Reclaiming Africa's Intellectual Futures

Utilising Artificial Intelligence Chatbots for Research 5.0: Empowering Student 5.0 Experience

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University of Pretoria

Research, Learning and Teaching Sessions
31 March 2025
11h00 -12h00

Define tomorrow.

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POINTS OF DISCUSSION

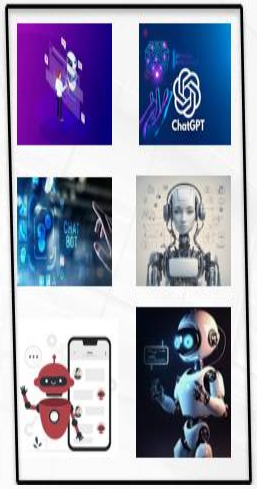
Presentation covers the following:

- Introduction
- Problem statement
- Context of research 5.0
- Context of student 5.0
- Purpose of the study
  - ✓ Objectives of the study
- Role of AI chatbots for research 5.0
- Types of AI chatbots for research 5.0
- Functions of AI chatbots for research 5.0
- Demerits of AI chatbots for research 5.0
- Ethics of AI chatbots for research 5.0
- Recommendation
- Conclusion

INTRODUCTION

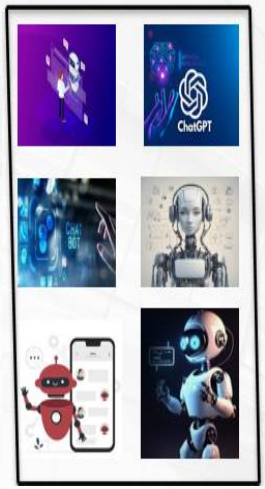
- AI chatbots are smart computer programmes that can talk with people and provide quick answers to their questions.
- In Research 5.0, which focuses on using advanced technology to improve studies, AI chatbots help researchers find information faster and more efficiently.
- If used effectively, these chatbots can search for data, summarize articles, and suggest useful sources, saving researchers a lot of time.
- By handling repetitive tasks, AI chatbots allow researchers to focus on creativity and innovation.
- With their ability to learn and improve, AI chatbots make research more accurate and effective.
- They can analyze large amounts of data, identify trends, and even assist in writing research reports.
- This makes research not only faster but also more reliable, especially when used ethically.
- As technology continues to advance, AI chatbots will play an even bigger role in shaping the future of research, making it smarter and more efficient than ever before.

PROBLEM STATEMENT



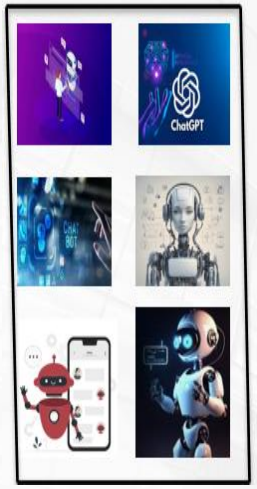
- The problem is that students might become too dependent on AI chatbots due to a lack of understanding of how to use them properly.
- Overreliance can weaken their critical thinking and creativity since AI can handle tasks like writing, literature reviews, and formatting—even analyzing and interpreting academic work.
- This could lead to research where the student's own voice is missing, making it hard for them to explain their own work later.
- However, if used correctly, AI chatbots can be valuable tools for literature reviews, collaboration, reference management, peer review, and editing.

CONTEXT OF RESEARCH 5.0



- Research 5.0 is a modern approach to research that combines advanced technology with human creativity and ethics.
- It builds on previous research models but focuses on making research more efficient, accurate, and people-centered.
- The goal of Research 5.0 is to use smart tools like AI, big data, and automation to help researchers find solutions to complex problems faster.
- However, it also ensures that human values, such as fairness and integrity, remain a priority.

