Intelligent Tax Advisory System: A Chatbot with Simulation-Based Tax Policy Analysis

Mr. Maruthi S T[1], Sanchitha G S[2], Shreesh V Hegde[3], Pramodh S[4], Rohan Lawrence E[5]

[1]*Assistant Professor, Department of Computer Science and Engineering (Data Science), PES Institute of Technology and Management*

[2]*Department of Computer Science and Engineering (Data Science), PES Institute of Technology and Management*

[3]*Department of Computer Science and Engineering (Data Science), PES Institute of Technology and Management*

[4]*Department of Computer Science and Engineering (Data Science), PES Institute of Technology and Management*

[5]*Department of Computer Science and Engineering (Data Science), PES Institute of Technology and Management*

---***---

Abstract - Taxation is an essential component of a country's economic framework, yet for individual taxpayers it often becomes a complex and confusing process. In India, the presence of multiple tax slabs, exemptions, deductions, and the introduction of both the Old and New Tax Regimes have increased the difficulty of tax planning. Many taxpayers lack access to professional tax advisors due to high costs or limited availability, which often leads to incorrect tax filing or suboptimal financial decisions. This paper proposes an Intelligent Tax Advisory System that uses Artificial Intelligence (AI), Natural Language Processing (NLP), and simulation-based tax computation to provide automated, personalized, and user-friendly tax guidance. The system features an AI-powered chatbot that understands user queries in natural language and responds with accurate tax-related information. It allows users to simulate tax calculations under both Old and New Tax Regimes, compare tax liabilities, and identify the most beneficial option based on their income and deductions. Additionally, the system generates detailed tax reports and provides instant answers to frequently asked tax questions. Experimental evaluation shows that the proposed system improves accessibility, reduces dependency on manual consultation, and enhances decision-making efficiency. This solution aims to simplify tax planning, promote financial awareness, and support informed compliance among individual taxpayers.

Key Words: Intelligent Tax Advisory System, Artificial Intelligence, Chatbot, Tax Simulation, Old and New Tax Regime, Decision Support System.

1. INTRODUCTION

Taxation plays a crucial role in national development by funding public services such as infrastructure, healthcare, education, and social welfare. In India, income tax is one of the primary sources of government revenue. However, for individual taxpayers, understanding income tax rules has become increasingly challenging due to frequent policy updates, multiple tax slabs, exemptions, and deductions. The introduction of the New Tax Regime alongside the traditional Old Tax Regime was intended to simplify taxation, but it has instead created confusion among taxpayers. While the Old Tax Regime offers various deductions and exemptions, the New Tax Regime provides lower tax rates with fewer benefits. Selecting the most suitable regime requires careful analysis of income structure and deductions, which many individuals find difficult

to perform on their own. Traditional tax advisory services depend on chartered accountants and financial consultants. Although effective, these services are often expensive, time-consuming, and not easily accessible to students, salaried employees, and small business owners. Moreover, manual tax advisory methods lack scalability and are unavailable outside working hours. With rapid advancements in Artificial Intelligence and Natural Language Processing, intelligent systems can now understand human language, process complex rules, and provide real-time decision support. AI-driven chatbots have already proven successful in domains such as banking, customer service, and healthcare. Applying similar technology to taxation can significantly simplify tax planning and compliance. This project aims to develop an Intelligent Tax Advisory System that provides automated tax guidance through a conversational chatbot interface and simulation-based tax computation. The system helps users understand tax concepts, compare regimes, and make informed financial decisions with minimal effort

2. RELATED WORK AND LITERATURE REVIEW

Metahaldan [1] introduced one of the earliest expert-system-based tax planning frameworks, designed for U.S. federal income and transfer taxation. Leszczyńska [2] presented a microsimulation model capable of evaluating personal and corporate tax policies using detailed micro-level datasets. Auerbach [3] further expanded the role of models in policy projection, demonstrating how economic, micro- and macro-simulation frameworks can predict taxpayer behavior, revenue flows, and compliance outcomes under alternative policies. Mellado-Silva et al. [4] explored chatbot-based tax learning during the COVID-19 pandemic, using decision-tree rule structures to guide university students through tax regulations.[5] proposed a scalable and secure architecture for government-grade chatbots by integrating encryption, authentication control, microservice deployment, and NLP-based interaction. A comprehensive overview of Indian taxation was presented in [6], offering a structured explanation of income heads, exemptions, assessment rules, and tax slabs. Habib [7] introduced a Retrieval-Augmented Generation (RAG)-powered tax advisory chatbot, trained using Pakistan's legal tax documentation. The study "Income Tax and Work Preferences Among Millennial Communities" [8] provided a socio-economic lens to taxation by examining how tax burdens influence motivation, productivity, job mobility, and entrepreneurship across global millennial populations.

