TECH ENHANCED AI INTERVIEW LEARNING PLATFORM

INTRODUCTION

This project introduces an advanced machine learning model designed to generate a wide range of interview questions tailored to specific topics based on an individual's resume, all while maintaining a deep level of conversation. Furthermore, we incorporate cutting-edge natural language processing (NLP) algorithms to analyse spoken responses, pinpointing grammatical errors, and providing precise corrections post-interview. Additionally, we employ state-of-the-art speech processing techniques, including Automatic Speech Recognition (ASR), to assess learners' speaking pace, detect variations, and provide timely feedback for improvement. The goal of our model is to boost its adaptability and effectiveness across diverse topics and communication styles.

- **RESUME SCANNING and CLASSIFICATION**
- **QUESTION GENERATION**
- **ASR and SPEECH ANALYSES**
- **GRAMMAR CORRECTION(using API)**
- **EVALUATION(BLEU SCORES)**

Model Overview

Our model consists of several components:

- **Resume Scanning:** It involves scanning the resume and then building the model to classify the resume according to various job profiles.

```
from sklearn.feature_extraction.text import TfidfVectorizer
tfidf = TfidfVectorizer(stop_words='english')
tfidf.fit(df['Resume'])
requredTaxt  = tfidf.transform(df['Resume'])
from sklearn.neighbors import KNeighborsClassifier
from sklearn.multiclass import OneVsRestClassifier
from sklearn.metrics import accuracy_score
clf = OneVsRestClassifier(KNeighborsClassifier())
clf.fit(X_train,y_train)
ypred = clf.predict(X_test)
```

- **Question Generation Module**: This involves use of techniques such as t5 transformer encodes the data using the training of model from dataset and then decode the data in the form of question and answer.

Requirements

```
import torch
import json
from tqdm import tqdm
import torch.nn as nn
from torch.optim import Adam
import nltk
import spacy
import string
import evaluate  # Bleu
from torch.utils.data import Dataset, DataLoader, RandomSampler
import pandas as pd
import numpy as np
import transformers
from sklearn.model_selection import train_test_split
import matplotlib.pyplot as plt
from transformers import T5Tokenizer, T5Model,
   T5ForConditionalGeneration, T5TokenizerFast

TOKENIZER = T5TokenizerFast.from_pretrained("t5-base")
MODEL = T5ForConditionalGeneration.from_pretrained("t5-base",
   return_dict=True)
```

```
OPTIMIZER = Adam(MODEL.parameters(), lr=0.00001)
Q_LEN = 256   # Question Length
T_LEN = 32    # Target Length
BATCH_SIZE = 4
DEVICE = "cuda:0"
```

- **Automatic Speech Recognition**: ASR converts spoken words into written text. It involves pre-processing audio, extracting features, mapping them to phonemes and words, and selecting the most likely sequence of words based on statistical models. The output is the transcribed text.

- **Speech Processing Module**: Incorporates state-of-the-art speech processing techniques to assess learners' speaking pace and detect variations. It offers real-time feedback for improvement in speaking skills.

```
import speech_recognition as sr
import os

r = sr.Recognizer()
r.energy_threshold = 10000
with sr.Microphone() as source:
    print('Say something')
    audio = r.listen(source)
    print("Done")

try:
    text = r.recognize_google(audio)
    f=open("output.txt","w")
    f.truncate(0)
    f.write(text)
    f.write("\n"
    f.close()
    print(text)
    os.system("say '"+'I think you said,'+text+'!'+"'")

except Exc
```

- **Evaluation Metrics:** Evaluation Metrics assess the model's performance in analysing the responses of the candidate. Key metrics include accuracy, precision, recall,**BLEU SCORE, AUC-ROC, mAP,** and user feedback. They provide insights into the model's accuracy, ability to identify relevant replies, and overall effectiveness in the task.

Dataset Creation

We curated comprehensive datasets consisting of interview transcripts, spoken responses, and grammatical error annotations. Additionally, we generated **custom datasets by crowdsourcing** interview questions and responses aligned with specific topics. This ensures the diversity and relevance of the generated questions and responses.

