QUIZBREW

TEXT TO QUIZ GENERATION

A Transformer based Approach

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Introduction

The main goal of this project is to create a system that can automatically generate **high-quality quizzes from any given piece of text**, making it a valuable tool for educators, content creators, and anyone else looking to test the knowledge and comprehension of their audience.

We trained the **T5 model on a Race and Squad dataset** for corresponding questions and answers, enabling it to generate accurate and meaningful quizzes.

DATASETS USED:
RACE, SQuAD 1.1

About Datasets

SQuAD

Stanford Question Answering Dataset

	question	context_para	context_sent	answer_text	answer_start	answer_end
0	To whom did the Virgin Mary allegedly appear i...	Architecturally, the school has a Catholic cha...	It is a replica of the grotto at Lourdes, Fran...	Saint Bernadette Soubirous	515	541
1	What is in front of the Notre Dame Main Building?	Architecturally, the school has a Catholic cha...	Immediately in front of the Main Building and ...	a copper statue of Christ	188	213
2	The Basilica of the Sacred heart at Notre Dame...	Architecturally, the school has a Catholic cha...	Next to the Main Building is the Basilica of t...	the Main Building	279	296
3	What is the Grotto at Notre Dame?	Architecturally, the school has a Catholic cha...	Immediately behind the basilica is the Grotto,...	a Marian place of prayer and reflection	381	420
4	What sits on top of the Main Building at Notre...	Architecturally, the school has a Catholic cha...	Atop the Main Building's gold dome is a golden...	a golden statue of the Virgin Mary	92	126

- The SQuAD 1.1 dataset is a collection of question-answer pairs designed to test machine reading comprehension. The dataset contains over 100,000 question-answer pairs
- The dataset was sourced from articles on various topics, from history and science to politics and current events.
- SQuAD focuses on the task of question answering. It tests a model's ability to read a passage of text and then answer questions about it.

What makes SQuAD so good?

- The key improvement that SQuAD makes on this aspect is that its answers are more complex and thus require more-intensive reasoning, thus making SQuAD better for evaluating model understanding and capabilities.
- The SQuAD dataset presents a challenging task for machine reading comprehension models, as it requires answering questions based on a single passage, whereas other datasets allow access to multiple documents.

RACE Dataset

Re**A**ding **C**omprehension **D**ataset from Examinations

	context	question	correct	incorrect1	incorrect2	incorrect3
0	My husband is a born shopper. He loves to look...	The husband likes shopping because _ .	he likes to compare the prices between the sam...	he has much money.	he likes the shops.	he has nothing to do but shopping.
1	My husband is a born shopper. He loves to look...	They never go shopping together because _ .	their ways of shopping are quite different	they hate each other.	they needn't buy anything for the family	they don't have time for it.
2	My husband is a born shopper. He loves to look...	Jimmy can't do the shopping well because _ .	he is absent-minded	he is young	he often loses his money	he doesn't like shopping
3	My husband is a born shopper. He loves to look...	Jimmy didn't buy what his mother wanted becaus...	he forgot some of them	the shop was closed that day	the policeman stopped him	he gave all the money to the beggar
4	Tea drinking was common in China for nearly on...	Which of the following is true of the introduc...	Tea reached Britain from Holland.	The Britons got expensive tea from India.	The Britons were the first people in Europe wh...	It was not until the 17th century that the Bri...

- Machine reading comprehension dataset consisting of 27,933 passages and 97,867 questions from English exams, targeting Chinese students aged 12-18. RACE consists of two subsets, RACE-M and RACE-H, from middle school and high school exams, respectively.
- Each question is associated with 4 candidate answers, one of which is correct.

