

# ChatGPT in Software Development: Methods and Cross-Domain Applications

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**Abstract:** Through the use of natural language processing (NLP) to analyze and synthesize data, ChatGPT has the potential to advance Software Engineering (SE) studies. Yet, it may provide moral challenges such as the possibility for data bias, leakage of private information, and the compromise of sensitive information. Utilizing ChatGPT, we highlight such current developments in SE. We also explore ChatGPT's potential outside of the gaming industry. Finally, we suggest leveraging ChatGPT to simplify UI and UX interaction. This article will provide an established protocol for using ChatGPT applications within SE investigation while keeping ethical concerns in mind.

**Keywords:** Generative images, Generative videos, UX, UI, Automation, AI

## 1. Introduction

OpenAI's ChatGPT is a state-of-the-art language abstraction built to mimic genuine human replies to questions. The framework makes use of deep learning algorithms, using state-of-the-art NLP methods to provide coherent and pertinent answers. In this context, "Generative Pre-trained Transformer" (abbreviated to "GPT") refers to the algorithm's design, which was built using the transform pattern and was then pre-trained using a massive collection of textual data [1]. ChatGPT has been trained on conversation information, enabling it to provide relevant and interesting replies in a conversational setting. Because of its generalizability, the model may be used for a wide range of purposes, such as chatbots, virtual assistants, support, and even automated literature generation. The OpenAI team is constantly refining and updating the model with new information and training methods, keeping it at the cutting edge of NLP research [2-3].

ChatGPT allows investigators to produce natural and superior text for uses including creating languages,

comprehension of language conversation systems, and recordings of experts' opinions. ChatGPT is a versatile instrument for scientists for developing individualized models of languages, since it may be modified for certain areas or activities [4-5]. ChatGPT's efficiency may be measured against data provided by humans, and it can be used to create artificial information to calibrate various other models. ChatGPT may also be used to study linguistically related social and cultural issues. ChatGPT is useful for simulating exchanges and interactions of people of various cultures, or for studying the effect of characteristics like language, terminology, and vernacular on acquiring a language and production [6-8].

The use of ChatGPT has a major effect on studies, particularly qualitative study that employs NLP techniques. It has been useful in the fields of language creation, language comprehension, and conversation systems because to its capacity to provide excellent replies. ChatGPT may help academics reduce both time and funds while allowing them to develop specialized models of languages and refine their results for certain areas or activities. Experts are able to better grasp conversation in many circumstances and create complex language modelling thanks to ChatGPT's modelling abilities [9-10]. Overall, ChatGPT has helped push NLP forward, allowing for advanced language modelling as well as applications to be developed. Code generation, issue fixing, and testing of software are just some of the SE activities that benefit from using ChatGPT. It may also aid programmers in NLP activities like analyzing needs and UI generation [2].

## 2. Related Work

This section emphasizes on the recent trends of ChatGPT in

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SE and the scope in cross domain applications.

## 2.1. Developments in education

This theoretical investigation in [11] brought real-world AI applications into the realms of dental clinical and academic instruction. The goal of this article is to offer a concise summary of the significant developments in the application of AI to dentistry training until 2020, as well as a preview of the impending changes. This analysis also serves as a roadmap for incorporating the latest developments in AI applications into dental curricula at the undergraduate as well as graduate levels. It should come as no surprise that most dental professionals lack the training to critically evaluate AI applications. In addition, advancements in AI have accelerated greatly in recent years. In the age of generative AI, the factual dependability and prospects with OpenAI Inc.'s ChatGPT are seen as crucial turning moments. Inevitably, dental schools will need to revise their courses as cutting-edge deep-learning technologies transform dental diagnoses, scheduling treatment leadership, and telehealth monitoring. The latest developments in AI models of speech will alter doctor-patient communication, requiring a rethinking of dentistry the educational system's cornerstones such as paper, dissertation, and research paper publishing. Concerns concerning either the moral or legal effects of using AI in dentistry education have been developing, and more research and agreement are required before it can be used responsibly.