Questions	Answers	Job Profile	Text
What is sales and marketing?	Sales involves persuading customers to purchase, while marketing focuses on creating awareness and interest.	Sales	Sales involves persuading customers to purcha
What is the difference between sales and marketing?	Sales involves direct interaction, while marketing involves creating strategies to attract potential customers.	Sales	Sales involves persuading customers to purcha
What are the key components of a sales strategy?	Target market identification, goal setting, tactics development, pricing strategies, and performance tracking.	Sales	Sales involves persuading customers to purcha
How do you identify your target market?	Through demographics, market research, and competitor analysis.	Sales	Sales involves persuading customers to purcha
What is a sales funnel?	A visual representation of the customer's journey through various stages before making a purchase decision.	Sales	Sales involves persuading customers to purcha
How do you generate leads for sales?	Through content marketing, social media, email campaigns, networking, and SEO.	Sales	Sales involves persuading customers to purcha
What is the importance of branding in marketing?	It differentiates products, builds trust, creates loyalty, and influences buying decisions.	Sales	Sales involves persuading customers to purcha
How do you measure the success of a marketing campaign?	By tracking KPIs like conversion rate, ROI, website traffic, CTR, and engagement metrics.	Sales	Sales involves persuading customers to purcha
What are the characteristics of a successful salesperson?	Strong communication skills, empathy, persistence, product knowledge, and ability to build relationships.	Sales	Sales involves persuading customers to purcha
How do you handle objections during a sales pitch?	By active listening, addressing concerns, providing solutions, and building rapport with the customer.	Sales	Sales involves persuading customers to purcha
What is customer relationship management (CRM)?	It's a strategy and software system for managing interactions with current and potential customers.	Sales	Sales involves persuading customers to purcha
How do you create an effective marketing plan?	By conducting market research, setting objectives, defining strategies, implementing tactics, and evaluating results.	Sales	Sales involves persuading customers to purcha
What role does social media play in marketing?	Social media helps reach a wider audience, engage with customers, build brand awareness, and drive website traffic.	Sales	Sales involves persuading customers to purcha
How do you conduct market research for a new product launch?	By analyzing market trends, surveying target customers, studying competitor offerings, and testing product concepts.	Sales	Sales involves persuading customers to purcha
What is a SWOT analysis, and how is it used in marketing?	SWOT analysis identifies Strengths, Weaknesses, Opportunities, and Threats to inform marketing strategies and decision-making.	Sales	Sales involves persuading customers to purcha
How do you create compelling content for marketing purposes?	By understanding audience needs, telling stories, providing value, using visuals, and optimizing for search engines.	Sales	Sales involves persuading customers to purcha
What is the role of email marketing in a marketing strategy?	Email marketing is used to nurture leads, build relationships, promote products, and drive conversions.	Sales	Sales involves persuading customers to purcha
How do you build brand awareness?	Through consistent messaging, visual identity, storytelling, advertising, sponsorships, and public relations.	Sales	Sales involves persuading customers to purcha
How do you optimize a website for search engines (SEO)?	By using relevant keywords, creating high-quality content, optimizing meta tags, improving site speed, and building backlinks.	Sales	Sales involves persuading customers to purcha
What is the importance of customer feedback in marketing?	Customer feedback helps improve products, refine marketing strategies, enhance customer satisfaction, and drive innovation.	Sales	Sales involves persuading customers to purcha
How do you segment a market for targeted marketing?	By dividing customers based on demographics, psychographics, behavior, geography, or purchasing habits.	Sales	Sales involves persuading customers to purcha
What are the key elements of a successful sales pitch?	Attention-grabbing opening, clear value proposition, addressing pain points, overcoming objections, and strong call to action.	Sales	Sales involves persuading customers to purcha
How do you nurture leads through a sales funnel?	By providing valuable content, building relationships, addressing objections, and guiding prospects towards a purchase decision.	Sales	Sales involves persuading customers to purcha
What is influencer marketing, and how does it work?	Influencer marketing involves collaborating with individuals who have a large following to promote products or services to their audience.	Sales	Sales involves persuading customers to purcha
How do you stay updated with industry trends in marketing?	By attending conferences, networking with peers, following industry publications, and participating in online forums.	Sales	Sales involves persuading customers to purcha
What are the ethical considerations in marketing?	Honesty, transparency, respecting customer privacy, avoiding deceptive practices, and adhering to industry regulations.	Sales	Sales involves persuading customers to purcha
How do you create a brand positioning strategy?	By identifying unique selling propositions, understanding target audience perceptions, and crafting a compelling brand story.	Sales	Sales involves persuading customers to purcha
What is the role of market segmentation in marketing?	Market segmentation allows companies to target specific customer segments with tailored marketing messages and offerings.	Sales	Sales involves persuading customers to purcha
How do you measure customer satisfaction in marketing?	Through surveys, feedback forms, net promoter score (NPS), customer reviews, and social media sentiment analysis.	Sales	Sales involves persuading customers to purcha
What are the different pricing strategies in marketing?	Pricing strategies include penetration pricing, skimming pricing, value-based pricing, cost-plus pricing, and competitive pricing.	Sales	Sales involves persuading customers to purcha
How do you create an effective advertising campaign?	By defining objectives, understanding target audience, selecting appropriate channels, creating compelling messages, and measuring results.	Sales	Sales involves persuading customers to purcha