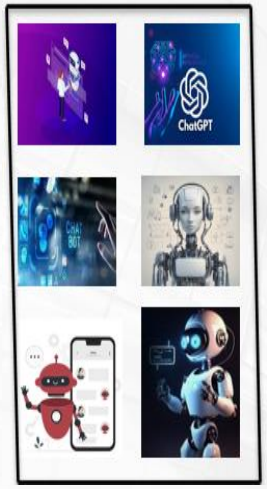
ASPECTS OF RESEARCH 5.0



The follow are the aspects:

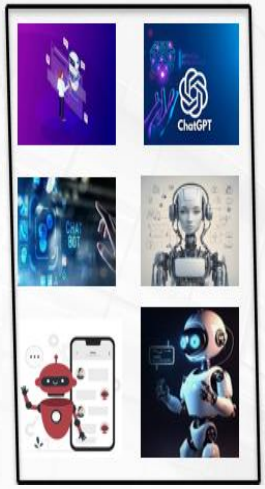
- **Technology and AI Integration:** Research 5.0 makes use of AI, machine learning, and automation to process large amounts of data quickly and accurately. This helps researchers save time and focus on creative problem-solving.
- **Ethics of AI**: It promotes responsible innovation, ensuring that scientific advancements are used for the greater good without harming nature or society.
- **Smart Decision-Making:** With the help of AI and data analytics, Research 5.0 allows researchers to make better decisions based on facts and trends. This leads to more reliable and impactful discoveries.

CONTEXT OF STUDENT 5.0



- Student 5.0 is a modern approach to learning that focuses on using advanced technology while keeping education human-centered.
- It aligns with Research 5.0, which combines AI, big data, and automation with human creativity and ethical values.
- Student 5.0 prepares learners to use smart tools, think critically, and contribute to research and innovation.
- The goal is to create students who are not just information consumers but also active problem-solvers and researchers in a fast-changing world.

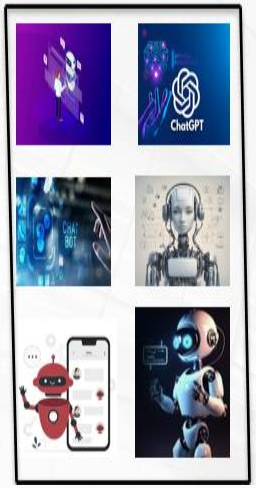
ASPECTS OF STUDENT 5.0



The following are the aspects:

- **Technology-Enhanced Learning**: Students 5.0 use AI-powered tools, virtual labs, and online resources to enhance their learning and research skills. They can access real-time information, conduct experiments virtually, and collaborate with global researchers.
- **Critical Thinking and Problem-Solving:** Instead of just memorizing facts, Student 5.0 focuses on analyzing information, questioning sources, and finding solutions to real-world problems. This prepares them for meaningful contributions to Research 5.0.
- **Ethical and Responsible Research:** Student 5.0 is trained to conduct research responsibly, ensuring that studies are fair, sustainable, and beneficial to society. They learn about the ethical use of AI and data privacy.

PURPOSE OF THE STUDY



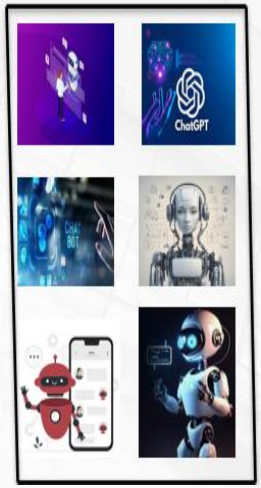
Purpose

- The purpose of this paper is to provoke discussions on the use of AI chatbots for research 5.0.
- **Objectives of the study**

The following are the objectives:

- Identify the types of AI chatbots relevant for conducting research 5.0.
- Examine the functions of AI chatbots in conducting research 5.0.
- Evaluate the demerits of AI chatbots in conducting research 5.0.
- Assess the ethics of using AI chatbots in conducting research 5.0.
- Recommend a framework for using AI chatbots for conducting research 5.0

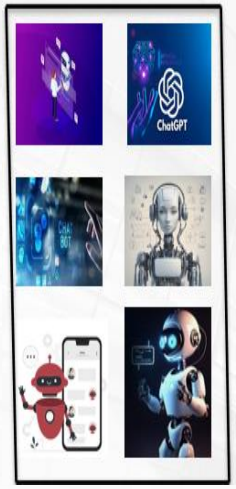
ROLE OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0