The use of chatbots and AI in classrooms and laboratories is rapidly expanding. Yet, there are a number of difficulties and restrictions connected with using these cutting-edge devices, most of which are ethical in nature. In this work, we examine the ethical considerations surrounding the use of AI systems and chatbots in the academy, and their possible effects on learning and teaching. Exploration studies and information collecting that utilize professional evaluation and interpretation are at the heart of an approach to qualitative research.

The investigator in [12] did a thorough literature analysis to identify prevalent procedures, obstacles, and openings in the field of bots in research and instruction. This investigation of the subject at hand lays the groundwork for further research. It also reveals the concealed significance of the observed trends, and it suggests possible ways to address the problems that have been uncovered. The purpose of this research is to provide light on the strengths and weaknesses of AI systems and chatbots to communicate as well as their function as a supplement to human knowledge and decision. The possibility for misuse and plunder by researchers using artificial intelligence and chatbots is discussed, along with the associated ethical difficulties, in this work. It also includes workable remedies to the ethical problems identified. The study confirms that academia and science

have entered a new age dominated by artificial intelligence. Observed technical advances will alter evaluation procedures and cause other changes to educational institutions. The time has come for the end of digital tests, and the adoption of more imaginative and original approaches to evaluation. The study stresses the need of adjusting to the modern world of AI and chatbots. Coexistence, sustainability, and ongoing adaptability to the growth of these structures are going to be critical. Strengthening studies and safeguarding educational institutions may be achieved via increasing understanding, enacting relevant laws, and establishing strong standards of ethical conduct. The introduction of AI systems and chatbots into the classroom should be seen as a chance to develop versus a danger.

A lot of first-year undergraduates worry that they don't know how to begin writing their undergraduate thesis because they aren't sure the way to determine their study's issue or even what subject their study is geared toward, or because they aren't sure the way to organize and organize the vast amounts of data that are at their disposal in the age of digitization. The work in [13] discusses learning methodologies for developing an undergraduate research thesis in technology, with an eye approaching the Higher learning paradigm via the application of technology for communication and information (ICTs). The content's focus, achieved via empirical method-based teaching techniques for pupils, is on a number of topics and issues: These include (i) advice on selecting a topic, (ii) guidance on identifying and investigating problems and questions, (iii) suggestions for a dissertation consultant, (iv) rules for locating appropriate sources of data, (v) a suggested outline for the thesis's body text, and (vi) ideas for getting ready for the thesis's oral defense. Using ChatGPT, a chatbot-style AI tool, for thesis development under an ethical behavior strategy for study is discussed, along with related advice and cautions aimed at teachers and undergraduates. In order to create an integrated educational setting that promotes inquiry and grows an environmentally friendly learning process within the framework of the College of 4.0 educational model, the work in [13] shows which tutoring/guidance methods among instructors and pupils require a suitable ethical use of ICTs throughout the creation of a dissertation.

In [14], the authors discuss the potential benefits and drawbacks of using chatbots powered by large language models (LLMs) in the classroom. It relies on lengthy discussions with ChatGPT on topics and papers relating to teaching methods. Discussion centers on the difficulties presented by chatbots like ChatGPT to teachers, on one end of the spectrum, and their ability to improve DL, as well as the responsibilities of the teacher and the educational atmosphere, on the other. To the contrary, it highlights the pedagogical difficulties of incorrect use of similar chatbots

and the methods of instruction and school settings that might accelerate learning. There are three fundamental features of pedagogical techniques that may either help or hinder a chatbot's ability to progress DL, and they are all rooted in the institution's society: instruction in the classroom, instructor continuing education, and the administration of the school. Assessment-based theory provides the framework, which differentiates evaluation cultures from testing cultures while also differentiating evaluation for education with evaluation for marking. Chatbot use patterns that are consistent with the tenets of many cultures are examined. To back up the insights gathered and the conclusions formed from the talking experience, a selection of quotations from the talks using ChatGPT are offered.

