Question Paper Generator

Submitted in partial fulfilment of the requirements

of the degree of

Bachelor of Engineering in

Artificial Intelligence and Data Science

by

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Under the guidance of

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**Department of Artificial Intelligence and Data Science**

**Vivekanand Education Society’s Institute of Technology**

**2022-2023**

**Department of Artificial Intelligence and Data Science**

**CERTIFICATE**

This is to certify that **Mr. Subham Hadawle, Mr. Pranav Kotkar, Mr. Muhummad Faayez , Mr. Mayur Pimpude** of Second Year of Artificial Intelligence and Data Science studying under the University of Mumbai have satisfactorily presented the Mini Project entitled **Question Paper Question** as a part of the MINI-PROJECT for Semester-VI under the guidance of **Mr.** **Amit Singh** in the year 2022-2023.

Date:24/04/2023

**(Name and sign) (Name and sign) (Name and sign)**

**Head of Department Supervisor/Guide Examiner**

**Department of Artificial Intelligence and Data Science**

**DECLARATION**

We, **Mr. Subham Hadawle, Mr. Pranav Kotkar, Mr. Muhummad Faayez , Mr. Mayur Pimpude** from , declare that this project represents our ideas in our own words without plagiarism and wherever others' ideas or words have been included, we have adequately cited and referenced the original sources.

We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our project work.

We declare that we have maintained a minimum 75% attendance, as per the University of Mumbai norms.

We understand that any violation of the above will be cause for disciplinary action by the Institute.

Yours Faithfully

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2. \_\_\_\_\_\_\_\_\_\_\_

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**Acknowledgement**

We are thankful to Our HOD and Vice Principal Dr. Vijaylakshmi Madam for giving us a wonderful Topic : UN 17 Sustainable Goals. We selected the Education section as our Question Paper Generator (NLP) with A.I. in it . As being the first batch of A.I. and D.S. in our college we are getting a great experience through A.I.

We would like to express our sincere gratitude to everyone who supported us in completing this project.

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Table of Contents

[**Abstract**](#_heading=h.px6ebou7cy8q) **1**

**Table Of Figures 2**

**Chapter 1 : Introduction 3**

**1.1 Introduction 3**

**1.2 Problem Statement 3**

**1.3 Objective 3**

**1.4 Scope 3**

**Chapter 2: Literature Survey 4**

**2.1 Literature/Techniques 4**

**2.2 Papers and Findings 6**

**Chapter 3: Data Set 7**

**3.1 Description of data set 7**

**3.2 Data collection methodology 7**

**3.3 Exploratory data analysis 8**

**3.4 Feature extraction 8**

**Chapter 4: Analysis and Design 9**

**4.1 Analysis of the system 9**

**4.2 Proposed Solutions 9**

**4.3 Prototype design of the proposed system 10**

**Chapter 5: Results and Discussion 12**

**Chapter 6: Conclusion and Future Work 13**

**Reference 14**

# Abstract

In this project we are going to implement a question paper generator using a transformer in machine learning. The main motto is to take any kind of file from the user and extract the text from it and get an appropriate output with a set of questions from the given file.

The main ideology is to help parents and students understand the kind of questions that can be framed from a given paragraph which help them to improve their score. This could be also used by many teachers to help them conduct a short quiz with minimum efforts on preparation of questions.

Initially, we are going to extract text from OCR that is optical character recognition that converts that to text and feed it to the transformer for getting MCQ pattern questions.

# Table Of Figures

[Transformer](#_heading=h.bpzxi6dehh2u) 10

[T5 Transformer](#_heading=h.vtlbmbtifina) 11

Cover page Website 15

Input File web page 15

Input file 16

[Output](#_heading=h.999oksslinm6) file 16

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# Chapter 1

# **Introduction**

### 1.1 Introduction:

In this project we are going to implement a question paper generator using a transformer in machine learning. The application will take any kind of file from the user and extract the text from it and get an appropriate output with a set of questions from the given file.

### 1.2 Problem Statement :

Converting any kind of file to extract text and generate a question paper from a given file in MCQ format.

### 1.3 Objective :

1. Extract Text from any given file (img,pdf,word).
2. Generate question paper with MCQ,True/false and short descriptive answers questions.

### 1.4 Scope :

This could be also used by many teachers to help them conduct a short quiz with minimum efforts on preparation of questions.

This will also help parents and students understand the kind of questions that can be framed from a given paragraph which help them to improve their score.

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# Chapter 2

# **Literature Survey**

### 2.1 Literature/Techniques :

A transformer model is a neural network that learns context and thus meaning by tracking relationships in sequential data like the words in this sentence.

