Automatic Question Generation from Handwritten Lecture Notes Using TrOCR Text Recognition and T5 Language Processing

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Abstract—This research involves the creation and evaluation of a system that allows for text extraction and automatic question generation (AQG) using a T5 and TrOCR pipeline. With the use of a Raspberry Pi 5, web camera, and a touchscreen display, factoid- type questions are created from image captures of singlecolumn handwritten notes that only contain textual information. The T5 large language model (LLM) used was fine-tuned using the Stanford Question Answering Dataset (SQuAD) for facilitating question generation. Evaluation was done using a procured set of handwritten notes on a cybersecurity, and networks undergraduate class described by the word error rate (WER) for content extraction, and the Recall-Oriented Understudy for Gisting Evaluation (ROUGE) as well as the Bilingual Evaluation Understudy (BLEU) for question generation. This research helps to promote the ease of creation of learning materials in learner education.

Index Terms—Large Language Model, Optical Character Recognition, Automatic Question Generation, Handwritten Lecture Notes, Raspberry Pi

I. INTRODUCTION

Handwritten lecture notes can be considered as the standard way for capturing and facilitating learning. These lecture notes are learning artifacts that may contain valuable information that can be the basis for other learning elements. One of these learning elements involve review questions. These questions are collected in the form of quizzes and question banks that allow for the enforcement of learning across various fields. Since the introduction of artificial intelligence (AI) to education, there have been several advancements that are attributed to improving the learning experience of students. Automatic question generation (AQG) is one of such advancements. It is achieved using large language models (LLMs) from various inputs that created questions for the assessment or learning enforcement of students.

II. MATERIALS AND METHODS

- A. Hardware Development
 - 1) System Block Diagram:
 - 2) Experimental Setup:

- B. Software Development
 - 1) System Flowchart:
 - 2) Model Fine-tuning:
- C. Data Gathering
- D. Testing and Evaluation

III. RESULTS AND DISCUSSION

IV. CONCLUSION AND RECOMMENDATIONS

A. Maintaining the Integrity of the Specifications

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Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \tag{1}$$

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Please don't use the {eqnarray} equation environment. Use {align} or {IEEEeqnarray} instead. The {eqnarray} environment leaves unsightly spaces around relation symbols.

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 word alternatively is preferred to the word "alternately"
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Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is "Heading 5". Use "figure caption" for your Figure captions, and "table head" for your table title. Run-in heads, such as "Abstract", will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

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Head	Table column subhead	Subhead	Subhead
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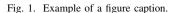


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ACKNOWLEDGMENT

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