AI and other technology developments during the past ten years have had a profound impact on classroom instruction. There has been a lot of buzz around GPT lately, especially OpenAI's ChatGPT. Applications in fields as diverse as education and health care stem from these models' groundbreaking features, such as the ability to generate natural-sounding text and facilitate robotic interactions. Concerns about their broad usage and transparency have been raised in the realm of science despite their enormous potential. ChatGPT, the most recent installment in the GPT series, has shown its worth with flying colors, having aced the US bar law exam and quickly amassing over a million users. Some teachers have praised it as a positive development, while others have voiced concerns that it might lead to a decline in critical thinking and an increase in dishonesty in the classroom. The purpose of [15] is to dive into these debates, investigating the advantages and disadvantages of using sophisticated AI models in the classroom. It expands upon prior research and helps us better grasp how the "new AI gold rush" is influencing academic standards and practices.

ChatGPT is a tool that teachers may utilize to provide their students individualized help in their studies. ChatGPT provides individualized recommendations for study materials and instructional strategies to each learner [16].

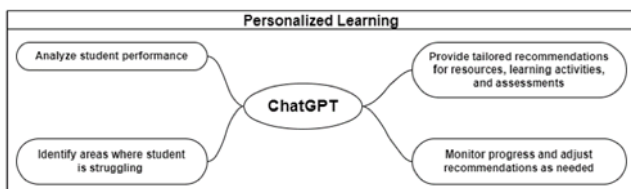


Fig. 1. Personalized Learning [16]

For instance, teachers may utilize ChatGPT to assess student progress and pinpoint the ideas or methods that learners are having trouble with. A teacher may see that a certain pupil is having difficulty with arranging algorithms. Here, the teacher may use ChatGPT to create materials tailored to the individual student's needs and skill level (e.g., a video instruction on the technique for sorting the student is having

trouble with, or a computer science practice to help them better understand the idea). This is depicted in Fig.1.

Two multi-response questions were used to finish the evaluation of subcategory A (Access and usage) and determine the most salient advantages and disadvantages of students' use of ChatGPT

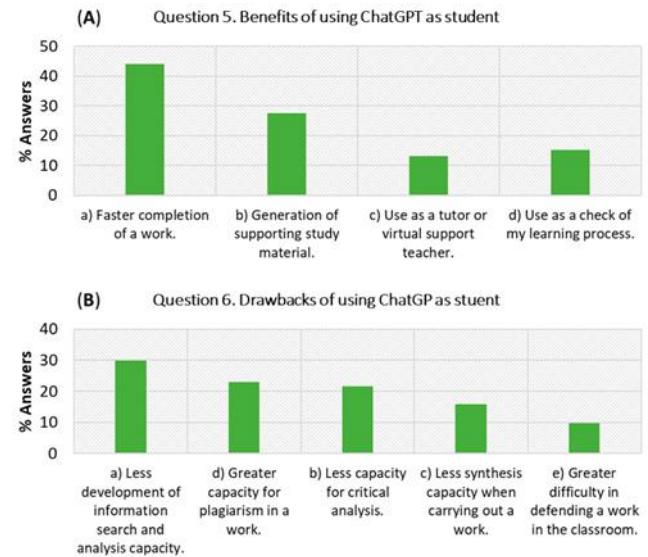


Fig. 2. Multi-response questions technique in [17]

in [17]. The results are shown in Fig.2. Quick job completion (a) and creating personalized support materials (b) accounted for 71.7% of the total answers to question 5 (benefits of ChatGPT) (Figure 2A). The usage of ChatGPT as a learning assessment tool and as an instructor or online assistance system (related items c and d) were rated as the least beneficial. When asked about the drawbacks of using ChatGPT, students indicated a decreased ability to seek for information (a), less time for critical thinking (b), and an increased likelihood of plagiarism (d) (74.3 percent of all replies; Figure 2B). The inability to make connections between ideas (c) and defending one's work in the classroom (d) are the two weaknesses that are least apparent.