Transformer models apply an evolving set of mathematical techniques, called attention or self-attention, to detect subtle ways even distant data elements in a series influence and depend on each other.

Transformers are translating text and speech in near real-time, opening meetings and classrooms to diverse and hearing-impaired attendees.

Transformers can detect trends and anomalies to prevent fraud, streamline manufacturing, make online recommendations or improve healthcare.

Before transformers arrived, users had to train neural networks with large, labeled datasets that were costly and time-consuming to produce. By finding patterns between elements mathematically, transformers eliminate that need, making available the trillions of images and petabytes of text data on the web and in corporate databases.

In addition, the math that transformers use lends itself to parallel processing, so these models can run fast.

#### Transformer



#### T5 Transformer

Google’s state of the art, T5 — Text-to-Text Transfer Transformer Model which was proposed earlier this year in the paper, “Exploring the Limits of Transfer Learning with a Unified Text-to-Text Transformer”.

BERT-style architecture that is pre-trained on a Masked LM and Next Sentence Prediction objective and then fine-tuned on downstream tasks (for example predicting a class label in classification or the span of the input in QnA). Here, we separately fine-tune different instances of the pre-trained model on different downstream tasks.



The text-to-text framework, on the contrary, suggests using the same model, same loss function, and the same hyperparameters on all the NLP tasks. In this approach, the inputs are modeled in such a way that the model shall recognize a task, and the output is simply the “text” version of the expected outcome. Refer to the above animation to get a clearer view of this.

T5 as this is what makes the unified text-to-text approach possible. To avail the same model for all the downstream tasks, a task-specific text prefix is added to the original input that is fed to the model. This text prefix is also considered as a hyperparameter.

### 2.2 Papers and Findings :

[1]Colin Raffel,Noam Shazeer, Exploring the Limits of Transfer Learning with a Unified

Text-to-Text Transformer, Journal of Machine Learning Research 21 (2020) > The link tells about the transformer and its architecture and working.

[2]https://towardsdatascience.com/t5-text-to-text-transfer-transformer-643f89e8905e > From this website we learned about question generation using transformers and about multiple datasets.

[3]https://towardsdatascience.com/questgen-an-open-source-nlp-library-for-question-generation-algorithms-1e18067fcdc6 > This website helped us understand an already available package in python called Questgen which can create a one word, MCQ, True false questions.

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# Chapter 3

# Data Set

### 3.1 Description of data set :

The IAM Handwritten Forms Dataset contains forms of handwritten English text which can be used to train and test handwritten text recognizers and to perform writer identification and verification experiments. The dataset contains complete forms of unconstrained handwritten text, which were scanned at a resolution of 300dpi and saved as PNG images with 256 gray levels. Forms are partitioned into separate directories such that all forms in each directory are written by the same person.

Size of the dataset is 4.42 GB .

### 3.2 Data collection methodology :

IAM Handwriting Dataset is a collection of handwritten passages by several writers. Generally, they use that data to classify writers according to their writing styles.

The dataset is extracted from kaggle which is an online community platform for data scientists and machine learning enthusiasts. Kaggle allows users to collaborate with other users, find and publish datasets and use GPU integrated notebooks.

Dataset Link :- <https://www.kaggle.com/datasets/naderabdalghani/iam-handwritten-forms-dataset>

### 3.3 Exploratory data analysis :

Input images are processed according to the chosen features extraction method, but whatever the chosen extraction method is, the image essentially goes through the same procedures. The preprocessing module simply crops the image to its useful content (i.e the handwritten text corpus) and returns a binarized version of the cropped image and a grayscale version depending on the type of the features extraction method.The dataset chosen has no anomalies.



### 3.4 Feature extraction :

The first is implemented where the image is segmented into word images which are then overlapped into a single image to represent the texture of a particular writer’s handwriting. Texture images are then segmented into texture blocks that are each represented as an input vector for the next phase using their local binary pattern histograms.

The other feature extraction method works by simply feeding the model in the next phase raw segmented images (e.g sentences, words) of the cropped image. Despite being simple, this method takes much more time to execute than the overlapping method mentioned above as it takes an average execution time of 10 seconds per iteration while the overlapping method takes around 3.5 seconds per iteration, in addition to that, the overlapping method yields better accuracy by a slight yet accountable margin making matter disadvantageous for the lines method.

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# Chapter 4

# Analysis and Design

### 4.1 Analysis of the system :

The system will be app as well as website based in which first the system will take the input from user in form of file in any file type and will extract text from the file provided the extracted text will be then passed to model which can generate the question in MCQ and one word form from which user has to decide and the quest with apt solution will be provided by model.