The following are the roles:

- **Quick Access to Information:** AI chatbots can search for data, summarize articles, and provide relevant research materials in seconds.
- **Round the Clock:** Students and researchers can ask questions anytime and get instant answers.
- **Simplifies Complex Topics:** Chatbots can explain difficult concepts in simple language, making learning easier.
- **Suggests Research Ideas:** They can help generate new research topics and find gaps in existing studies.
- **Helps with Writing & Editing:** Chatbots can assist in writing research papers, checking grammar, and improving sentence structure.
- **Data Analysis Support:** Some AI tools can process and analyze large amounts of research data quickly.
- **Enhances Collaboration:** AI chatbots can help teams communicate, share knowledge, and organize research work more effectively.

TYPES OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0



The following are the types:

Informational Chatbots

These AI chatbots are designed to provide information on specific topics or fields of study.

They can answer questions, provide definitions, explain concepts, and offer references to relevant resources such as research papers, articles, or websites.

This an example:

ResearchBot – ResearcherBot is designed to assist researchers in navigating the vast landscape of academic literature, providing quick access to relevant papers, abstracts, and summaries. It can be helpful in:

- ❑ Literature review
- ❑ Article summaries
- ❑ Citation assistance
- ❑ Recommend papers and journals
- ❑ Research methodology support

TYPES OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0

Q&A AI Chatbots

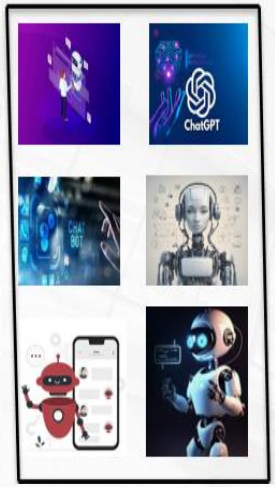
Q&A chatbots are trained to answer specific questions posed by researchers. They can be customized to provide responses based on pre-defined knowledge bases and databases relevant to a particular research domain.

They are trained on large datasets or knowledge bases and use NLP techniques to understand user inquiries and provide relevant answers.

The following are the example of Q&A Chatbots

- **IBM Watson Assistant:** It uses machine learning algorithms to understand user intents and context, enabling it to provide accurate responses.
- **QuillBot:** It can answer questions about grammar, writing style, paraphrasing, and more, helping researchers improve their writing skills.
- **ChatGPT:** It provide responses to user queries based on its training data. It can provide answers to a wide range of questions across various topics.

TYPES OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0



Conversational Agents

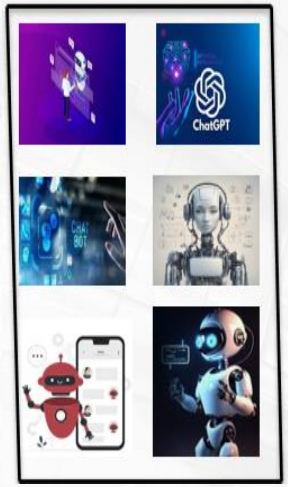
Conversational agents, also known as virtual assistants or dialogue systems, engage researchers in natural language conversations.

They can assist researchers by providing guidance, answering inquiries, facilitating discussions, and performing tasks such as scheduling meetings or setting reminders.

The following are the examples:

- **Siri:** Researchers can interact with Siri using voice commands to perform tasks such as setting reminders, sending messages, making calls, or answering questions.
- **Google Assistant:** It uses natural language processing to understand user queries and provide relevant responses and perform various research task.
- **ChatGPT:** It engages in text-based and voice command conversations with users, providing responses that are contextually relevant and coherent across a wide range of topics.