## 2.2. Developments in healthcare

ChatGPT can respond to inquiries on methods for promoting health and preventing sickness, as well as give instances [18]. These are a few instances:

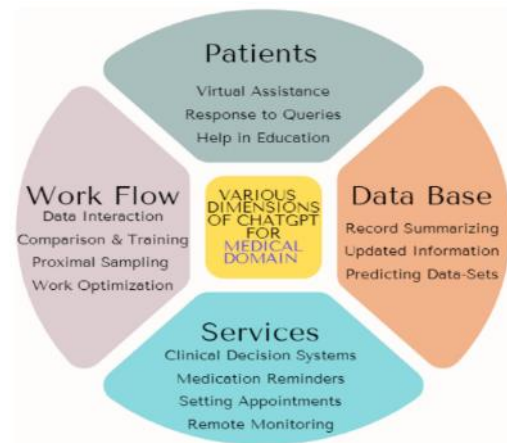
- (1) Selecting a diet that is nutritious Details regarding tactics for encouraging an active way of life may be found on ChatGPT, decisions include a wholesome diet, frequent exercise, and refraining from dangerous drugs like cigarettes and In excess of liquor.
- (2) Knowledge concerning vaccinations may be found on ChatGPT, the significance of immunization in halting the epidemic of diseases that are infectious and respond to inquiries regarding the vaccination kinds that are accessible and those that are advised timetables.
- (3) Prevention and testing ChatGPT may offer details on the

significance of regular examinations tests like cancer of the colon checks and mammograms in discovering illnesses in their earliest stages, during are easier to cure.

(4) Elimination of risk factors: ChatGPT can offer guidance on methods for lowering the risk for long-term health conditions, like stress management, cholesterol and blood pressure levels regulation, and abstaining from cigarettes and excessive beverage use.

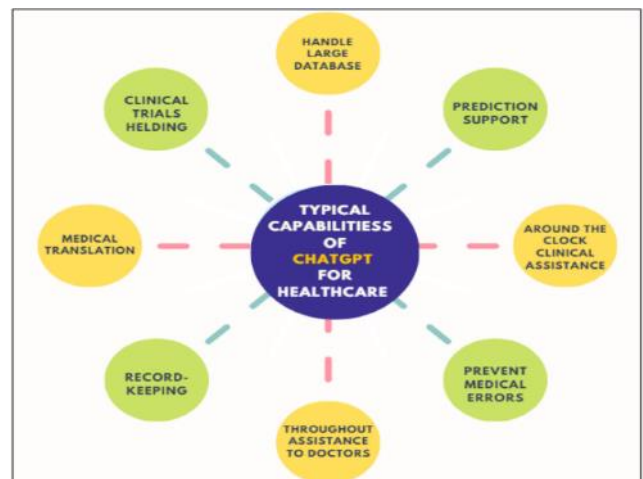
(5) ChatGPT for the well-being of the environment can offer details about methods for preserving the surroundings, such as lowering contact with harmful pollutants and chemicals and encouraging the adoption of eco-friendly activities and goods.

After giving ChatGPT details about current therapies, lab results, blood gas testing data, as well as breathing and cardiac variables, in a randomized sequence, the work in [19] began requesting ChatGPT to write a medical report for a patient hospitalized to the ICU. While the values received just as acronyms along with any explanation of what they meant, ChatGPT was capable to accurately classify the majority of the variables into the right sections after being given an organized note request. Additionally, ChatGPT demonstrated an excellent capacity for self-correction by assigning the appropriate section to the earlier missing variables only by requesting that they be put in the appropriate area without providing any additional prompts. Particularly, the main problem was how to deal with the causative relationships between various illnesses, like acute respiratory distress syndrome (ARDS) and bacterial infections. Although it was accepted that the data providers may not be up to date or sufficient completion for determining precise correlations, they further underlined that. Furthermore, because ChatGPT wasn't designed to respond to clinical inquiries, it has the understanding of medicine and background necessary to properly comprehend the intricate connections between various illnesses and therapies. Additionally, ChatGPT showed that it might give insightful recommendations for additional therapies determined by what was presented, even when the data were occasionally broad. ChatGPT strongest achievement had been in his capacity to succinctly describe facts, but occasionally being inaccurate, employing technical jargon for clinic-to-clinic contact in addition to plain English for clients and relatives.



