



# Infosys Responsible AI Toolkit Explainability for LLMs API usage Instructions

## Contents

Introduction	2
Sentiment Analysis	
Uncertainity	3
Graph of Thought	3
Serper Response	Error! Bookmark not defined.
Token Importance	5
LLM Explainability endpoints in Moderation Layer	6
Chain Of Thought	6
Chain Of Thought for RAG	7
Thread Of Thought	8
Chain of Verification	9

## Introduction

**LLM Explain** provides explanations for Large Language Models using methods such as token importance, Graph of Thoughts, and Search Augmentation. It evaluates the responses with metrics including uncertainty, relevancy, and coherence to ensure the reliability and clarity of Generative AI models' outputs.

Once API swagger page is populated as per instructions given in the github repository Readme file, click on 'try it out' to use required endpoints. Details of endpoints associated with LLM-Explainability tenet are outlined below.

# Sentiment Detection and Explainability

**Endpoint** – /rai/v1/llm-explainability/sentiment-analysis Using this API, we can see sentiment analysis of the prompt along with token importance.

## Input:

inputPrompt: Replace the input prompt with the prompt you want to check

```
{
    "inputPrompt": "Unfortunately the movie served with bad visuals but the actors performed well"
}
```

# **Uncertainity and Coherence Metrics**

Endpoint - /rai/v1/llm-explainability/uncertainty

Using this API, we can evaluate the LLM response in terms of confidence level. to evaluate this, we have metrics such as uncertainty and coherence. Along with evaluation metrics, It provides corresponding explanation and corrective actions to improve the LLM response.

## Input:

inputPrompt: Replace the input prompt with the prompt you want to check

response: Add response of the input prompt

```
{
"inputPrompt": "Who are the co-founders of Infosys?",
"response": "Infosys was co-founded by Narayana Murthy along with six other engineers: Mandan Milekani, S. Gopalakrishnan (Kris), S. D. Shibulal, K. Dinesh, N. S. Raghavan, and Ashok Arora. Established in
1981, Infosys started with a modest capital of $250 and has since grown into one of the largest IT services companies in the world. Narayana Murthy, often regarded as the face of Infosys, played a pivotal ro
le in shaping the company's culture and vision, while the combined efforts of all co-founders contributed to its remarkable growth and success in the global IT industry."
}
```

#### **Response:**

```
"uncertainty": {
    "score": 8,
    "scylamation": "The response provided is confident and specific. It lists all the co-founders correctly and includes their contributions and the company's journey. Furthermore, the details provided, especially around the establishment date and initial capital, are commonly known facts and are not debated.",
    "recommendation": "The response is certain and clear in answering the prompt about the Infosys co-founders and the narrative surrounding the initial formation of the company. Therefore, no changes are required for the prompt to improve this metric score.",
    "uncertainty_level": "Highly Certain"
},
    "coherence": {
    "score": 95,
    "explanation": "The response is highly coherent. It logically begins with the names of the co-founders, then transitions smoothly into a brief history of Infosys' establishment and growth, a
not the roles that the co-founders played. All the information is logically connected and relevant to the given prompt.",
    "recommendation": "The response showcases effective coherence. It successfully maintains a logical flow and connects all the bits of information smoothly. Therefore, there are no recommendat
ions for changing the input prompt to improve the coherence score as the flow and linkage of the information provided is excellent.",
    "coherence_level": "Highly Coherent"
},
    "time_taken": 8.25
```

# **Graph of Thought Reasoning**

Endpoint - /rai/v1/llm-explainability/got

Using this API, we can view a graph of thought reasoning for the given input. Here, we provide the final thought, score and consistency level.

