FSM Online Internship

Chat-Bot for FSM

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Project Background

In the support service, one of the most important aspect is quality and precise supports. Customers go through a lot of questions and problems from technological to data safety, and lack of support at any stage may prevent user/customer from using that particular technology making it a failure. Due to higher number of issues, large number of queries remain unanswered; sent through emails and call centers. This is where Machine Learning and Natural Language Processing can provide an alternative for Chat-support and user experience to support other service channels.

Challenges:

In order to achieve this we had various obstacles namely, data extraction and arranging it into squad dataset, lack of hardware resources like RAM,CUDA for processing large data, large training time.

Objective

- Main Objective is to develop a Chatbot from scratch for a FSM website.
- The Chatbot should be able to understand user queries or interactions within the context of the website.
- Not only understanding queries but also generate relevant and accurate responses in real-time.
- To provide an user interface to obtain information, support, or assistance related to the website’s content and services
- Deploy the model for better reach

Methodology

TRAINING AND IMPLEMENTING THE MODEL :

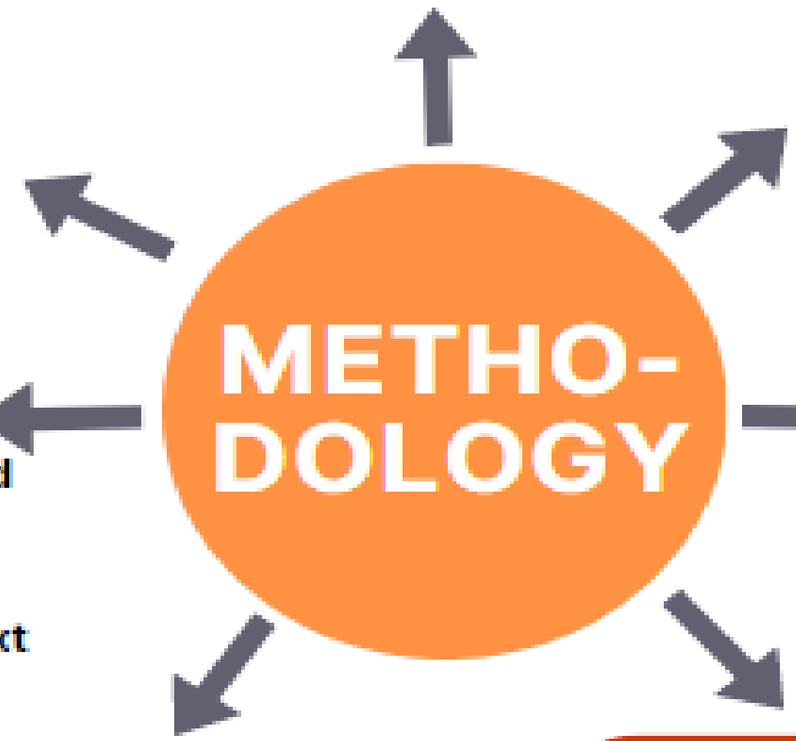
After dataset preparation we need to fine-tune model for better Context understanding and implementing the coding and model for question answering.

• COLLECT AND PREPARE DATA:

For transformers' model fine-tuning we need site data, I scraped website data and arranged in format required by transformers for training.

Testing and improving overall project

After implementation of model for question answering we tested and improved the accuracy by training , increasing dataset.



• CHOOSE THE TECHNOLOGY:

Out of all present technology I found transformers most appropriate for this project, as most updated and much ccurate technology for context of large quantities of data.

DEVELOPING USER INTERFACE

In order to provide better user experience, developing chat interface is required to provide a space and chance for customer support and service.

UNDERSTANDING TECHNOLOGY:

For NLP we have various technology like Machine learning models, Deep Learning models namely RNN, LSTM-RNN, Encoder-Decoder, Transformers.

DEPLOYMENT OF MODEL

Finally, deploying the model for easy and remote access for the people.