**Fig 3.** ChatGPT's related parameters for the medical area [20].

A single application for ChatGPT in the medical field is the development of systems that support clinical decisions. Such initiatives could examine client data and offer recommendations for managing discomfort and other conditions. To choose the optimal anaesthesia or dosage, for example, ChatGPT might look at the medical condition of a person, health indicators, and other data. Making sure they receive the finest care might improve the security of patients and outcomes. Another potential application for ChatGPT in anaesthesia is the delivery of pre-operative teaching. Clients that might be experiencing questions or issues about their planned procedure can receive individualized, reliable data via ChatGPT as shown in Fig.3. [20].



**Fig:4:** Standard ChatGPT characteristics in medical facilities [20]

The application for ChatGPT in healthcare is the creation of online aides for clients. These staff members could offer tailored advice depending on the individual's medical record, current signs, and other relevant data. For example, an online assistant could give advice on controlling a chronic condition such diabetic or suggest generic drugs or at-home treatments for someone who has influenza or the common cold. These virtual assistants can be accessed through a variety of channels, such as mobile apps,

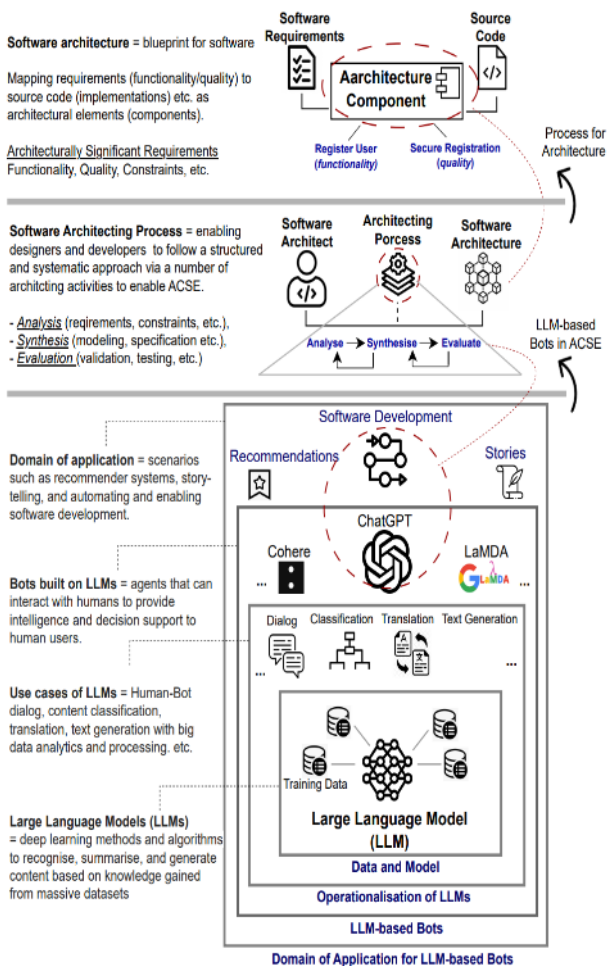
websites, and voice-controlled devices. People who live in isolated regions or require assistance accessing treatment might benefit from this since they can receive individualized recommendations and counselling while going to see a physician. This is depicted in Fig.4. ChatGPT could be used for evaluating a wide range of scholarly content, like research publications and trademarks, so as to identify novel therapeutic targets and create original concepts. When employing the framework to generate novel theories or suggestions for more research in the context of pharmaceutical creation, this technique is employed for training the models on a substantial corpus of academic material. Particularly in terms of its ability to read and write text on a variety of themes with exceptional precision, ChatGPT as a model of language is an unprecedented breakthrough in health. It could have the potential to have been utilized in a range of medical uses, such as streamlining tedious duties like taking observations and the creation of reports descriptions, that may conserve period of time and enhance productivity; assisting individuals who have symptom-checking, medication control, and selection scheduling; while encouraging education for patients, conformity, and managing oneself for long-term limitations. In the health care industry, it may be used for a variety of tasks, such as as patient interaction, clinical study evaluation, drug research, and healthcare recordkeeping. The development of ChatGPT resembles the design of the website's engine in certain aspects.

