GUSTO UNIVERSITY

Unit-16: Computing Research Project

The Investigation for the enhancement of Self-Study Learning through Big Data-Driven AI Chat Bot

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Abstract

With the constantly evolving of the Big Data technologies based Artificial Intelligence conversational Chatbot, the way students perform their learnings has revalorized from searching resources from search engines to communicating with chatbot. Thus, this study is intended to explore how GUSTO student can take advantages from applying Big Data driven AI chatbot for their self-studying processes. This research will be conducted by collecting survey data from 80 people through mix-method approach, targeting to the GUSTO students who currently utilize AI driven chatbot tools like ChatGPT.

Keywords: AI chatbot, Big Data, self-study, educational technology, GUSTO university.

Research Purposed Title

"The Investigation for the enhancement of Self-Study Learning through Big Data-Driven AI Chat Bot"

Introduction

To update the knowledge base, self-study acStivities are a main learning process in higher education (Dörrenbächer and Perels, 2016). With the constantly evolving of the Big Data driven AI chatbots like OpenAI, Gemini, etc., students get mainly depend on them to get applicable and valuable information for their questions, which can help with their self-study processes. In parallel, GUSTO university become large with the expanding programs like IGCSE besides its base programs, which can lead to a limitation of individual attention from instructors for answering questions and giving guidelines to each GUSTO student. The rise of AI chatbots emerges as a solution to effectively address this issue. Research states that AI chatbots can support for the improvement of students' learning outcomes and their academic performances by immediately answer their specific questions,

providing clear explanations, and additional resources without human intervention. (Lasha Labadze, Maya Grigolia, Lela Machaidze, 2023). This perfectly helps self-study of GUSTO students where need strong guidelines and instant answers or explanations.

The result of this research contributes to the insight of using chatbots to enhance self-learning of students in higher educational institutions like GUSTO university. Also, this research aims to give insights on the potential challenges associated with the utilization of Big Data driven AI chatbot in the aspect of GUSTO university and its students.

Research Question

"What are the effectiveness of GUSTO students' Self-Study Learning through Big Data Driven AI chatbot? "

Aim

This research project aims to fill the gap of knowledge regarding the Big Data driven AI chatbot by exploring its effectiveness in enhancing self-study practices among GUSTO students without regarding to future solutions for integrating chatbot into the infrastructure of GUSTO university.

Objectives

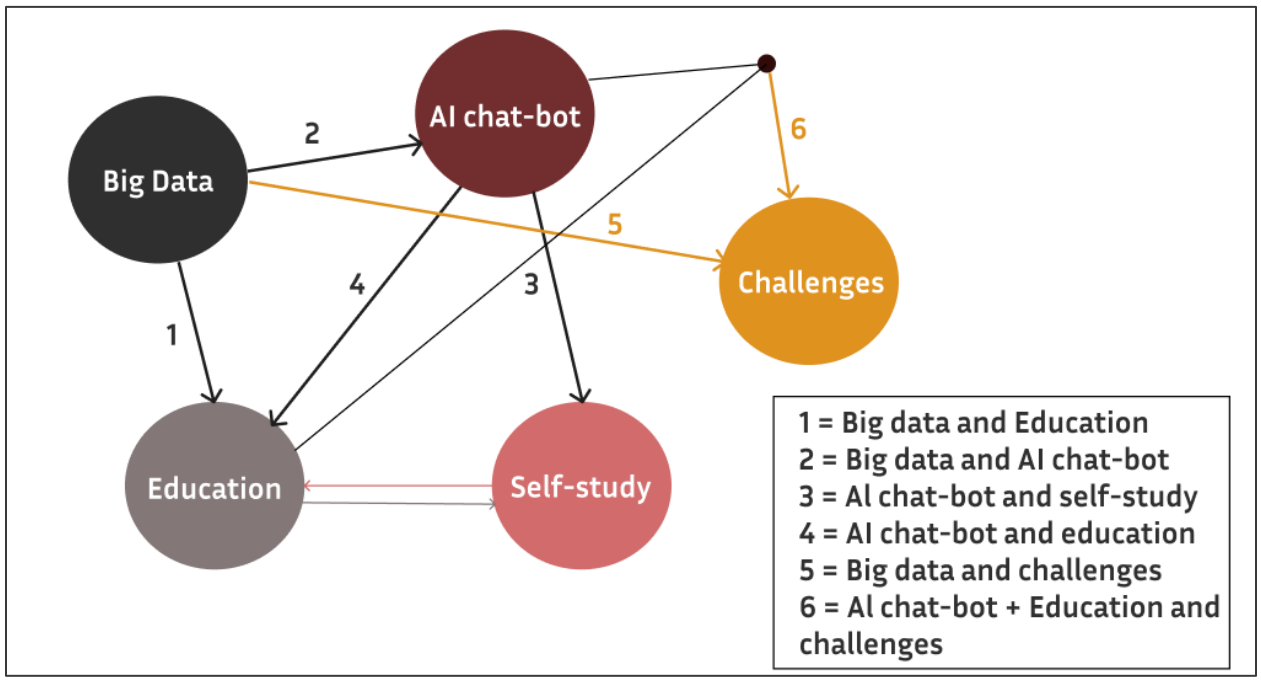
1. To explore the effectiveness of using Big Data in GUSTO university's AI chat bot to enhance self-study practices among GUSTO students.
2. To study the impact of GUSTO university's AI chatbot on Self-study experience of GUSTO students.
3. To identify potential challenges associated with the usage of Big Data driven AI chatbot for enhancing GUSTO students' self-study aspect.