## Input:

inputPrompt: Replace the input prompt with the prompt you want to check

modelName: Provide deployment name from Azure

```
{
    "inputPrompt": "Who are the co-founders of Infosys?",
    "modelName": "gpt4"
}
```

```
{
    "final_thought": "Step 1: The first step to identify the co-founders of Infosys is understanding what Infosys is. Infosys is a multinational corporation that provides business consulting, info mation technology, and outsourcing services. It is headquartered in Bangalore, Karnataka, India.\n\nstep 2: The next step is identifying when it was founded. Infosys was founded in 1981.\n\nstep 3: Finally, the most essential step is identifying the individuals who founded Infosys. Susing accessible resources, such as company databases, credible online business information platform s, historical records, and articles or books, we can identify that Infosys was co-founded by seven individuals. \n\nstep 4: After thorough research, the co-founders of Infosys are identified as N. R. Narayana Murthy, Nandan Nilekani, Kris Gopalakrishnan, S. D. Shibulal, K. Dinesh, Ashok Arora, and N. S. Raghavan. \n\nTo confirm this, one can cross-verify with multiple reliable sources. Infosys' official website and annual reports would also support this information. \n\nThus, based on the information gathered and verified from several sources, the co-founders of Infosys are N. R. Narayana Murthy, Nandan Nilekani, Kris Gopalakrishnan, S. D. Shibulal, K. Dinesh, Ashok Arora, and N. S. Raghavan.",
    "score": 55,
    "cost incurred": 0.52,
    "consistency_level": "Moderately Consistent",
    "time_taken": 81.414
}
```

## Factuality Check by Internet Search

**Endpoint** - /rai/v1/llm-explainability/serper\_response

Using this API, we can verify the LLM's response with the Google search engine to check for factual score and an explanation

## Input:

inputPrompt: Replace the input prompt with the prompt you want to check

lls\_response: provide the response of input text

inputprompt": "Nho are the co-founders of Infosys?",

"Im\_response": "Infosys, a global leader in technology services and consulting, was founded in 1981 by seven visionaries: N.R. Narayana Murthy, Nandan Nilekani, S. Gopalakrishnan, S.D. Shibulal, K. Dines
N, N.S. Raghavan, and Ashok Arora. These co-founders combined their expertise and entrepreneurial spirit to create a company that has saince grown into one of the largest and most respected II services firms
in the world. Infosys, headquartered in Bangalore, India, has been instrumental in the global II revolution, providing innovative solutions and services to clients across various industries. The founders' commitment to excellence and their forward-thinking approach laid a strong foundation for the company's enduring success."

```
{
    "intermetResponse": [
        "Infosys was co-founded by Salil Parekh in January 2018."
},
    "metricName": "Factuality Check",
    "score": 1,
    "epclanation": [
        "Fact": "The co-founders of Infosys are N.R. Narayana Murthy, Nandan Nilekani, S. Gopalakrishnan, S.D. Shibulal, K. Dinesh, N.S. Raghavan, and Ashok Arora.",
        "Reasoning": "The context provides a quote from an article which confirms that these seven individuals are indeed the co-founders of Infosys. However, it is unclear if this statement i
s valid as of today since it does not mention any dates. It is possible that some of these co-founders may have stepped down or new co-founders may have joined. Therefore, we cannot confirm the
validity of this statement without more information.",
        "Judgement": "Fact Unclear"
        "]
        "The caken": S.478
}

Download
```



# Token Importance

**Endpoint** - /rai/v1/llm-explainability/token\_importance Using this API, we can get importance of each token in the input prompt.

## Input:

inputPrompt: Replace the input prompt with the prompt you want to check

modelName: Pass the modelName as GPT or Code

```
{
    "inputPrompt": "Who are the co-founders of Infosys?",
    "modelName": "GPT"
}
```





# LLM Explainability endpoints in Moderation Layer

The following LLM reasoning endpoints are currently available in the Moderation Layer (<u>responsible-ai-moderationlayer</u>) repository. Please follow the setup instructions in the <u>README</u> file of the moderation layer repository to configure them. Ensure that the service is up and running to execute.

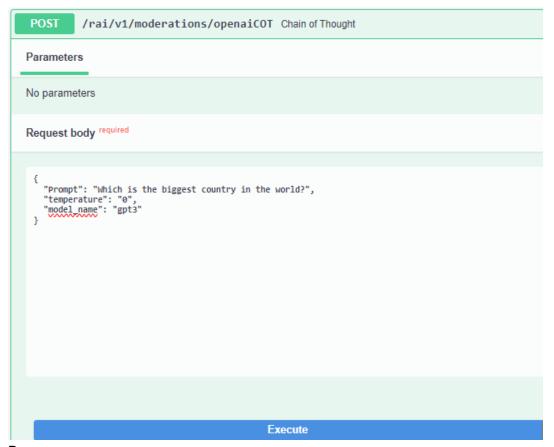
## Chain Of Thought

Endpoint - /rai/v1/moderations/openaiCOT

Using this API, we can get the 'chain of thoughts' the LLM went through to provide response to our prompt.