### 2.3. Other SE recent trends:

Predictive linguistic modelling for coding has established itself as a useful technique for allowing new types of automated for programmers during the past ten years. The development of broad function "large language models" built on neural transformers topologies, learned on huge amounts of human-written written content, including coding and natural language, has been witnessed lately. Nevertheless, interaction with these types of models has often been restricted to particular job conditions, restricting their wide application notwithstanding the established expressive capability of such models [21]. The advent of models like ChatGPT has already ignited intense debate among teachers, who have expressed anything from anxiety that learners would exploit these AI tools to avoid studying to enthusiasm over the potential for novel types of educational possibilities. Due to such tools' infancy, researchers presently know very little about how effectively they function in various educational contexts and a chance potential (or threat) that they may bring to conventional modes of teaching. As a result, in this study, we evaluate ChatGPT's performance in addressing typical queries from a well-known software assessment curricula. According to the research in [21], ChatGPT can currently react to 77.5% of the queries we looked at, and of those inquiries, it can offer accurate or partly correct responses in 55.6% of

instances and the right or partly right clarification of responses in 53.0% of cases. It was also discovered that causing the tool in a common inquire about context results in a slightly greater number of right answers and clarifications.

By demonstrating exceptional efficiency in activities like coding and the creation of documents, ChatGPT exhibits tremendous promise to improve SE). The absence of accessibility for ChatGPT is problematic, though, because SE has stringent dependability and risk management standards. The authors in [22] conducted investigation assessing ChatGPT's strengths and limits in SE to solve this problem. We divided the skills required for AI models to handle SE jobs into three groups: 1) syntactic knowledge, 2) comprehension of static conduct, and 3) knowledge of behavior that is dynamic. Our research focuses on ChatGPT's understanding of abstract syntax trees (AST), control flow graphs (CFG), and call graphs (CG), which are all types of code architectures. According to our research, ChatGPT is quite good at understanding AST, but it has struggle to comprehend code language, especially those that are dynamic. It concludes that ChatGPT has preliminary skills in analyzing static code and has skills resembling those of an AST parser. Our research also shows that ChatGPT is prone to hallucination when analyzing code semantic structures and making up false information. These findings highlight the necessity to investigate techniques for confirming ChatGPT's outputs' accuracy in order to guarantee its reliability in SE. More crucially, our research offers a preliminary explanation for why produced codes from LLMs are frequently syntactically accurate yet vulnerable.



**Fig.5:** Various SEs [23].

The ISO/IEC/IEEE 42010:2011 standard's description of computer programs design tries to abstraction the complexity entrenched in code solutions by using structural interconnections and elements that serve as a design for the application software infrastructure, amenities, and apps that will be created. There is a requirement for the developing manage, also known as the method for developing programs, to assist software architects with an organized and progressive approach to developing software structures [23]. The division of architecture issues in architecture-centric

software engineering (ACSE) may be supported by an array of extremely fine developing actions in the architecture procedure as shown in Fig.5. From the standpoint of the SE, ChatGPT is regarded as an exceptional illustration of a chatbot that can provide eloquent answers to challenging questions. However, it is still an uncharted territory in terms of in terms of SE, of both its promise and risks methods. Recent ideas and experimental results show that the emphasis of the ChatGPT research is on promoting SE, validation. Conversations between programmers using ChatGPT make it possible for the creation of a web-based cognitive challenge with human-bot assistance source code for HTML, CSS, and JavaScript.

This literature provides us the motivation to propose a novel method of UI/UX communication using ChatGPT.