TYPES OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0



Research Assistants

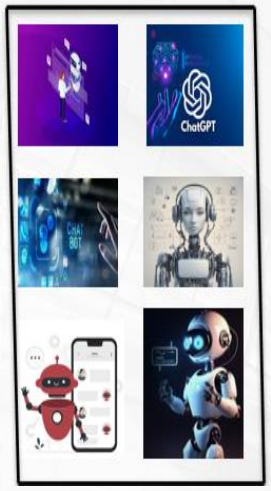
These chatbots are specifically designed to support researchers throughout the research process.

They can help with tasks such as literature review, data collection, hypothesis generation, experimental design, data analysis, writing assistance, and collaboration management.

The following are the examples:

- **IBM Watson Discovery:** It can ingest large volumes of unstructured data from various sources such as research papers to aid researchers in their work.
- **Meta:** It uses NLP and ML algorithms to analyze and categorize scientific articles, making it easier for researchers to find relevant information.
- **Grammarly:** assistant that helps users improve their writing by providing suggestions for grammar, punctuation, style, tone, and clarity.
- **Scite:** Scite is a platform that uses AI to analyze scientific articles and provide citation context for research claims.
- **Writefull:** It helps researchers with grammar, style, and structure, and also offers a feature to search for similar phrases in published research to ensure the correct academic tone.

TYPES OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0



Peer Review Chatbots

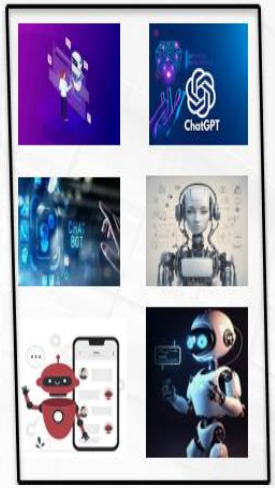
These chatbots assist researchers in the peer review process by providing feedback on research manuscripts, evaluating writing quality, identifying errors or inconsistencies, and suggesting improvements to enhance the overall quality of the submission.

Peer review chatbots are tools designed to assist in the peer review process by providing feedback on research manuscripts, evaluating writing quality, identifying errors or inconsistencies, and suggesting improvements.

The following are the examples:

- **PubPeer:** is a platform that allows researchers to post comments and feedback on published research articles.

TYPES OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0



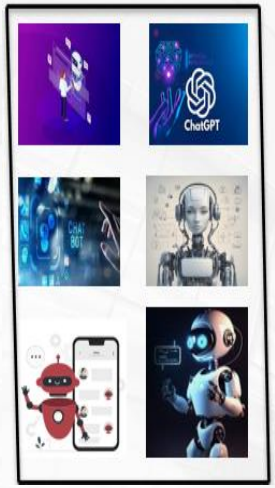
Personalized Learning Chatbots

Personalized learning chatbots assist researchers in acquiring new knowledge, skills, or competencies tailored to their individual learning objectives and preferences.

They can recommend relevant resources, deliver adaptive learning experiences, and track progress over time. Below are examples:

- **Brainly**: It offers a chatbot interface for students to ask questions, get instant answers, and receive personalized recommendations for further study based on their learning goals and interests.
- **Quizlet:** Its chatbot feature provides personalized recommendations for study materials, flashcards, and quizzes based on learners' preferences, learning history, and performance.

TYPES OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0

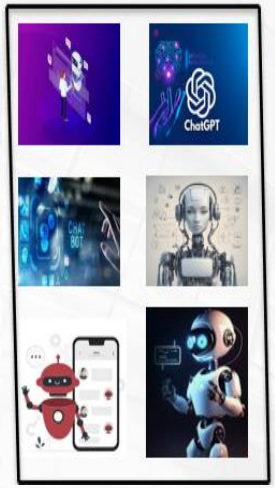


Language Translation Chatbots

It facilitates communication and collaboration among researchers from different linguistic backgrounds. It can translate text or speech between multiple languages, enabling researchers to access and share information across language barriers. The following are examples:

- **Google Translate:** It offers text and speech translation between over 100 languages and supports various input methods, including typing, handwriting, and voice input. It offers a chatbot feature that allow researchers to have a conversation in different languages.
- **Microsoft Translator:** It offers real-time translation in over 60 languages and supports conversation mode for multilingual communication.

