



南方科技大学  
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

# ASME 2025 HACKATHON Problem 2



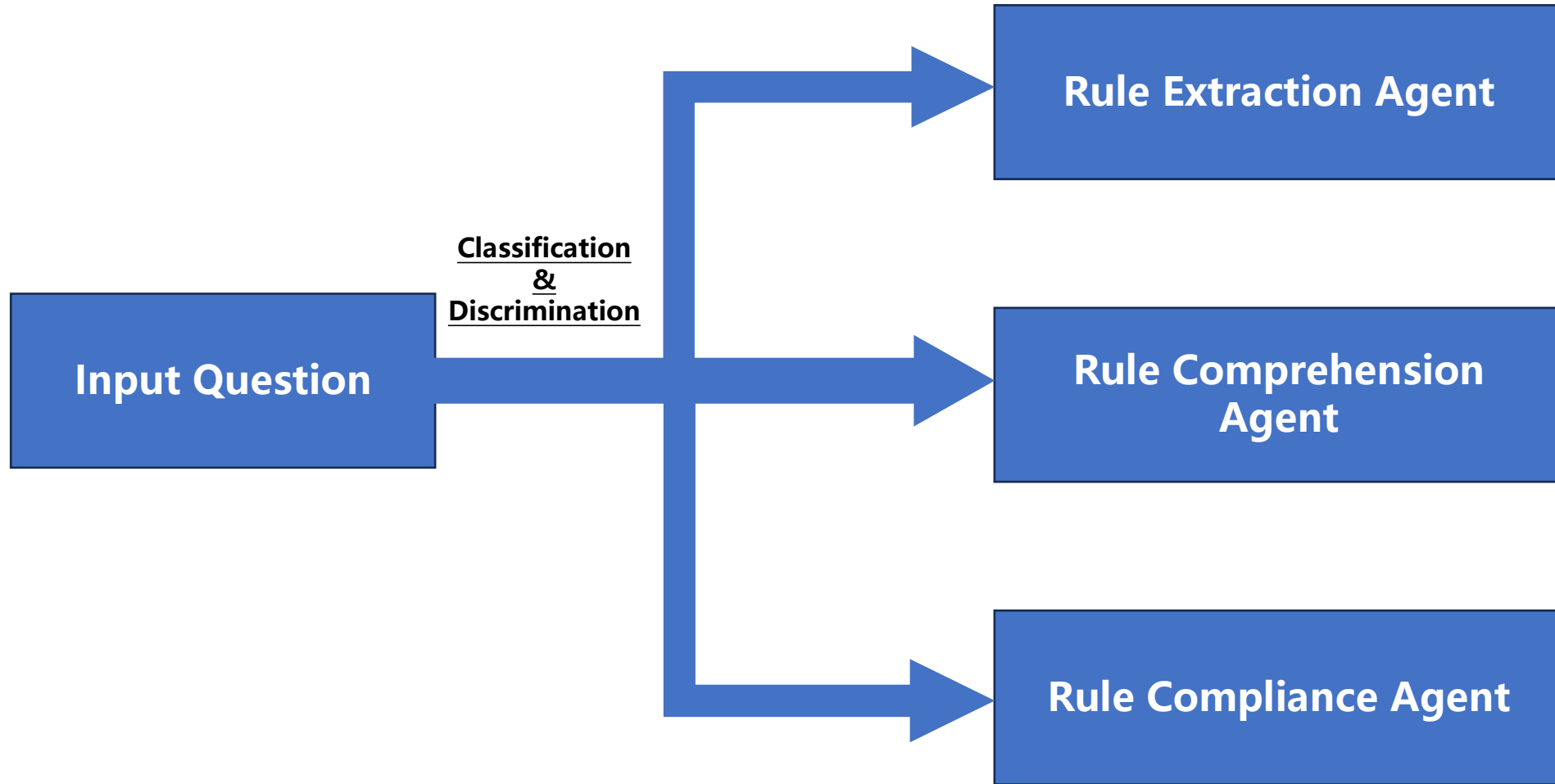
**Team: AIDesigners (No.12)**

**Members: Peijiang Li, Ziwei Lyu**

**By: Ziwei Lyu**

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# Proposed Solution Framework



# 1.1 RULE EXTRACTION Retrieval

## ChatGPT API Prompt Engineering + file search (Tools)

### # FSAE Rule Extractor

#### Role-play

FSAE competition rulebook. Purpose: Given the FSAE rules document and a rule identifier, extract the exact text of the specified rule.

#### ## inputs

##### ### Question

#### Structured input

##### ### Task

- Thought Process:: Retrieve relevant information from the document based on the input question and answer the related question.
- Document Question Answering: Retrieve relevant information from the document based on the input question and answer the related question. Answers should be strictly based on the document content.