Hypothesis

Utilizing the Big Data Driven AI-Chat-bot positively influences the self-study habits and enhances the academic performance of GUSTO students.

Literature Review

Papers are interconnected in the below mentioned diagram to get sufficient knowledge base to fulfill the research objectives.



01. Chatbots as a Tool to Scale Mentoring Processes: Individually Supporting Self-Study in Higher Education

In this paper, researcher focus on how chatbots effective as a tool to scale mentoring process in higher education, especially in supporting self-study to students. Researcher employed both qualitative method (interviews, survey with students and workshops with lecturers) and quantitative method (analysis on chatbot usage data and evaluation on interaction counts & survey scores).

Neumann did a thorough research on the design and implementation of FeedBot (provide automated feedbacks on students' writing tasks) and LitBot (help in reading activities) alongside with the in-depth analysis of them in enhancing student engagement and feedback in the large university setting. This research's findings point that chatbots can support traditional mentoring effectively and give immediate supports to each of 700 students. Students express positive feedback that they appreciate these chatbots' ability on giving automated support for their self-study tasks. They also point its weakness that these bots cannot adaptable to the personalized students' questions because they rely much on the predefined responses.

This research revealed not only the ability of chatbots to assist in scaling mentoring processes but also the facts that they need to maintain a balance between AI and human mentoring.

The main gap of this research is lacking the long-term impacts of two chatbots on mentoring and student outcomes. Although Neumann provides the initial results, the future research should focus on the in-depth evaluation the effectiveness of such chatbots in wide academic terms.

02. An Assessment of the role of AI chatbots as a communication medium in higher education

In this research book, the author mainly explored the impact of AI chatbots on communication and acceptability in higher education based on the **UTAUT2** framework.

UTAUT2 = Unified Theory of Acceptance and Use of Technology 2

This study adopted a qualitative approach including semi-structured interviews and open-ended surveys to collect non-numerical data from students from Sweden, Norway, Finland, and the Czech Republic. Researcher utilize

exploratory case study to examine students' thoughts on the potential use of AI chatbots in higher education.

The research finds that student often contact university staff for information about common topics: exam dates, course requirements, and admission policies. They rarely asked single topic and asked multiple types of questions within a month. This shows that they need timely response and possibly reflects that university cannot provide sufficient information. However, the findings indicated that chatbots can improve administrative efficiency with their ability in handling routine questions. Slepankova identified key themes that students' opinions on chatbots which are: **Fast support, no judgement, Simplicity Kill, Limited Capabilities, Lack of Concerns**. The research could also identifies the factors influencing the acceptance: **PE, EE, NE, HA**, and **FC**. (Slepankova, M., 2021)

PE = Performance Expectancy, EE = Effort Expectancy,

NE = Nonjudgmental Expectancy, HA = Habits,

FC = Facilitating Conditions

The paper's key strengths are that it can analyze the student interactions with university staff and explore detailly AI chatbot capabilities and students' acceptances. The notable gap is that they study didn't delve into the practical challenges and barriers to implement within specific university even though it highlights the benefits and areas for AI chatbot application. According to Slepankova's notes, existing research can extensively covers the PE and EE among acceptance's factors but there are a few studies that address the emotional aspects of nonjudgmental nature. These gaps suggest that future search should focus on those area more deeply.

03. Chatting Up the Grade: An Exploration on the Impact of ChatGPT on Self Study Experience in Higher Education

In the 2023 research paper by Larsson and Eriksson, researchers mainly focused on the impact of ChatGPT on self-study of higher education students and its integrating into LMS.

Researcher conducted online survey to 79 participants across various field of study to know the general usage of ChatGPT among students. Based on the survey result, a diary study was conducted with 5 participants over 3-4 weeks. In-depth post-study interviews followed by diary study were conducted to get deeper understanding of the experience of participants. Moreover, researchers conducted interviews with a pedagogic consultant to get insights about usage of ChatGPT from universities perspective. These collected data were iteratively analyzed with Grounded Theory method.