### 3. Methods

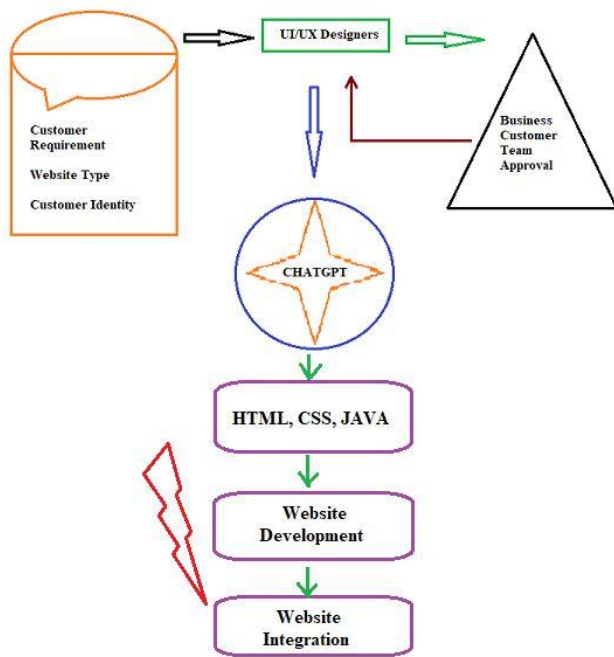
#### 3.1. Conventional Website creation

User interface (UI) design and user experience (UX) development are both facets of website design that focus on the visual appeal and user experience of an excellent product. When it comes to creating schematics, prototypes, designs, and final products, UI/UX designers have access to a plethora of materials. While interacting with a computer program or item, an individual encounters a variety of visual and auditory cues, all of which make up the UI. Because to advancements in UI design, the quality of the user interface has improved. When one uses a website or an app, one should gain knowledge about it by interacting with it. Which, as we've seen, may go either way, contingent upon the individual's attitude toward such encounters. UX designers and developers focus on a wide range of customer interactions. They collaborate with the advertising division to investigate the customer journey, including the order in which they encountered one's company, the steps they took to complete a job on your site, the emotions they experienced, or their overall assessment of the service. UX designers focus on making more functional and pleasurable user interfaces. Engineers of user interfaces focus on both textual and graphical user input to convey the company's values in an elegant and functional online platform. The goal of the user interface designer (UI designer) is to convey data to the client as fast and efficiently as possible. There are generally three primary categories of programmers at work on a web page. By maintaining and enhancing the source code on the server side, a back-end developer maintains the website working smoothly. At last, it's been found an engineer who can handle it all. The user's interface and user experience designers are front-end programmers. They collaborate with user interface and user experience designers to ensure that the visual aspects of a product function properly. Designs are responsible for the visual appeal and creativity of the user experience whereas developers ensure that all of the moving parts work together seamlessly and harmoniously.

#### 3.2. Proposed Method

We propose a system that considers inputting the data to the ChatGPT, such as the requirements of the customers, who the customers actually are, and what type of website is being designed. The ChatGPT, in turn, will provide the suggestions to the UX designers. The designers are responsible for designing the complete webpage and getting it approved by the business customer team. This information about the designed website is once again fed to ChatGPT, which will understand it and return back with the HTML, CSS, and Java script code. This data can be easily integrated

into the website. This is depicted in Fig 6



**Fig. 6.** Proposed Methodology

#### 4. Conclusion

ChatGPT has a profound impact on research, especially qualitative research that makes use of NLP methods. Its ability to produce high-quality responses has made it effective in language development, language understanding, and conversation systems. ChatGPT has the potential to assist academics save time and money while enabling them to create domain-specific language models and hone their findings. ChatGPT's modelling capabilities allow experts to better understand conversation in a variety of contexts and to develop advanced language models. In general, ChatGPT has contributed to the advancement of NLP by facilitating the creation of sophisticated language models and related software. ChatGPT is useful for several SE operations, including code development, bug repair, and software testing. It might also help developers with natural language processing tasks like requirements analysis and UI design. ChatGPT has the ability to contribute to the field of SE by using NLP to evaluate and synthesize data. However, it might provide ethical difficulties, such as the risk of data bias, the disclosure of private information, and the compromise of secret data. We use ChatGPT to bring attention to these recent advances in SE. We also investigate applications for ChatGPT outside the gaming community. Finally, we propose using ChatGPT to streamline user interface and user experience communication. In this piece, we'll lay out a standard procedure for integrating ChatGPT apps into SE investigations without sacrificing integrity.

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