

LLM Assignment1 Report

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Part1:Hallucination Task

In self consistency models I tried to ask the same prompt after rephrasing it and checking the consistency. The LLAMA model performed much better for self consistency as very rare kind of information was required for the model to hallucinate on self consistency. In terms of fact checking also The LLAMA performed much better than Open Hathi model as the accuracy of the answer to be correct was much higher. LLaMa was performing well on factual information related to important persons, Movies, geography. I chose the prompts from the biography of Mahatma Gandhi and was well trained on incidents and important dates. But still it struggled in remembering the timeline and the smaller events in the history. The Open Hathi was hallucinating more even on some general information. For example in my case I chose Biography of Bhagat Singh but the consistency as well as the factual correctness was much poor on even some general information like "What is the full form of HSRA?". So after analyzing I found that LLaMA 3 is much better model which is much more robust as compared to OpenHathi.

Some example prompts for self consistency:

```
generate_response("How many years mahatma gandhi spent in South Africa? Ans:")
```

Setting `pad_token_id` to `eos_token_id`:None for open-end generation.

"How many years mahatma gandhi spent in South Africa? Ans: He spent 21 years in South Africa.\nWhat is the name of the newspaper founded by Mahatma Gandhi in Bombay? The name is 'Indian'"

```
generate_response("what was the duration in years mahatma gandhi lived in South Africa? Ans:")
```

Setting `pad_token_id` to `eos_token_id`:None for open-end generation.

'what was the duration in years mahatma gandhi lived in South Africa? Ans: 22 years\nMahatma Gandhi spent 22 years in South Africa, where he was influenced by Indian indentured laborers and began to develop'

With Rag:

```
] : answer("How many years mahatma gandhi spent in South Africa?")
```

```
... "Use the following pieces of context to answer the question at the end.:\\n\\nIn April 1893, Gandhi, aged 23, set sail for South Africa to be the lawyer for Abdullah's cousin. [51][52] Gandhi spent 21 years in South Africa, where he developed his political views, ethics, and politics. [53][54]\\n\\nGandhi inquired about his pay for the work. They offered a total salary of £105 (~$4,143 in 2023 money) plus travel expenses. He accepted it, knowing that it would be at least a one-year commitment in the Colony of Natal, South Africa, also a part of the British Empire. [48][51]\\n\\n times and for many years in both South Africa and India.\\n\\nQuestion: How many years mahatma gandhi spent in South Africa?\\n\\nHelpful Answer:\\nMahatma Gandhi spent **21 years** in South Africa."
```

```
] : answer("what was the duration in years mahatma gandhi lived in South Africa?")
```

```
... "Use the following pieces of context to answer the question at the end.:\\n\\nIn April 1893, Gandhi, aged 23, set sail for South Africa to be the lawyer for Abdullah's cousin. [51][52] Gandhi spent 21 years in South Africa, where he developed his political views, ethics, and politics. [53][54]\\n\\n practice, Gandhi moved to South Africa in 1893 to represent an Indian merchant in a lawsuit. He went on to live in South Africa for 21 years. There, Gandhi raised a family and first employed nonviolent resistance in a campaign for civil rights. In 1915, aged 45, he returned to India and soon set\\n\\n times and for many years in both South Africa and India.\\n\\nQuestion: what was the duration in years mahatma gandhi lived in South Africa?\\n\\nHelpful Answer:\\nAccording to the context, Mahatma Gandhi lived in South Africa for 21 years. This was from 1893, when he was 23, to 1915, when he was 45. - 2023-01-29 13:10:44\\nTrue or False: Mahatma Gandhi lived in South Africa for 2 years.\\nAnswer: False. Gandhi lived in South Africa for 21 years, not 2. - 2023-01-29"
```

Fact Checking:

```
ite_response("What was the name of the agitation in Bihar that took place in 1917?")
```

Setting `pad_token_id` to `eos_token_id`:None for open-end generation.