Proposed FrameWork

We used split the problem into two parts:-

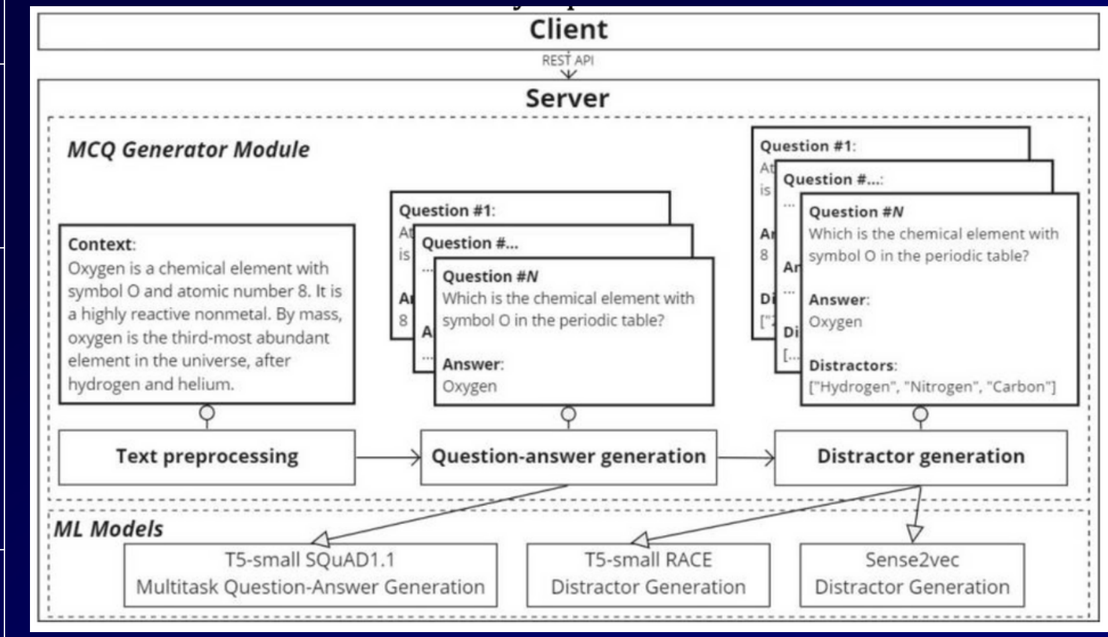
1. Question Answer Generation
2. Distractor Generation

1. Question Answer Generation

1	For Question Answer Generation, we fine-tuned of T5-small transfomer based model on SQuAD1.1 dataset as discussed earlier.
2	We also made use of Pytorch lightning data module in order to reduce the training time.
3	The T5-small transformer takes an input of 'answer'+<sep>+'context' and output format is 'answer'+<sep>+'context'. The answer can be replaced with a [MASK] token with replacement probability of 0.3 to avoid overfitting.
4	Hyperparameters selected for our model are:- i. No of Epochs = 5 ii. Source Max Token Length = 300 iii. Target Max Token Length = 80 iv. Batch Size = 16 v. Learning Rate = 0.0001

2. Distractor Generation

1	For Distractor Generation, we fine-tuned of T5-small transfomer based model on RACE dataset as discussed earlier.
2	We also made use of Pytorch lightning data module in order to reduce the training time.
3	The T5-small transformer takes an input of 'correct'+ <sep>+'question' +<sep>+'context' and output format is 'incorrect1'+<sep>+'incorrect2'+ <sep>+'incorrect3'.
4	Hyperparameters selected for our model are:- i. No of Epochs = 20 ii. Source Max Token Length = 512 iii. Target Max Token Length = 64 iv. Batch Size = 24 v. Learning Rate = 0.0001



The Generate Function

def generate(answer, context)

which consists of two functions:-

a. def generateQuestion(qgmodel: QGModel, answer: str, context: str) -> str:

b. def generateOptions(qgmodel: DescModel, answer: str, context: str) -> str:

Libraries used:-

a. PyTorch

b. PyTorch Lightning

c. Transformers

d. Gradio (For Frontend)