TYPES OF ARTIFICIAL INTELLIGENCE CHATBOTS FOR RESEARCH 5.0



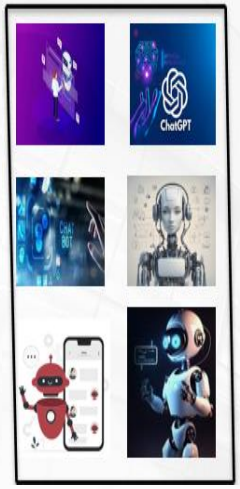
Survey Chatbots

Survey chatbots are used to conduct surveys or gather data from respondents through conversational interactions.

They can guide users through survey questions, collect responses, and store data for analysis, making the survey-taking process more engaging and accessible. The following are examples:

- **Typeform:** It offers a chatbot-like interface for respondents, presenting questions one at a time in a conversational format. Users can embed Typeform surveys on websites or share them via links.
- **Microsoft Forms:** It is a part of the Microsoft 365 suite, allowing users to create surveys, quizzes, and polls easily.
- **Tars:** It offers a drag-and-drop interface for building chatbot workflows and integrates with various messaging platforms, websites, and CRMs. Tars' chatbots can be used to collect feedback, conduct market research, and generate leads.

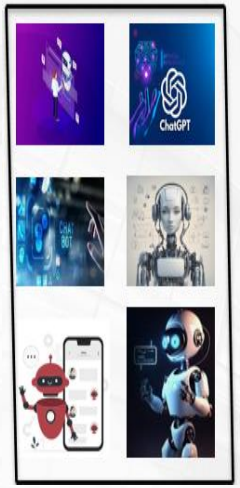
FUNCTIONS OF ARTIFICIAL INTELLIGENCE CHATBOTS IN RESEARCH 5.0



The following are the functions of AI chatbots in research:

- **Literature Review**: AI chatbots can assist researchers in conducting literature reviews by searching through vast databases of academic papers, summarizing key findings, and identifying relevant sources based on specific research topics or keywords e.g. The use of Google Bard as well.
- **Writing Assistance**: AI chatbots can help researchers in drafting research proposals, manuscripts, or reports by providing writing prompts, grammar checks, and suggestions for improving clarity and coherence e.g. The use of Writefull as well.
- **Peer Review Assistance:** Chatbots can aid in the peer review process by assisting reviewers in evaluating research manuscripts, identifying strengths and weaknesses, and providing feedback on writing quality, methodology, and interpretation of results.
- **Collaboration Management:** Chatbots can facilitate collaboration among research team members by coordinating tasks, scheduling meetings, sharing resources, and providing updates on project progress e.g.. Microsoft Teams with AI Powered Bots such T-bot.
- **Knowledge Sharing and Dissemination:** Chatbots can disseminate research findings to broader audiences by providing summaries, answering questions, and engaging with stakeholders through various channels such as websites, social media, or messaging platforms e.g., Google scholar Alerts with Slackbots or ChatGPT.

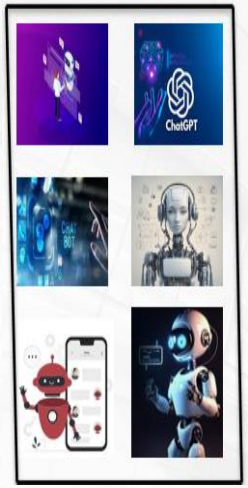
FUNCTIONS OF ARTIFICIAL INTELLIGENCE CHATBOTS IN RESEARCH 5.0



The following are the functions of AI chatbots in research:

- **Data Collection**: Chatbots can be programmed to gather data from respondents through conversational surveys or interviews. They can interact with participants, ask questions, record responses, and store data in a structured format for analysis.
- **Hypothesis Generation:** AI chatbots can analyze existing data or literature to identify patterns, correlations, and potential research hypotheses. They can suggest new research directions based on insights derived from data analysis or literature review.
- **Data Analysis:** Chatbots can perform basic data analysis tasks such as descriptive statistics, graphical visualization, and hypothesis testing. They can analyze research data and provide insights into patterns, trends, and relationships. The use of Atlas TI is an example of AI chatbot that can be used to analyse data.