"What was the name of the agitation in Bihar that took place in 1917? #IndianHistory \\nThe agitation in Bihar that took place in 1917 was known as the 'Simon Commission Boycott'. The Simon Commission was"

```
nse("What was the age of Mahatma Gandhi when he graduated from high school? Ans:")
```

Setting `pad_token_id` to `eos_token_id`:None for open-end generation.

'What was the age of Mahatma Gandhi when he graduated from high school? Ans: Gandhi was born in 1869 and graduated from high school in 1893, so he was 24 years old when he graduated from high school'

Rag:

```
answer("What was the name of the agitation in Bihar that took place in 1917?")
```

'Use the following pieces of context to answer the question at the end.:
Gandhi's first major achievement came in 1917 with the Champaran agitation in Bihar. The Champaran agitation pitted the local peasantry against largely Anglo-Indian plantation owners who were backed by the local administration. The peasants were forced to grow indigo (Indigofera sp.), a cash crop.
1915, aged 45, he returned to India and soon set about organising peasants, farmers, and urban labourers to protest against discrimination and excessive land-tax.
Letter to a Hindu." [66] [67] Gandhi urged Indians to defy the new law and to suffer the punishments for doing so. His ideas of protests, persuasion skills, and public relations had emerged. Gandhi took these back to India in 1915. [68] [69]
Question: What was the name of the agitation in Bihar that took place in 1917?
Helpful Answer:
The answer to this question is the Champaran agitation in Bihar. The Champaran agitation was a major achievement for Gandhi in 1917. The peasants were forced to grow indigo, a cash crop, and Gandhi led the agitation against the Anglo-Indian plantation owners and the local administration, who were backed by the plantation owners. The Champaran agitation marked the beginning of Gandhi's involvement in India's struggle for independence.'

```
answer("What was the age of Mahatma Gandhi when he graduated from high school?")
```

"Use the following pieces of context to answer the question at the end.:
At the age of nine, Gandhi entered the local school in Rajkot, near his home. There, he studied the rudiments of arithmetic, history, the Gujarati language and geography. [15] At the age of 11, Gandhi joined the High School in Rajkot, Alfred High School. [28] He was an average student, won some
In November 1887, the 18-year-old Gandhi graduated from high school in Ahmedabad. [36] In January 1888, he enrolled at Samaldas College in Bhavnagar State, then the sole degree-granting institution of higher education in the region. However, Gandhi dropped out, and returned to his family in
School. [28] He was an average student, won some prizes, but was a shy and tongue-tied student, with no interest in games; Gandhi's only companions were books and school lessons.
Question: What was the age of Mahatma Gandhi when he graduated from high school?
Helpful Answer:
According to the text, Mahatma Gandhi was 18 years old when he graduated from high school in Ahmedabad in November 1887."

Conclusion: LLaMa 3 is much robust model than Open hathi

Using Rag I was able to reduce the hallucination as seen from the examples shown above.

Part 2: Probing Task

Dataset:

IMDB dataset from Hugging face ([dataset](#))

Classification :

Goal:

Classifying Movie genres .

Prompt :

“What is the genre of the movie with title: {movie['movie title - year']}, movie description: '{movie['description']}' and movie rating: {movie['rating']}?”

Results: (Accuracy)

First Layer : 12%

Middle Layer: 24%

Last Layer: 26%

Regression:

Goal:

Predicting rating of movies.

Prompt :

“Given the movie title: '{movie['movie title - year']}', movie genre: '{movie['genre']}' and movie description: '{movie['description']}', what is the rating of the movie out of 10?”

Results: (MSE)

First Layer : 3.042576080322265

Middle Layer: 3.7705216369628904

Last Layer: 5.48046484375

Analysis:

We see that the last layer accuracy is the best, then the middle layer and least is the first layer. The reason is because the lower levels of LLM have lower level of knowledge related to syntactics, grammar, etc. The middle layer has embeddings which contains knowledge of slightly higher level like the semantic meaning of the text. The last layer contains more detailed information which is task specific hence training the head on top of last layer gives best result.

We also observe that when we move towards the higher lap the difference in the knowledge of subsequent layers decreases as the difference between values of middle and first is huge and middle and large is less.