CONTAIN 4 COLUMNS: QUESTIONS, ANSWERS, JOB PROFILE, CONTEXT(for T5 TRANSFORMER)

Model Training

We conducted training of our AI model using the curated datasets. We employed techniques like **transfer learning and fine-tuning** to enhance adaptability and performance across various topics and speaking styles. **Hyperparameter tuning** is performed to optimize model performance.Hyperparameter tuning optimizes model performance by adjusting parameters not learned from data, enhancing effectiveness and generalization.

Evaluation Metrics

We evaluate our model based on various metrics:

- **Question Relevance (BLEU Score)**: Measures the similarity between generated questions and human-generated questions. A higher BLEU score indicates better question relevance.

Score Calculation in BLEU

$$\text{Unigram precision } \mathbf{P} = \frac{m}{w_t}$$

$$\text{Brevity penalty } p = \begin{cases} 1 & \text{if } c > r \\ e^{\left(1-\frac{r}{c}\right)} & \text{if } c \leq r \end{cases}$$

$$\text{BLEU} = p.\, e^{\sum_{n=1}^{N} \left(\frac{1}{N} * \log Pn\right)}$$

- **Error Analysis (F1 Score)**: Evaluates the accuracy of grammatical error detection and correction. A higher F1 score indicates better error analysis performance.

- **System Usability (SUS Score)**: Assesses the usability of our system through user feedback. A higher SUS score indicates better usability.

Challenges Faced

During the project, we encountered several challenge

- **Custom Dataset Creation**
- **Integrating different pipelines of code together**
- **Fine tuning the model to make it more accurate**

- **GPU limitations**
- **Training the transformers part**

Limitations & Future Improvements

Despite our model's advancements, it has certain limitations:

- **Limited Domain Coverage**: Our model's performance may vary across different domains due to data availability and domain-specific language.
- **Speech Recognition Accuracy**: The accuracy of speech recognition algorithms may impact the performance of our speech processing module.
- **Scalability**: Scaling our model to handle a large volume of users simultaneously may pose challenges.
- **Training issue**

In the future, we aim to address these limitations and improve our model by:

- Expanding the dataset to cover a wider range of topics and speaking styles.
- Enhancing speech recognition accuracy through advanced algorithms and techniques.
- Implementing scalability measures to support a larger user base.

Conclusion

Our advanced machine learning model for interview question generation and analysis demonstrates promising results in generating diverse interview questions, analysing spoken responses, and providing feedback for improvement. Despite certain limitations, our model shows potential for real-world applications in interview preparation and language learning. Further research and development can lead to significant advancements in this field.

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