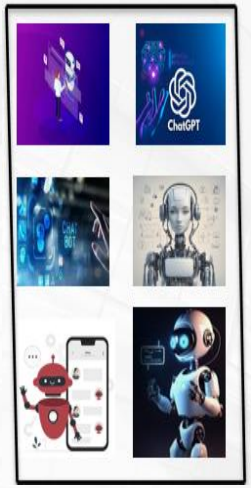
DEMERITS OF ARTIFICIAL INTELLIGENCE CHATBOTS IN RESEARCH 5.0



The following are the demerits of AI chatbots in research:

- **Bias and Fairness:** Researchers should be mindful of potential biases in AI chatbots, particularly in data collection, analysis, and decision-making processes, to ensure fairness and prevent discriminatory outcomes.
- **Data Privacy and Security:** They may handle sensitive research data, raising concerns about data privacy and security breaches if not properly implemented and secured.
- **Lack of Contextual Understanding:** They may struggle to understand the nuanced context of research inquiries, leading to misinterpretations or irrelevant responses.
- **Limited Creativity and Critical Thinking:** They may lack the creativity and critical thinking skills of human researchers, limiting their ability to generate novel research ideas or critically evaluate complex problems.
- **Technical Limitations:** They may have technical limitations such as language barriers, speech recognition errors, or limitations in natural language understanding, impacting their effectiveness in communication and assistance
- **Dependency and Overreliance:** Researchers may become overly dependent on chatbots for research tasks, potentially reducing their own critical thinking skills and autonomy in decision-making.

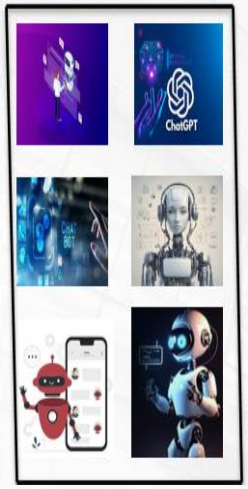
DEMERITS OF ARTIFICIAL INTELLIGENCE CHATBOTS IN RESEARCH 5.0



The following are the demerits of AI chatbots in research:

- **Ethical Concerns:** There may be ethical concerns surrounding the use of chatbots in research, such as transparency in their operation, informed consent for participants interacting with chatbots, and accountability for any errors or biases in their responses.
- **Transparency:** Researchers should ensure transparency in the use of AI chatbots, disclosing their purpose, capabilities, and limitations to participants and stakeholders involved in the research process.
- **Informed Consent:** Participants interacting with AI chatbots should provide informed consent, understanding the nature of their involvement, the potential risks and benefits, and their rights regarding data privacy and confidentiality.
- **Data Privacy and Security:** Researchers must prioritize the protection of participants' data privacy and security when using AI chatbots, implementing robust measures to safeguard sensitive information and comply with relevant data protection regulations.