By analyzing each participants' results, the below main findings are achieved.

- Due to the ease of use and simple layout of ChatGPT, participants find it a useful tool for self-study in a short time.
- Most participants viewed ChatGPT as an effective tool for time-saving shortcut with concise responses.
- Some students worried about the reliability and accuracy of information that provided by ChatGPT and its bias algorithm nature.
- A certain group of students reported that there is no big impact on their self-studies since it cannot replace their efforts and routines.
- Participants stated that the fully implementation of ChatGPT into school system can change the learning methods.

The main strength of this research is that it deep delves into the actual experiences of students on interacting with ChatGPT and this study also point out

the consultant's POVs on the case that student using ChatGPT that give insight about cheating on assignments and exams, the issues of plagiarism and ways to integrate ChatGPT into classrooms. In this paper, research emphasize not only on the effectiveness of ChatGPT in students' self-study but also on the UX (user experience) to suggest the appropriate designing of AI tools to be effective and engage & user-friendly.

Even though Eriksson and Larsson (2023) can highlight the current state and benefits of ChatGPT for self-studies, there is still a gap on the longitudinal research on the long-term impact of using AI on student's critical thinking skills and reliance on traditional study methods. These gaps point that future research should focus on those areas to fill the knowledge gap to grasp Chatbot's role in education.

04. Big Educational Data & Analytics: Survey, Architecture and Challenges

In this paper, researchers intended to do a comprehensive survey of the current and emerging paradigms for Big Educational Data.

This paper covers a lot of essential topics regarding to big educational data. It thoroughly explores about educational data sources like LMS, MOOCs, OCW, OER and social media platforms, data collection, EDM, technological POVs, and various big data analytics methods. In technological aspects, researcher deeply discussed big data platform like Hadoop, Spark and Samza and their challenges of deploying in education settings. Further, this paper delves into advanced analytics methods used in big educational data analytic such as predictive analytics, learning analytics, sentiment analytics and immersive learning. (Ang, K.L.M., Ge, F.L., Seng, K.P., 2020.)

The main strength of this paper is that it delves into the both technological and educational perspectives related to Big data. These give insight about the current landscape and potential of big educational data to improve learning

outcomes together with the technical challenges that highlights how complex to implement such systems. Moreover, the author presented practical examples and experimental insights about various big data tools and platforms.

The critical gaps in this paper are that its topics doesn't cover on specific real-world applications or techniques and it doesn't provide the thorough analysis on the ethical implications and privacy issues related to big educational data. These gaps suggest that the future research should focus on addressing ethical issues and focus on specific applications of one of these big educational technologies.

LMS = Learning Management Systems, **MOOCs** = Massive Open Online Courses, **OCW** = Open Course Ware, **OER** = Open Educational Resources, **EDM** = Educational Data Mining.

05. Chatbots in Education and Research: A Critical Examination of Ethical Implications and Solutions

In this paper, researcher used an exploratory and interpretivist methodology. It intended to examines the ethical concerns and potential impacts of using AI chatbots in education and research field. The researcher collected in-depth data by using qualitative methods and analyzed them using a thematic analytical framework.

Kooli (2023) research the potential and challenges of using chatbots in academia. This research emphasizes on the ethical concerns which specifically are biases in AI responses and the misuse in assessments and the reduction of critical thinking and creativity of students because of easily accessible AI chatbots. In parallel, it also identifies the significant advantages of AI chatbots.

The key strengths of this paper are that it examines not only the positive impacts such as enhancing student engagement and supporting the research process to streamline but also it could identify the theme that AI chatbots lead to

perpetuate biases and impact on the integrity of students' assessments. This papers not only indicate the point that AI chatbot can improve efficiency and automate the repeated tasks but also the truth that they still cannot replace the human educators' and researchers' ability in personalized judgement and creativity.

According to the Kooli (2023) statement, the research on the implementation of chatbots are plenty but there are only few researches that examine their long-term effects on students' ability on critical thinking and independent problem-solving skills. These gaps suggest future research direction that focus on the longitudinal research on the impacts on students and the specific guidlines or considerations of their ethical implications.

06. Time to Revisit Existing Student's Performance Evaluation Approach in Higher Education Sector in a New Era of ChatGPT: A Case Study

This research paper intended to observe the impact of ChatGPT on students' assessment integration and on HEIs' existing performance evaluation models.

Researcher compared graded student's work (from courses randomly chosen by Python program) with ChatGPT-generated answers (which is quais-experimental design). This focus on BBA-HRM (Bachelor of Business Administration in Human Resource Management) program which need both technical and soft skills. Instructors check and grade ChatGPT work without knowing its source to avoid bias. Researchers did case analyses, empirical study, self-reflection group-work, and calculation-based assignments to measure the capabilities of ChatGPT on various complex levels.