Implementation

Collect and prepare data:

- Web scrapping was done using beautiful soup, and heading, paragraphs were extracted.
- Some divisions As given in the fig (i) are extracted through searching div “sppb-addon-content”
- Explained how scrapping of links was done for example button named “Learn more” .

|_Dashboard (1st link)

|_ all links on dashboard (eg. Links of Technologies, services, facilities)

|_ all links on redirected Page (eg. All the links on Technologies, Services page)

- Scrapped data is in json format.

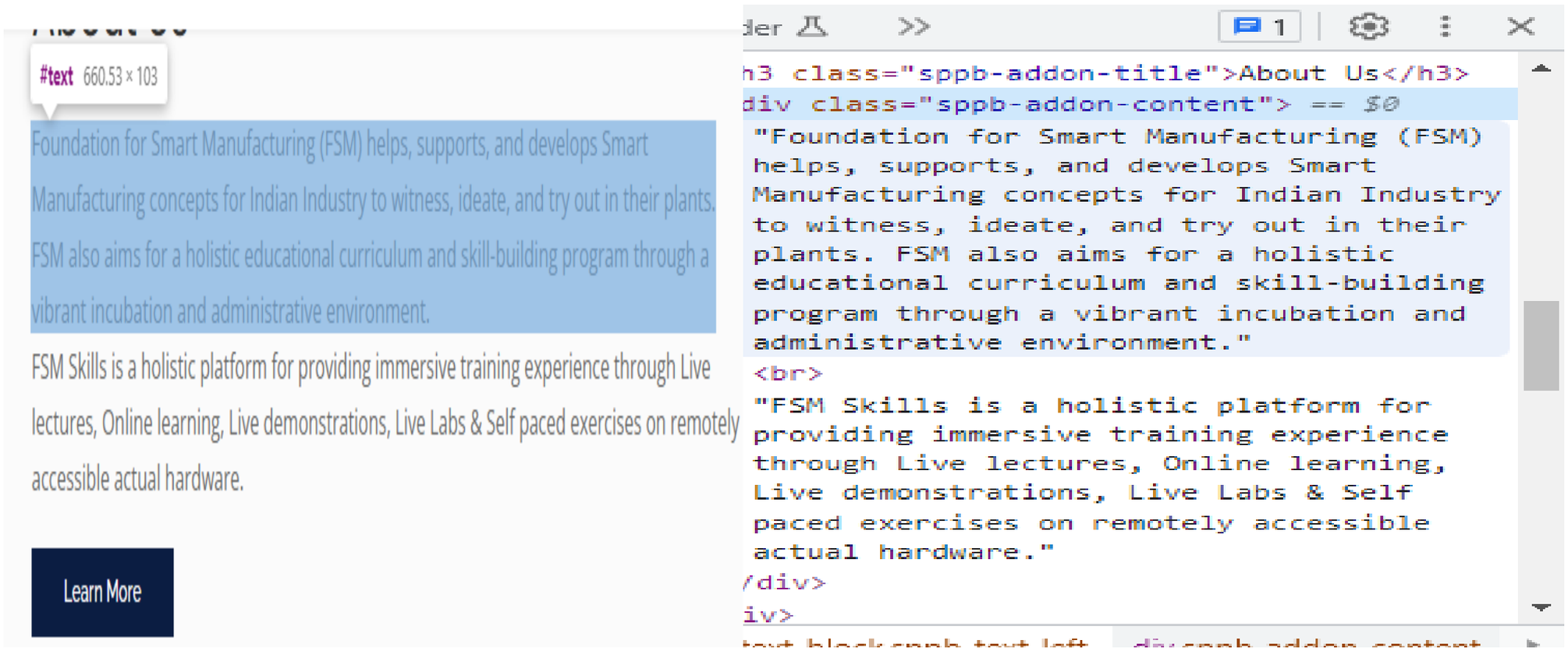
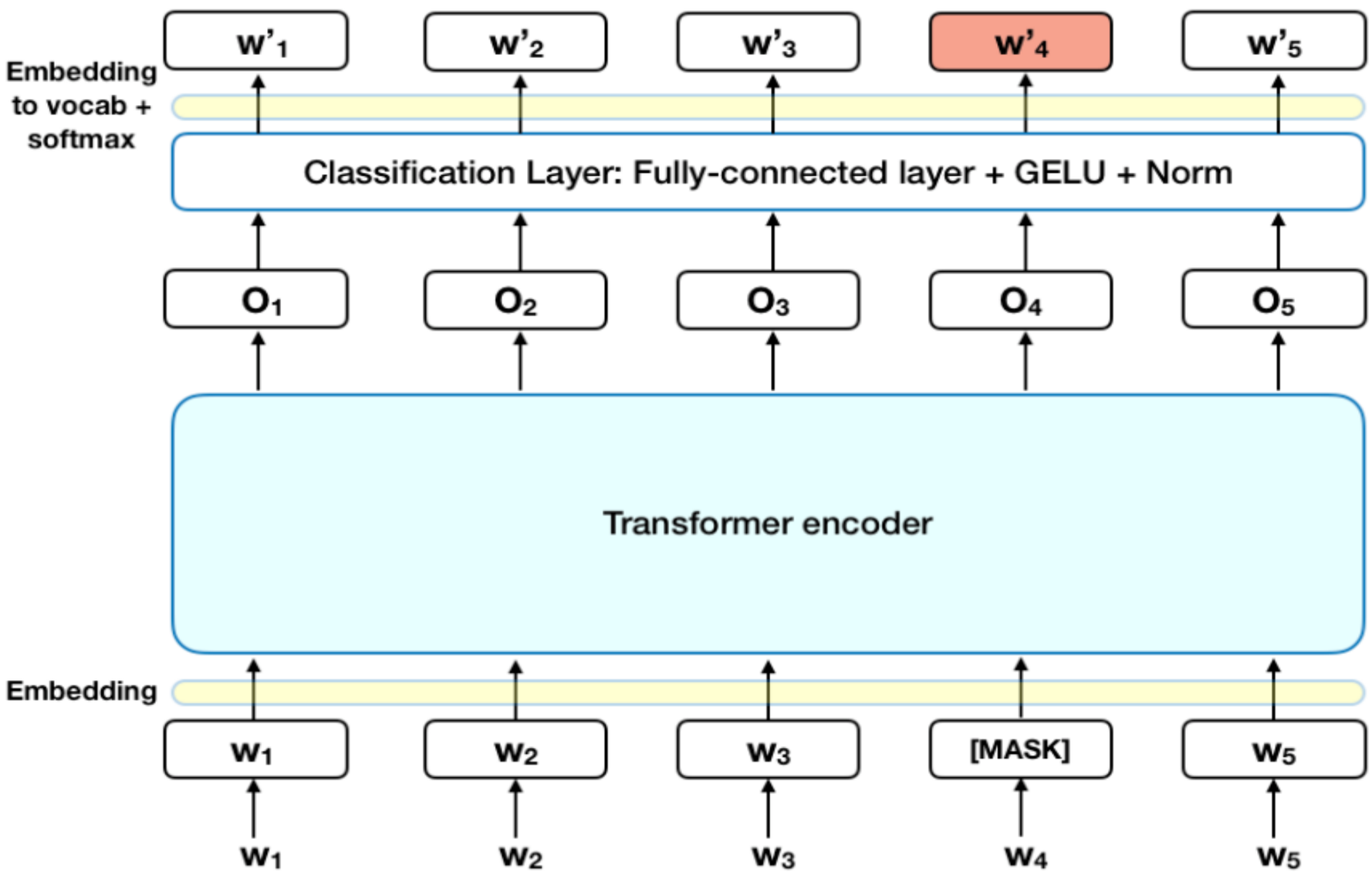


Fig (i) “About” Section of Dashboard Page (highlighted)

Implementation

- **Overview of Transformer :**

Transformer is used when there is large context to understand. It consist of three things namely, encoder, decoder, Neural network. In this; question, context are provided to encoder. And there is neural network in between encoder and decoder. The weights of neural network provides the information which word in context need to be addressed and, has some importance, wrt context relation. These words (vector) are then passed to decoder which convert tokenized value to actual word and previous word is used to predict current word.