## Input:

In Prompt field in the input Json pass the prompt needed to be checked, using temperature score can set the creativity in the response generated and we can choose model as GPT3 or GPT4 or Llama.



```
Server response

Code Details

200

Response body

{
    "finishReason": "stop",
    "index": 0,
    "text": "The biggest country in the world by land area is Russia. It spans across both Eastern Europe and Northern Asia, covering approximately 17.1 million square kilometers. Russia's vast te rritory stretches across eleven time zones and is home to diverse landscapes, including the Siberian tundra, the Ural Mountains, and the Russian Far East. \ninwou can find more information about Russia's size and other countries' land areas on reputable sources such as the CIA Morld Factbook (https://maw.cia.gov/the-world-factbook/) or the United Nations Statistics Division (https://unstats.un.org/mome/).",
    "timetaken": 1.537
}

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```

## Chain Of Thought for RAG

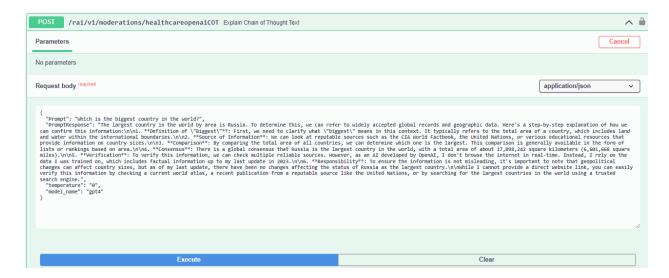
## **Endpoint –** /rai/v1/moderations/healthcareopenaiCOT

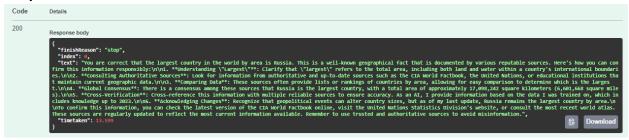
Using this API, we can get the 'chain of thoughts' the LLM went through to provide response to our prompt, adding in example prompt response to tell the LLM which details to be included in the response and what format the response should be in. If you are using RAG based application, you can generate chunks from vector storage add the respective context of RAG files along with the actual prompt. This API will consider context and generates explanation for the same.

#### Input:

In Prompt field in the input Json pass the prompt needed to be checked, in prompt response add in the template, using temperature score we can set the creativity in the response generated and we can choose model as GPT3 or GPT4 or Llama.







## Thread Of Thought

## **Endpoint** – /rai/v1/moderations/openaiTHOT

Using this API, we can get the 'thread of thoughts' the LLM went through to provide response to our prompt, we can see how the LLM break down the prompt to correctly understand it and to generate response.

## Input:

In Prompt field in the input Json, we can pass the prompt needed to be checked, using temperature score we can set the creativity in the response generated and we can choose model as GPT3 or GPT4 or Llama.

```
Parameters

No parameters

Request body required

{ "Prompt": "Which is the biggest country in the world?", "temperature": "9", "model_name": "gpt4" }

Execute
```

## Chain of Verification

## Endpoint - /rai/v1/moderations/COV

Using this API, we can see the 'chain of verification' or questions the LLM asked itself to reach the response it gave us. We can give 'gpt4', 'gpt3' or 'Llama' as model names.

## Input:



```
Code

Details

Response body

{"original_question": "Which is the biggest country in the world", "baseline_response": "The biggest country in the world by land area is Russia.", "verification_questions": "1. What is the largest country in the world by land area of any country/ln4. Can any country surpass Russia in terms of land area/Nn5. Is the baseline response correct in stating that Russia is the biggest country in the world", "verification_answers": "Question: 1. What is the largest country in the world by land area is Russia in the largest country in the world by land area is Russia in the largest country in the world by land area is Russia in Navaest the largest country in the world by land area is Russia in the largest country in the world by land area is Russia in the largest country in the world by land area in Russia in the largest country in the world by land area in Russia in the largest country in the world by land area in Russia in the largest country in the world by land area in Russia is the largest country in the world by land area in Russia is the largest country in the world by land area in Russia is the largest country in the world by land area in Russia is the largest country in the world by land area in Russia is the largest country in the world by land area in Russia is the largest country in the world by land area in Russia is the largest country in the world world by land area in Russia is the largest country in the world world by land area in Russia is the largest country in the world by land area in Russia is the largest country in the world by land area in Russia is the largest country in the world by land area in Russia in the largest country in the world by land area in Russia in the largest country in the world by land area in Russia in the largest country in the world by land area in Russia in the largest country in the world by land area in Russia in the largest country in the world by land area in Russia in the largest country in the world by land area in Russia in the largest
```