The findings showed that ChatGPT can effectively solved complex academic assignments in the same level with Highest-scoring students. It passed Turnitin's plagiarism checks with small number of detected plagiarisms. Existing AI-detector tools like GPTZero and Copyleaks didn't detect AI-generated text fully. These

findings indicated that HEIs need a better AI-detectors to make sure the authenticity of students' work and need to redesign assessment methods to enforce academic integrity. If so, researcher stated that ChatGPT can be a valuable tool for education. (Chaudhry, I.S., Sarwary, S.A.M., El Refae, G.A. and Chabchoub, H., 2023.)

This study has done to only BBA-HRM field so it was geographically limited and limited sample sizes. The future research should focus on more wide and longitudinal studies to evaluate the long-term impact of ChatGPT usage.

07. Barriers to the Implementation of Big Data Technology in Education: An Empirical Study

This study is mainly focus on the identification of key barriers that need to be solved before implementing Big Data technologies in education.

Researchers used online survey methods with quantitative research methodology and distributed via Survey Monkey. This survey targeted professionals in ICT, Education, and other stakeholders (ministries, national statistics agencies, research organizations). Data from 358 participants from various countries are collected and analyzed by using Statistical Package for Social Sciences (SPSS). (Gloria Iyawa, 2020) Researchers categorized and presented survey-results in tables and charts which give a clear overview of the findings.

From the researcher' survey, these barriers were captured. It described that 81% of respondents lack resources to implement big data, 78% has insufficient experience, 70% lack necessary skills to use big data technologies, 69% indicated that lack of proper government policy on technologies and 56% indicated that technology requirements might be one of the barriers. 89% of respondents answered that they are familiar with Big data technologies and 98% stated that big data is important in education. Researchers carefully analyzed other results regarding participants' geographic (Africa, Asia and America), their work

experiences and connected those results with the above results to get insightful findings. (Jude Osakwe, 2020)

Even though researchers could analyzed quantitative data to get insights, the study lack a depth qualitative data analyzed on main barriers which can be a future research focus point. Researcher stated that future research also should do on the challenges of interoperability if data must be consolidated.

08. AI Solution with Interactive Communication: AI-enhanced Chat for Big Data in Education

In this research, researcher focused on the exploring roles of AI-enhanced chatbots using big data in e-learning within higher education.

Researcher used qualitative case study approach because he/she thought that this approach can explore the participants' perceptions. The study is targeted to 12 faculty members from engineering and computer science field who already familiar with AI and big data. Researcher used purposive sampling to select participants. Researcher collected data with semi-structured interviews that can collect rich and detailed qualitative data regarding the use of AI in academic setting. Researcher used NVivo software for coding and thematic analysis for analyze interview transcripts systematically. (Asmita Thakore, 2021)

From this study, researchers developed 3 main themes together with sub-themes to highlight the what participants see AI in e-learning. 3 main themes: Benefits to professors (together with sub-themes: Important AI, Skill improvement, Support for faculty), Benefits to Students (together with sub-themes: Helpful tool, Global information access), Ease of Technology vs. Use. (together with sub-themes: Conversational response, Advancements and integration, Helpful feedback). (Asmita Thakore, 2021)

From these themes, researcher extracts key roles of AI chatbots in e-learning from different perspectives such as Professors indicated that AI chatbots assist them

by automating repetitive tasks, providing quick references or course material and help them in student feedback.

The study was limited to 12 participants so future research should focus on more extensive sample & fields and collect quantitative impact of chatbots on student performance metrics.

Research Methodology

Research onion model is applied for this research as well.

Onion Layer	Choice (Approaches & Methodologies)
Philosophies	Pragmatism
Approaches	Deductive
Strategies	Survey
Choices	Mixed Methods
Time horizons	Cross-sectional
Techniques and Procedures	Data collection and Data analysis

Conclusion

In summary, this report encompassed the research abstract, research question, objectives, hypothesis, as well as the selecting section of appropriate research methodologies and approaches. For supporting the researcher's knowledge base and achieving theoretical framework, the research paper in the similar fields has been reviewed as a summarized literature review. Even though this secondary research investigates the Big Data driven AI chatbot and its impact on students' self-study and academic performance, there can have certain limited study due to the constraint time-frames and limited access to the broader aspect and real-life

system as well. Nevertheless, this study could be possibly contributed to the insights and ideas regarding the fields of Big data, AI, chatbot, education that can give further steps to do for educators, policymakers, and developers.

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Main Content – 2490 words (From Abstract to Conclusion)

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