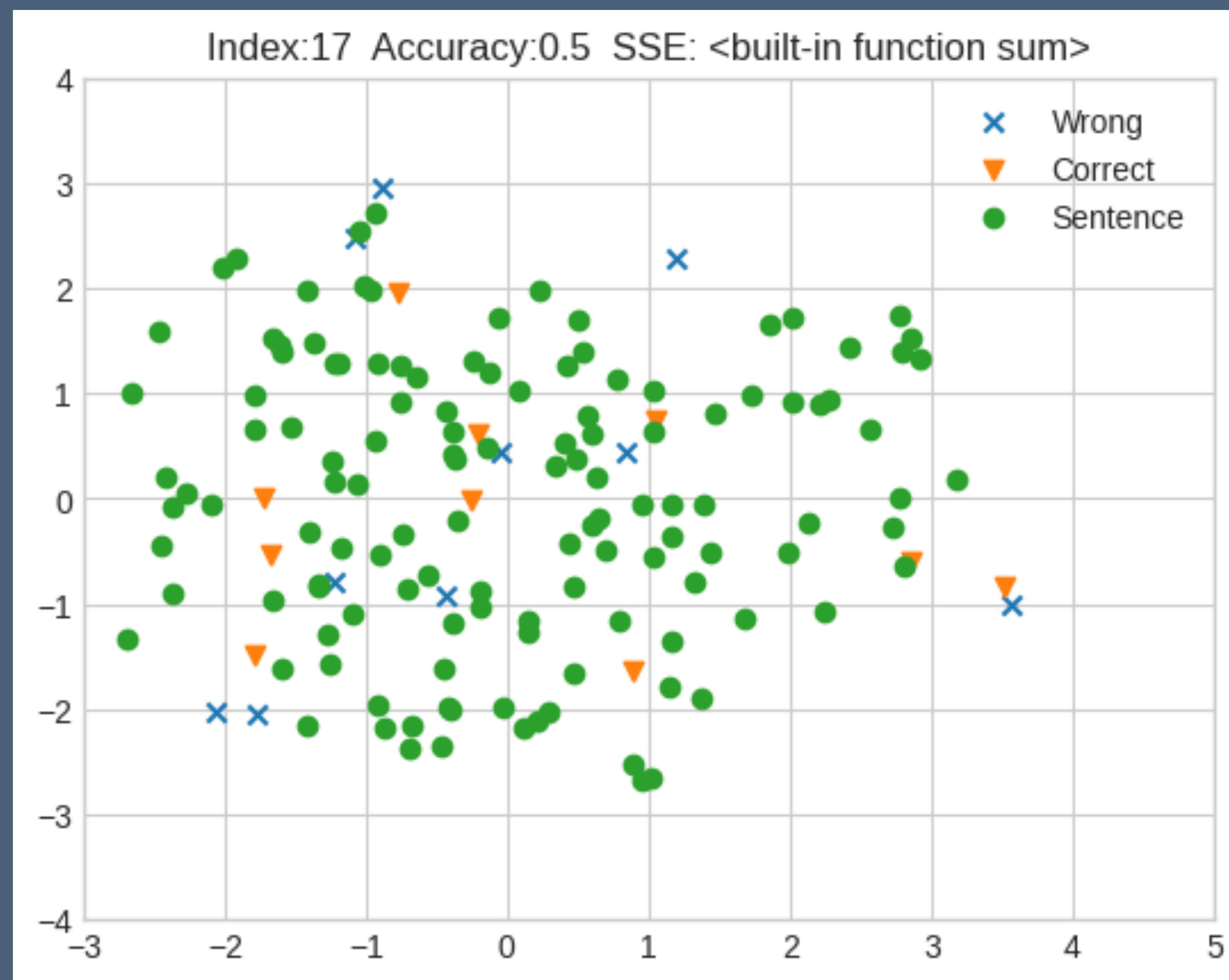
Top 5 answer more the
0.96 of accuracy

Results: risk of hallucinations

Table 4
Hallucination of Chat GPT.

Index	Rule	Text
1	Question	How does the text advise guests to handle their valuables for added security?
	Answer Chat GPT	The text does not specifically advise guests on how to handle their valuables for added security.
2	Answer BERT	Please keep your valuables in the special safes in your rooms.
	Question	Are hotel rooms equipped with audio-visual and audio devices, and what are the restrictions on guests using their own devices in the rooms?
	Answer Chat GPT	Guests must be quiet during night hours (10 p.m. to 7 a.m.).
	Answer BERT	The hotel is entitled to decide to place an audio-visual or an audio device in the conference rooms and public areas, provided that such device will only be used for the guest's/ organizer's personal needs
3	Question	Is there a specific age restriction for leaving children unattended in Hotel, and if so, what is it?
	Answer Chat GPT	The text does not specify a specific age restriction for leaving children unattended.
	Answer BERT	For safety reasons, it is not appropriate to leave children under 10 years of age without adult supervision in the room and other areas of Hotel
	4	Question
	Answer Chat GPT	The guidelines do not provide specific information about how a "Frequent Guest" is defined. You may want to refer to any other sections or documents that might elaborate on this.
	Answer BERT	Frequent Guest – a Guest who uses the Hotel's services on a regular basis

Results: relation between sparseness and performance



Conclusions and future work

BERT outperforms in terms of time all the generative models and avoids any risk of hallucination

Open more possibilities for future works studying the relation between sparseness and performance.

Thanks for the attention

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