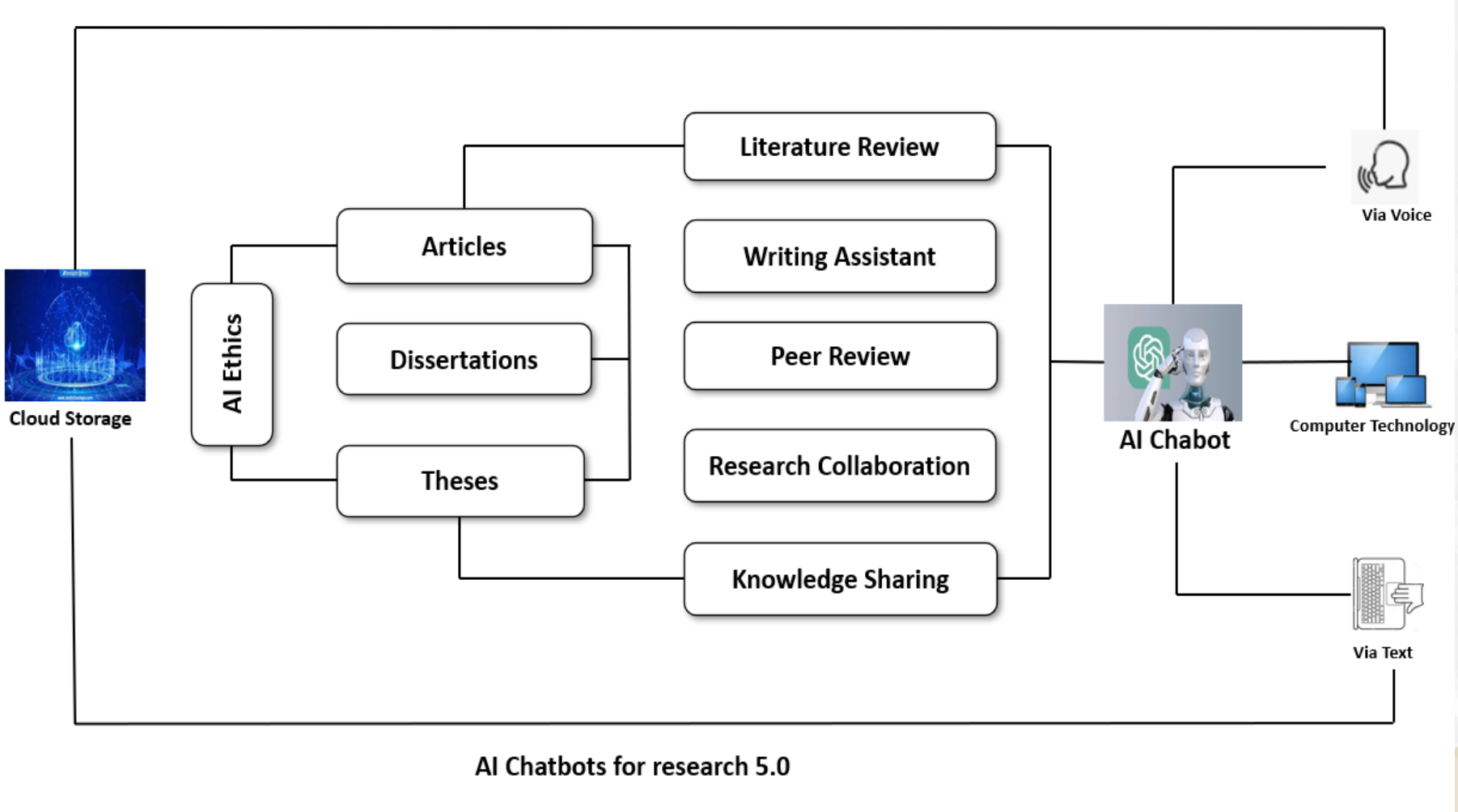
ETHICS OF ARTIFICIAL INTELLIGENCE CHATBOTS IN RESEARCH 5.0



The following are the ethics of AI chatbots in research:

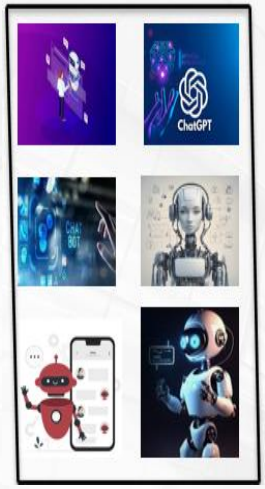
- **Accountability and Responsibility:** Researchers are accountable for the actions and decisions of AI chatbots used in research, including any errors, biases, or unintended consequences that may arise, and should take responsibility for addressing and mitigating these issues.
- **Integrity and Trustworthiness:** Researchers should ensure the integrity and trustworthiness of AI chatbots in research, maintaining accuracy, reliability, and accountability in their operation and communication with participants.
- **Human Oversight and Intervention:** Despite their autonomy, AI chatbots may require human oversight and intervention, particularly in complex or sensitive research situations where human judgment and ethical considerations are essential.