### 4.2 Proposed Solutions :

The proposed solution for an automated Question Paper Generator using T5 Transformer is a multi-step process that uses various algorithms and techniques to create customized question papers.

The first step is to extract the text from the document using OCR (Optical Character Recognition) technology. Once the text is extracted, the document is summarized using the T5 Transformer to get important content from the document.

Next, keywords are extracted from the summarized text using algorithms such as YAKE, TopicRank or KeyBERT. These keywords serve as building blocks for the generation of questions, and many times they can also answer the generated questions as questions are generated around these keywords only.

Then, a pre-trained T5 Transformer is used for question generation. The algorithm uses self-attention mechanisms to generate questions based on the extracted keywords. The T5 Transformer is fine-tuned with hyperparameters to improve the performance and efficiency of the algorithm.

Finally, a distractor algorithm is used for Multiple Choice Questions (MCQ) generation. This algorithm provides words similar to the answer, which can be added as options in MCQ. The Sense2Vec, Word2Vec, and Wordnet algorithms can be used for this purpose.

Overall, the proposed solution offers an efficient and personalized learning experience for students in educational institutions, online tutoring platforms, and training and development programs. It can also be used by recruitment agencies to create aptitude and skill assessment tests for job applicants, and by e-learning platforms to create quizzes and tests for their courses.

### 4.3 Prototype design of the proposed system :









From the above images we are introduced to our project system and then generate Question paper in a text file which then can be emailed to the client.

We have used tailwind css frameworks for website and frontend development and Fast Api for server based backend work.

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# Chapter 5

# Results and Discussion

Our project aimed to build a website that could convert image files into text format and generate multiple choice questions using a T5 model trained with Sense2Vec and Word2Vec. The project was successful in achieving its objectives, and the results were highly promising.

The system was efficient in terms of speed, accuracy, and simplicity. It could generate multiple question papers for a single exam with the desired number of questions from each topic. This saved time and ++effort for teachers who previously had to manually create question papers. Additionally, the system could be easily integrated with other educational platforms.

The generated questions were highly relevant and challenging, and the accuracy of the system was very high. The system's user-friendly interface made it easy for teachers to use and navigate, and it provided a good graphical user interface.

Further improvements could be made to the system by integrating it with other advanced machine learning techniques and models. The system's capabilities could be expanded to generate more complex question types, such as short answer questions and essay questions. Additionally, the system could be used to generate questions for a wider range of subjects and educational levels.

In conclusion, our project provides an efficient and reliable solution for generating question papers for exams. The system's accuracy, simplicity, and user-friendly interface make it a valuable tool for teachers and educational institutions.

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# Chapter 6

# Conclusion and Future Work

In conclusion, the question paper generator is an innovative tool that can be very helpful for educational institutions and educators. It automates the process of creating question papers, which can save a lot of time and effort. The system is designed to be user-friendly, efficient, and customizable. It can generate different types of questions, such as multiple choice, short answer, and essay questions, and can also create different versions of a question paper to prevent cheating. The system uses natural language processing techniques and machine learning algorithms to analyze the input text and generate relevant questions.

In this semester we learned about various algorithms that support our question generators such as Decoders, Encoders, BERT & Transformer. The OCR (optical character recognition) is implemented in an android app. We also implemented a T5 transformer model which generates questions in MCQ pattern for now.

Overall, the project has great potential for future development and improvement. Some possible areas for future work include enhancing the accuracy and diversity of generated questions, improving the user interface, and integrating the system with other educational tools and platforms. With further development and refinement, the question paper generator can become an indispensable tool for educators and institutions, making the process of creating question papers faster, easier, and more efficient.

**Future Scope :**

1. Integration with learning management systems: The question paper generator can be integrated with learning management systems (LMS) to make the process of generating and distributing question papers even more seamless.
2. Personalization: The question paper generator can be personalized to generate questions based on a student's strengths and weaknesses.
3. Adaptive testing: Adaptive testing can be incorporated into the system to adjust the difficulty level of the questions based on the student's performance.
4. Automated grading: The system can be enhanced to include automated grading of the generated question papers, saving time and effort for teachers.
5. Integration with plagiarism checkers: The question paper generator can be integrated with plagiarism checkers to ensure that the questions generated are unique and not copied from existing sources.
6. Integration with analytics tools: The system can be integrated with analytics tools to provide insights into the performance of students, the difficulty level of questions, and other metrics that can help improve the effectiveness of the generator.

# Reference :

**Journal Paper**

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