Implementation

- **Testing and improving overall project:**

1. BERT model pre-trained on SQuAD is used.
2. To increase accuracy, the model is fine-tuned on website data.
3. Scrapped data was in json format Fig(iv), now processed the data to make it a context (removing symbols, spaces , lines).
4. Used the above context to generate question-answer in SQuAD format using Haystack Annotation Tool for fine-tuning. Fig (v),fig(vi)
5. Used **1.pipeline confidence score**, **2.string search** (target_word, topic on which question is asked) to get exact answer.

final_iafsm _scrapping_json.py | final_website_data.json | final_chatbot.ipynb | final_training model.ipynb | linear regression.ipy

hello > {} final_website_data.json > [ ] p_content

```
{
    "div_content": [
        "At FSM we provide various Client services and training under the domain of Smart Manufacturing. The servi
        "Education & Training",
        " Consulting",
        "Site Integration",
        "Skill Certification",
        "Prototyping",
        "Research",
        "",
        "Foundation for Smart Manufacturing (FSM) helps, supports, and develops Smart Manufacturing concepts for I
        "FSM is focussed on enabling people from becoming Smart to Samarth (capable) fraternity by creating awarer
        "Academic strength of IIT Delhi brought interdisciplinary learnings to FSM. Expert Faculty members from va
        "FSM has highly trained manpower to implement the Industry 4.0 projects in guidance with experienced facul
        "M.Tech and Ph.D students doing research in Smart manufacturing are contributing to FSM technologies and i
        "FSM brought industry partners from MNCs operating all across the globe to bring rich experience in the sm
        "The Automation Industries Association (AIA) in its quest to set up a Common Engineering Facility Center (
        "",
        "Contact us today for implementing",
        "Call us for any query011-26582053, 8076197190",
        "or email us oninfo@iafsm.in",
```

Fig (iv)