#### Task

#### arrangement

#### ## Outputs

(You need to follow the following steps to output,IMPORTANT)

#### Structured output

##### ### 1.Chain of Thoughts:

(Please list all the points mentioned in the Chain of Thoughts, together with your answers.)

- Are you prepared to answer the question.
- What are the key points of the question.
- What key information is retrieved from the provided document.
- Does the retrieved information match the key points of the question. - If the answer satisfies the question, explain why.

#### Chain of Thoughts

##### ### 2. Generate answer

If you are planning to answer the question, please ensure that the answer fully addresses the question.

- Please ensure that the answer you provide matches the description in the provided Chain of Thoughts.- Output only the original text of the rule with no additional words, explanation, or formatting (**IMPORTANT!**)

**Role definition:** By endowing the LLM with the role of "FSAE Rule Extractor" to guide the generation process of the model, the output text is enhanced to improve its reasoning ability and interpretative performance in complex tasks.

**Structured Input:** By using structured identifiers to code the requirements of the rack design item by item, the modular input of the design task is achieved. This not only helps LLM accurately interpret the design goals, but also improves the input efficiency and readability of the problem requirements.

**Task arrangement:** By introducing the "retrieval first, organization later" mindset, we can improve the effectiveness and rationality of LLM in retrieval tasks.

**Structured output:** The output of LLM is formatted to make its thinking process easy to read and clearly show the reasoning path. This mechanism not only facilitates the analysis of the rationality of the generated results, but also helps to quickly judge the effectiveness of the generated structure, thereby improving the transparency and engineering usability of the retrieval process.

**Chain of thoughts:** An effective method that guides LLMs to break down complex problems into smaller, more manageable subtasks, thereby improving problem-solving capabilities and overall output quality.

**Important marker:** By clearly labeling key steps in the design task, LLM's attention and priority scheduling during the retrieval process are improved.,

# 1.1\_RULE EXTRACTION \_ Retrieval

## ➤ Testing

- **Question1:** We are a student engineering team designing a vehicle for the FSAE competition. Attached is the FSAE rules document. What does rule V.1 state exactly? Answer with only the text of the rule and no other words.

1. Chain of Thoughts:

- I am prepared to answer the question.
- The key point is to extract the exact text of rule V.1 from the FSAE rules document.
- The relevant information is found under "V.1 CONFIGURATION" on page 19 of the document.
- The retrieved text matches the requirement, as it is the exact statement of rule V.1.
- This answer satisfies the question because it provides only the original text of rule V.1 with no additional words.

2. Generate answer

The vehicle must be open wheeled and open cockpit (a formula style body) with four wheels that are not in a straight line.

- **Question2:** We are a student engineering team designing a vehicle for the FSAE competition. Attached is the FSAE rules document. What does rule V.1.1 state exactly? Answer with only the text of the rule and no other words.

Chain of Thoughts:

- Are you prepared to answer the question.  
Yes.
- What are the key points of the question.  
Extract the exact text of rule V.1.1 from the FSAE rules document.
- What key information is retrieved from the provided document.  
The text under V.1.1 Open Wheel outlining criteria a, b, and c.
- Does the retrieved information match the key points of the question.  
Yes, it is the exact text of rule V.1.1.
- If the answer satisfies the question, explain why.  
It provides the full, verbatim rule text with no additional words.

V.1.1 Open Wheel

Open Wheel vehicles must satisfy all of the following criteria:

- The top 180° of the wheels/tires must be unobstructed when viewed from vertically above the wheel.
- The wheels/tires must be unobstructed when viewed from the side.
- No part of the vehicle may enter a keep out zone defined by two lines extending vertically from positions 75 mm in front of and 75 mm aft of, the outer diameter of the front and rear tires in the side view elevation of the vehicle, with tires steered straight ahead. This keep out zone will extend laterally from the outside plane of the wheel/tire to the inboard plane of the wheel/tire.



# 1.1\_RULE EXTRACTION \_ Retrieval

## ➤ Testing

- **Question3:** We are a student engineering team designing a vehicle for the FSAE competition. Attached is the FSAE rules document. What does **rule V.1.2** state exactly? Answer with only the text of the rule and no other words.

Chain of Thoughts:

- I am prepared to answer the question.
- The question asks for the exact text of rule V.1.2 from the FSAE rules document.
- I located rule V.1.2 under the Configuration section on page 19 of the provided document.
- The retrieved text matches the identifier V.1.2 and states the requirement for the vehicle's wheelbase.
- The answer satisfies the question as it provides the exact wording of rule V.1.2.