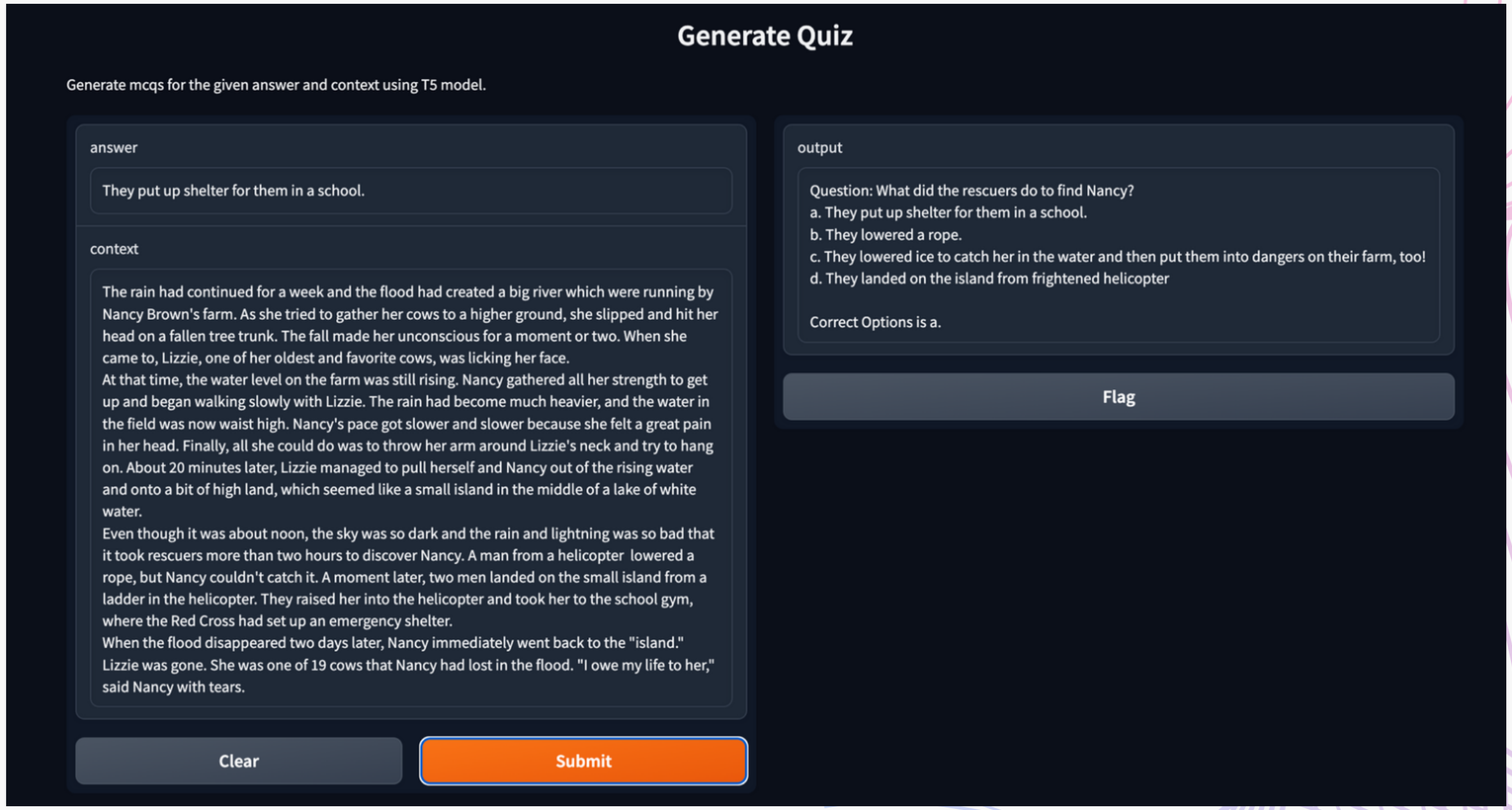
e. Basic ML Libraries such as NumPy, Pandas, Matplotlib, Sklearn, etc.

RESULTS

```
generate(df_test['correct'][1], df_test['context'][1])
```

[47] ✓ 1.8s

```
{'Question': 'What did Lizzie do to get her up?',
 'Options': {'correct': 'Nancy took hold of the rope and climbed into the helicopter.',
  'incorrect': ['Lizzie lowered the rope and took Nancy to the school gym.',
   "Lizzie was the first woman who had lost 19 cows in the flood, but she didn't know how to catch it at all!",
   "Lizzie was the only one of Nancy Brown'"]}}
```



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