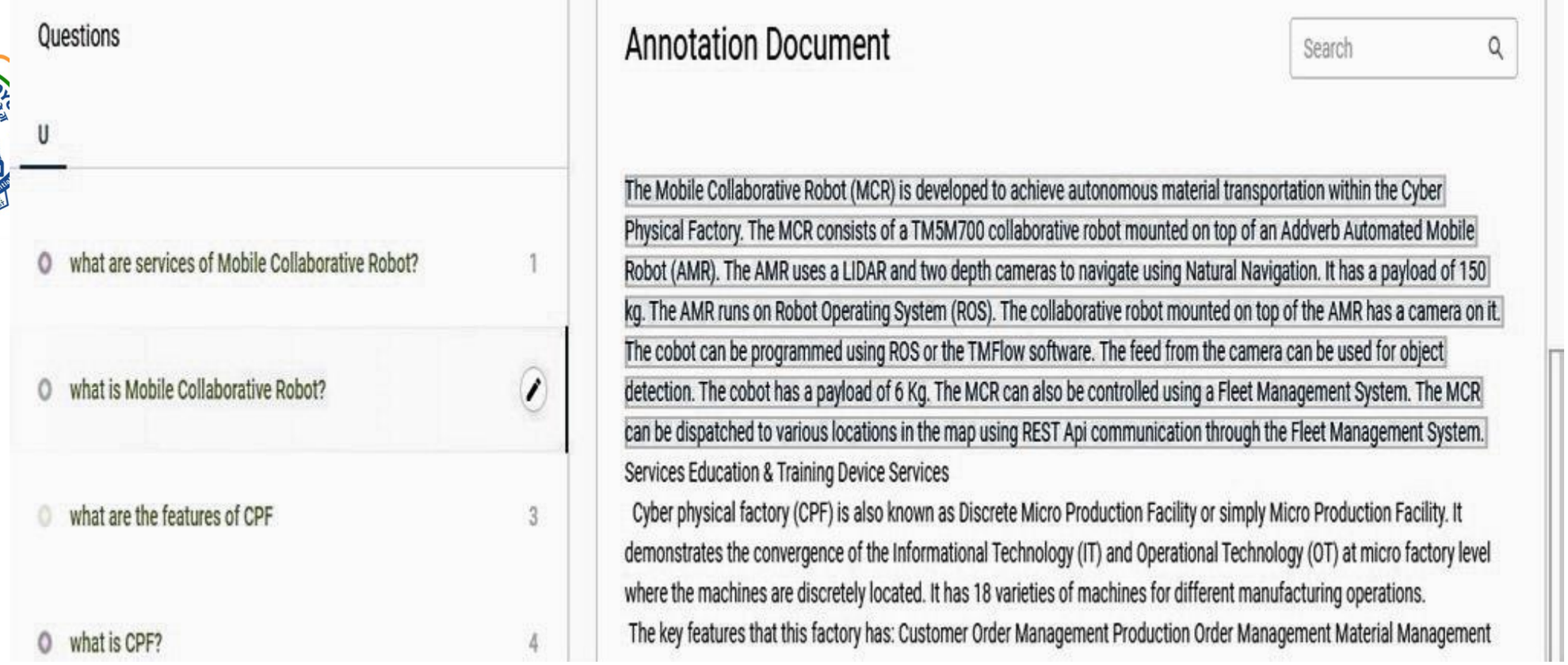

Questions
U
what are services of Mobile Collaborative Robot? 1
what is Mobile Collaborative Robot?
what are the features of CPF 3
what is CPF? 4
Annotation Document
Search
The Mobile Collaborative Robot (MCR) is developed to achieve autonomous material transportation within the Cyber Physical Factory. The MCR consists of a TM5M700 collaborative robot mounted on top of an Addverb Automated Mobile Robot (AMR). The AMR uses a LIDAR and two depth cameras to navigate using Natural Navigation. It has a payload of 150 kg. The AMR runs on Robot Operating System (ROS). The collaborative robot mounted on top of the AMR has a camera on it. The cobot can be programmed using ROS or the TMFlow software. The feed from the camera can be used for object detection. The cobot has a payload of 6 Kg. The MCR can also be controlled using a Fleet Management System. The MCR can be dispatched to various locations in the map using REST Api communication through the Fleet Management System.
Services Education & Training Device Services
Cyber physical factory (CPF) is also known as Discrete Micro Production Facility or simply Micro Production Facility. It demonstrates the convergence of the Informational Technology (IT) and Operational Technology (OT) at micro factory level where the machines are discretely located. It has 18 varieties of machines for different manufacturing operations.
The key features that this factory has: Customer Order Management Production Order Management Material Management

Fig (v)


hello > {} more_answers_squad_data.json > [ ] data > {} 2
{
"data": [
{
"paragraphs": [
{
"qas": [
{
"question": "explain Remote Maintenance?",
"id": 1064369,
"answers": [
{
"answer_id": 951969,
"document_id": 1582518,
"question_id": 1064369,
"text": "Being able to assist customers remotely, serv
"answer_start": 0,
"answer_end": 779,
"answer_category": null
}
],
"is_impossible": false
},

Fig (vi)

Implementation

- **Developing User Interface:**

For user interface I used Gradio as time was less , and I found it easy to implement where first, question answering interface was used. Then I got introduced to State parameter which used to keep all the asked question on screen like chats on WhatsApp if not refreshed. While, I was trying with state parameter I got to know about Chat Interface of Gradio. Now, this Chat Interface was used where I was getting errors of list and string. However, resolved them using print and type function.