The vehicle must have a minimum wheelbase of 1525 mm

- **Question4:** We are a student engineering team designing a vehicle for the FSAE competition. Attached is the FSAE rules document. What does **rule V.1.3.1** state exactly? Answer with only the text of the rule and no other words.

Chain of Thoughts:

- I am prepared to answer the question.
- The key point is to find the exact text of rule V.1.3.1 in the FSAE rules document.
- I located the section V.1.3 on vehicle track in the Rules, which includes V.1.3.1 and V.1.3.2 .
- V.1.3.1 states the required relationship between track and center of gravity for rollover stability.
- The retrieved information matches the key point of the question exactly. The answer satisfies the question because it provides the exact text of rule V.1.3.1 with no additional words.

The track and center of gravity must combine to provide sufficient rollover stability. See IN.9.2

# 1.2\_RULE EXTRACTION\_Compilation

## ChatGPT API Prompt Engineering + file search (Tools)

### # FSAE Aerodynamic Rule Finder

role: you are an expert at identifying all rules in the FSAE competition rulebook relevant to a given keyword or concept.

Purpose: Given the FSAE rules document and a keyword, extract the rule numbers of all rules that contain that keyword.

[Role-play](#)

#### ## Inputs

##### ### Question

[Structured input](#)

##### ### Task

[Task arrangement](#)

- **Thought Process:** Retrieve relevant information from the document based on the input question and answer the related question.
- **Document Question Answering:** Retrieve relevant information from the document based on the input question and summarize all the rules. Answers must be strictly based on the document content and strictly follow the required format.

#### ## Outputs

(You need to follow the following steps to output,IMPORTANT)

##### ### 1.Chain of Thoughts:

[Chain of Thoughts](#)

(Please list all the points mentioned in the Chain of Thoughts, together with your answers.)

- (A) Are you prepared to answer the question.
- (B) Search only for the exact word or phrase that appears after "Please list all rules relevant to" in the question, and treat it as the key term. It must match the original exactly (including spaces and singular/plural form), with no expansion, inference, modification, or morphological changes. The search is case-insensitive. (MUST!)
- Execute the following steps (1)–(3) in order:
- (1) When performing a full-text search, a rule number may only be extracted if the search term exactly matches a word in the document.
- (2) For each rule number entry (Rule Number A) extracted in step (1), if the full text of Rule Number A contains or references another rule number (Rule Number B), then Rule Number B must also be extracted (this requirement is critical).
- (3) Extract all rule numbers from the Table of Contents that contain the exact same search term.

##### ### 2. Generate answer

- If you are planning to answer the question, please ensure that the answer fully addresses the question.
- Please ensure that the answer you provide matches the description in the provided Chain of Thoughts.- Output only the original text of the rule with no additional words, explanation, or formatting (IMPORTANT!)

##### 、、、 Reference Output Format 、、、

['F.10.4.2', 'T.9.2.3', 'T.9.2.4', 'IC.9.3.1', 'EV.1.2', 'EV.6.6.2', 'EV.6.6.3', 'EV.7.7.1', 'EV.6.6.1', 'EV.7.2.1', 'EV.4.5']

[Structured output](#)

# 1.2\_RULE EXTRACTION\_Compilation

## ➤ Testing

### ■ Question1:

We are a student engineering team designing a vehicle for the FSAE competition. Attached is the FSAE rules document. Please list all rules relevant to **Shutdown System**. Answer with only the rule numbers (i.e.: AA.1.1.1) separated by commas and no other words. The rules relevant to Shutdown System are:

1. Chain of Thoughts:

- (A) Confirmed preparedness to answer the question.
- (B) The exact key term "Shutdown System" was searched, matching case-insensitive and without any modifications.
- (1) Only rules whose text includes the exact phrase "Shutdown System" were extracted.
- (2) From each extracted rule, any referenced rule numbers were also extracted.
- (3) From the Table of Contents, any rule entries with the exact phrase "Shutdown System" were extracted.

2. Reference Output Format

```
['EV.7', 'EV.7.1', 'EV.7.2', 'EV.7.3', 'EV.7.4', 'EV.7.5', 'EV.7.6', 'EV.7.7', 'EV.7.8', 'EV.7.9', 'EV.7.10', 'EV.5.4.3', 'EV.8.4', 'IC.9',  
'IC.9.1', 'IC.9.1.1', 'IC.9.1.2', 'IC.9.1.3', 'IC.9.2', 'IC.9.2.1', 'IC.9.2.2', 'IC.9.3', 'IC.9.3.1', 'IC.9.3.2', 'IC.9.4', 'IC.9.4.1', 'IC.  
9.4.2', 'IC.9.4.3', 'IC.4.8', 'IC.4.1.1', 'T.3.3', 'T.9.3', 'T.9.4']
```