RECOMMENDED FRAMEWORK



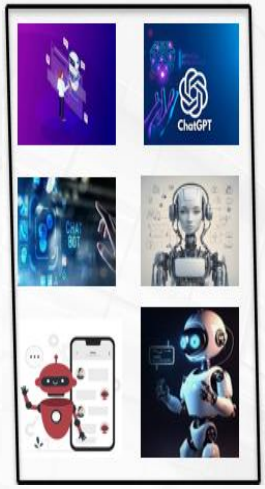
AI Chatbots for research 5.0

DISCUSSION ON RECOMMENDED FRAMEWORK



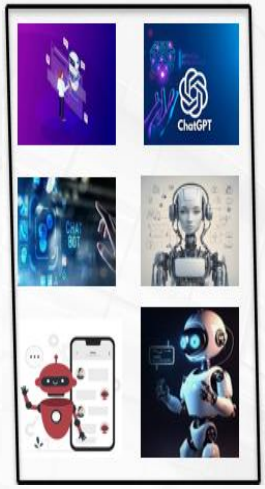
- Researchers can use voice command to interact with some AI chatbots. This functionality is also good for disabled researchers.
- Researchers can also use the text functionality; researchers can use this to type and receive feedback from the AI chatbots.
- The researchers can use the AI chatbots for conducting literature review when doing their research.
- The researchers can use AI chatbots to as writing assistants. It will check and correct their grammars.
- Researchers can use AI chatbots for peer review of their research projects.
- Researchers can use AI chatbots for data collection and analysis.
- The researchers can use AI chatbots to share their research to the wide communities.
- However, the researchers must use AI chatbots ethically so that the standard and quality of their research projects can not be compromised.

DISCUSSION ON RECOMMENDED FRAMEWORK



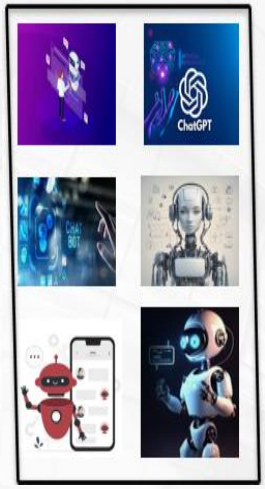
- Researchers must not replace their thinking and creativity in research and academic writing with the use of AI chatbots.
- If AI chatbots are used properly and ethically, they can help researchers produce quality research projects.
- Research outputs that can be produced through AI chatbots include among others the following:
  - ✓ book chapters
  - ✓ Articles
  - ✓ Dissertations
  - ✓ Thesis
- The research can be published open access and be accessed anywhere since most databases are cloud based.

CONCLUSION



- In conclusion, researchers and academic institutions can perhaps observe the following tips:
- Tips for researchers when using AI for research:
  - ✓ **Exercise Caution with Dependency:** Avoid overreliance on AI for research tasks. Maintain your identity as a diligent researcher.
  - ✓ **Leverage AI for Basic Functions:** Utilise AI chatbots primarily for tasks like editing, scoping literature, sharing your research, and facilitating collaboration with peers.
  - ✓ **Engage Critical Thinking:** Apply your critical thinking skills to assess th literature provided by AI chatbots. Conduct further research and ensure to rephrase the information in your own words.
- By following these guidelines, researchers can effectively integrate AI into their workflow while preserving the integrity of their research process.

CONCLUSION



- Tips for academic institutions regarding the use of AI chatbots for research:
  - ✓ **Establish AI Task Teams:** Form specialized teams dedicated to advising the university or research departments on the effective utilization of AI for research purposes.
  - ✓ **Craft Comprehensive Policies:** Develop clear and comprehensive policies governing the use of AI in research endeavors. These policies should ethical considerations, data handling protocols, and guidelines for integrating AI technologies into the research process effectively.
- By implementing these measures, academic institutions can harness the potential of AI chatbots for research while ensuring responsible and ethical practices are upheld

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150 YEARS

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Thank you

Define tomorrow.

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