Deployment of model (project):

Finally, deploying the model for easy and remote access for the people.I used Hugging-face spaces .

Here is the link for deployed model:

https://huggingface.co/spaces/Nickitaa/gradio-chatbot

Innovation in Implementation

1.I used fine-tuned DistilBERT model for predicting answers as fine-tuning was done using CPU, so it has less parameter and fast in implementation and BERT for Confidence score for choosing the correct answers from all the predicted answers of DistilBERT.

2. After fine-tuning and training the model, bot was giving answers but there were some extra stuff. So in order to solve this I used two things:
1. Confidence score 2. String search

- I used a pipeline confidence score to search for answer that has correct context with respect to question i.e. answer with high score.
- For, string search I extracted out target_word from question; line having these word are part of the exact final answer.

Outcome

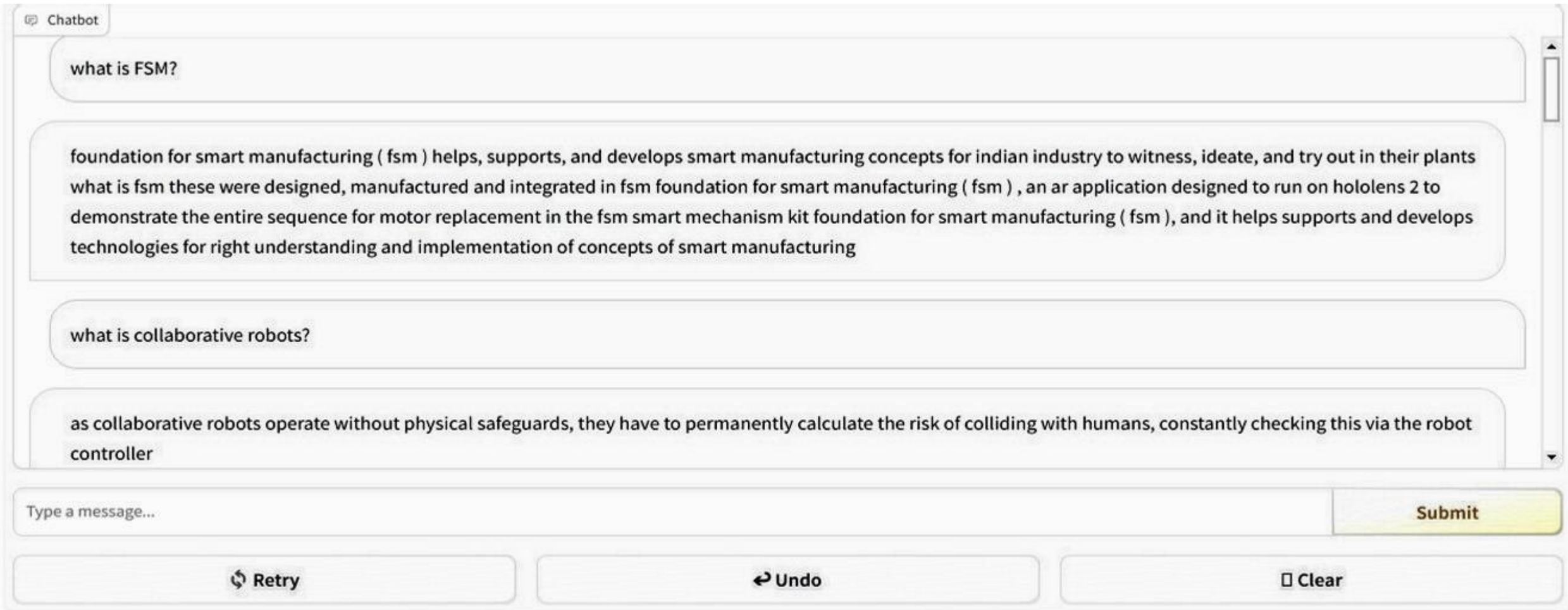
After developing the graphic user interface of chat-bot system. Question is been typed in the prescribed area and answers related to that are generated. This, bot can answer questions related to site.