### ■ Question2:

We are a student engineering team designing a vehicle for the FSAE competition. Attached is the FSAE rules document. Please list all rules relevant to **Battery**. Answer with only the rule numbers (i.e.: AA.1.1.1) separated by commas and no other words. The rules relevant to **Battery** are:

Chain of Thoughts:

- (A) I am prepared to answer the question.
- (B) Search only for the exact word "Battery" (case-insensitive, exact match).
- 1. Extract rule numbers whose full text contains "Battery".
  - EV.1.3
  - T.9.2.4
  - T.9.2.5
  - F.10.4.3
  - IC.9.3.2
  - EV.7.7.2
  - EV.6.6.3
  - EV.6.6.5
- 2. From those, include any rule numbers referenced in their text.
  - EV.4.6
  - EV.7.2.2
  - EV.6.6.2
- 3. From the Table of Contents, no entries contain the exact term "Battery".

Reference Output Format

```
['EV.1.3', 'EV.4.6', 'EV.6.6.2', 'EV.6.6.3', 'EV.6.6.5', 'EV.7.2.2', 'EV.7.7.2', 'F.10.4.3', 'IC.9.3.2', 'T.9.2.4', 'T.9.2.5']
```



# 1.2\_RULE EXTRACTION\_Compilation

## ➤ Testing

### ■ Question3:

We are a student engineering team designing a vehicle for the FSAE competition. Attached is the FSAE rules document. Please list all rules relevant to **Aerodynamic/Aerodynamics**. Answer with only the rule numbers (i.e.: AA.1.1.1) separated by commas and no other words. The rules relevant to **Aerodynamic/Aerodynamics** are:

```
1. Chain of Thoughts:
- (A) I am prepared to identify all rules relevant to Aerodynamic/Aerodynamics.
- (B) The key term "Aerodynamic/Aerodynamics" is treated as the exact words "Aerodynamic" and "Aerodynamics", searched case-insensitively with no modifications.
- Executed the following:
  1. Retrieved every rule whose text contains an exact match of "Aerodynamic" or "Aerodynamics."
  2. For each extracted rule, added any rule numbers referenced within its text.
  3. From the Table of Contents, extracted all entries whose titles contain the exact term.
2. Reference Output:
['T.7', 'T.7.1', 'T.7.1.1', 'T.7.1.2', 'T.7.1.3', 'T.7.1.4', 'T.7.1.5', 'T.7.2.2', 'T.7.3.1', 'T.7.3.2', 'T.7.3.3', 'T.7.4', 'T.7.5', 'T.7.6.1', 'T.7.6.2', 'T.7.6.3', 'T.7.7.1', 'IN.8.2', 'IN.8.2.1', 'IN.8.2.2', 'IN.8.2.3', 'GR.6.4.1', 'V.1.1', 'V.1.4.1']
```

### ■ Question4:

We are a student engineering team designing a vehicle for the FSAE competition. Attached is the FSAE rules document. Please list all rules relevant to **Tractive System**. Answer with only the rule numbers (i.e.: AA.1.1.1) separated by commas and no other words. The rules relevant to **Tractive System** are:

```
### 1. Chain of Thoughts:
- (A) Confirm readiness to answer the question.
- (B) Identify "Tractive System" as the exact, case-insensitive search term, with no modifications.
- Execute the following steps in order:
  (1) Search the full text for exact matches of "Tractive System" and extract any rule numbers where it appears.
  (2) For each extracted rule number A, inspect its full text; if it references any other rule number B, include B as well.
  (3) Scan the Table of Contents for entries whose titles contain the exact phrase "Tractive System" and extract those rule numbers.

### 2. Generate answer
['EV.1.1', 'EV.2.1.1', 'EV.3.2.3', 'EV.4.8', 'EV.5.1.1', 'EV.5.2.1', 'EV.5.6.3', 'EV.5.8.1', 'EV.5.8.2', 'EV.5.8.3', 'EV.5.8.4', 'EV.5.8.5', 'EV.5.9.1', 'EV.5.9.2', 'EV.5.9.3', 'EV.5.9.4', 'EV.5.9.5', 'EV.5.9.6', 'EV.6.1.1', 'EV.6.1.2', 'EV.6.1.3', 'EV.6.3.4', 'EV.6.4.1', 'EV.6.5.1', 'EV.6.5.2', 'EV.6.5.3', 'EV.6.5.5', 'EV.6.5.7', 'EV.6.5.9', 'EV.6.7.1', 'EV.7.2.2', 'EV.7.2.3', 'EV.7.3.1', 'EV.7.6.1', 'EV.7.6.4', 'EV.7.8.2', 'EV.8.4.2.b', 'EV.9.3.2']
```





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Thanks !