I tested my code against three different size of context

1. 512 tokens
2. 3 chunks each of 512 size
3. 28 chunks each of 512 size (complete site data)

Following is the output:

(output presented is using complete site data)



Results

what is IIT?

common engineering facility center (cefc) at iit delhi has brought together experts from various industries in the sector of automation iit iit iit iit , with a far - sighted approach, the government of india has supported automation industry and iit delhi in creation of advanced engineering and software facilities for smart manufacturing delhi, and automation industry association (aia) together with industry sponsors have set up common engineering facilities under the aegis of the iitd - aia foundation for smart manufacturing (fsm) iit sunil jha, iitd - aia foundation for smart manufacturing presents a 5 days / 10 hours online self learning program on components and integration for smart manufacturing sunil jha,, iitd - aia foundation for smart manufacturing presents 4 hours free awareness course on industrial automation learning sunil jha, iitd - aia foundation for smart manufacturing presents a 5 days / 10 hours online self learning program on components and integration for smart manufacturing sunil jha,, iitd - aia foundation for smart manufacturing presents 4 hours free awareness course on industrial automation learning indian institute of technology delhi (iitd)

Results

hi

hello

what is internship?

[CLS] what is internship [CLS] what is internship level 1 learning level 2 technology stream learning final selection project allocation internship commencement, fill out the online registration form shortlisting based on the eligibility criteria level 1 : learning modules (approx you are then required to undergo and clear the assignments based on your selection and qualify the level 2 assignments after which you shall be taken forward for project based learning under summer internship 2023 this internship program is an excellent chance for individuals to gain valuable knowledge and experience in this field

Type a message...

Submit

Retry

Undo

Clear

Chatbot

what is robotic welding cell?

< - robotic welding cell, cyber physical factory - >, short - term education and training courses will be offered along with on - line learning and assessment tools to educators and users on a chargeable basis final selection and project allocation based on the level 2 performance and preferences these are full - time internships and require 48 hours per week, ar - based fault diagnosis of rwc implementing ar for complete demonstration of robotic welding cell unity ros cobot fsm amr ar fsm interactive lab introduction, 02digital twin, digital twin of robotic welding cell for process optimization and predictive maintenance digital twin for advanced milling machine centre, 03industrial automation, cp lab autonomy phase - 2 multi process robotic cell simulation on a simulation platform robotic welding cell simulation on a simulation platform training course on rockwell kit training course on siemens kit, 04industrial iot, implementing iiot on cpl autonomy implementing iiot for plant owner on robotic welding cell, 05machine learning, remaining usable life estimation (nasa turbine dataset) power line fault detection computer vision to detect defects in pcb power line fault detection steel defect detection using computer vision, 06manufacturing execution system, digital quality report generation for 3d prints final selection and project allocation based on the level 2 performance and preferences these are full - time internships and require 48 hours per week, ar - based fault diagnosis of rwc implementing ar for complete demonstration of robotic welding cell unity ros cobot fsm amr ar fsm interactive lab introduction, 02digital twin, digital twin of robotic welding cell for process optimization and predictive maintenance digital twin for advanced milling machine centre, 03industrial automation, cp lab autonomy phase - 2

Scalability

In the fourth industrial revolution, Smart and Samarth technologies are evolving and NLP will provide a hand for development.

- In transformer model one of the important step for behavior of model towards prediction is fine tuning, model can be fine-tuned with customized data to suit specific requirements of industry and it can be domain specific and more relevant to industry.

- Transformers model pre-trained in various international language are available in the industry. So, it can be deployed round the globe and international collaboration will be easy.

- It can be relevant in assistance and support service, which the model is doing now i.e., aiding the user queries but it can provide assistance to developers in particular domain with respect t data provided.

- If provided with resources like cloud, better processing units it can handle and can be accessible to wider audience with less execution time

Thank You

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