3. PROPOSED METHODOLOGY

The Intelligent Tax Advisory System follows a multi-layered methodology that enables automated tax computation, user-interactive guidance, and structured output generation. The architecture is designed to accept user inputs, extract information through OCR when available, process computations using tax rule logic, and generate advisory responses through a conversational interface. Figure 1 illustrates the modular structure of the system, highlighting how each layer communicates to ensure streamlined workflow and low error dependency.
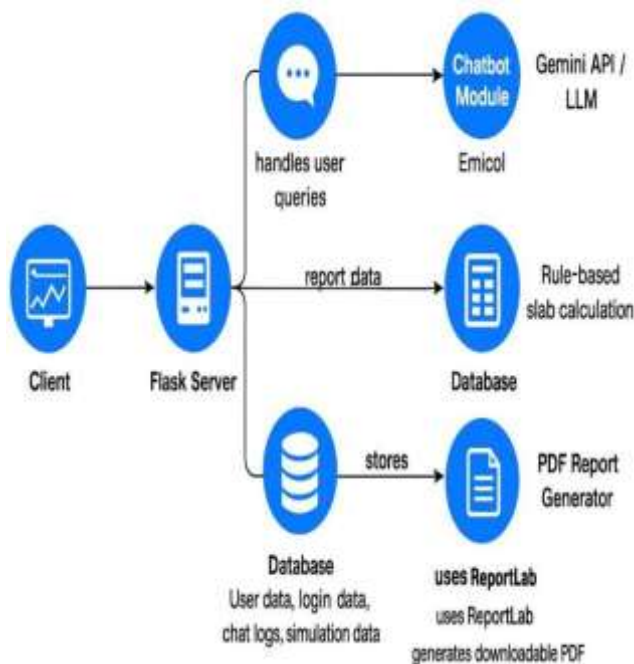
Fig -1: Overall workflow and system architecture.

The system architecture of the Intelligent Tax Advisory System is designed to provide efficient, scalable, and user-friendly tax assistance through the integration of artificial intelligence and simulation-based computation. The architecture follows a modular client–server model to ensure flexibility and ease of maintenance. Users interact with the system through a web-based interface that allows them to enter income details and ask tax-related questions in natural language. The user interface communicates with the backend server using secure HTTP requests. The backend is developed using a Flask framework, which acts as the central controller of the system. The chatbot module processes user queries using Natural Language Processing techniques to understand intent and context. Based on the query type, the system either retrieves predefined tax knowledge or forwards the request to the tax simulation engine. The tax simulation module calculates tax liabilities under both the Old and New Tax Regimes by applying current income tax rules. A comparison module analyzes the computed results and recommends the most suitable tax regime. The report generation module creates detailed and downloadable tax reports for user reference. All components are loosely coupled, allowing easy updates to tax rules or AI models. This layered architecture ensures reliability, scalability, and real-time responsiveness of the system

The Intelligent Tax Advisory System follows a layered and modular architecture that ensures smooth interaction between users and backend services. The architecture is designed to handle both conversational queries and numerical tax computations efficiently. At the presentation layer, a responsive web interface allows users to interact with the system using simple forms and chat-based input. This interface is designed to be intuitive so that users with minimal technical knowledge can easily use the system. The communication between the frontend and backend occurs through RESTful APIs, ensuring secure and structured data exchange. The application layer, implemented using the Flask framework, acts as the core controller of the system. It manages incoming requests, validates user inputs, and routes them to appropriate modules based on the nature of the request. This centralized control improves system reliability and simplifies error handling. The chatbot engine forms a key component of the architecture. It uses Natural Language Processing techniques to analyze user queries, identify intent, and extract relevant tax-related entities. Context management allows the chatbot to maintain conversational flow and provide meaningful responses. For frequently asked questions, the system retrieves answers from a predefined knowledge base, ensuring fast response times. For computation-related queries, the system forwards extracted parameters to the tax simulation module. This module implements rule-based logic aligned with current Indian income tax regulations. It computes tax liabilities separately for the Old and New Tax Regimes, considering applicable slabs, deductions, and exemptions. The comparison engine evaluates both results and determines the most beneficial tax option for the user. The architecture also includes a report generation module that converts computed results into structured and downloadable documents. This module enhances transparency by presenting calculations in a clear and user-friendly format. Logging and monitoring components track system activity and assist in debugging and performance optimization. Overall, the architecture supports scalability, maintainability, and future expansion such as mobile integration and multilingual support Data were split 80:20 for training and testing using stratified random sampling to ensure representative spatial coverage. Model performance was evaluated using Accuracy, Precision, Recall, and F1-Score metrics to ensure balanced performance across recharge classes.

The Intelligent Tax Advisory System emphasizes clarity, modularity, and efficient processing of user requests. The architecture is divided into multiple logical layers to separate responsibilities and improve maintainability. The presentation layer focuses entirely on user interaction, providing input forms and a chatbot interface that allows users to communicate with the system in a natural and intuitive manner. This layer ensures proper input validation before sending data to the backend. The application layer acts as the brain of the system and is responsible for coordinating communication between different modules. It receives user requests from the frontend and determines whether the request is informational or computational. This decision-based routing ensures that simple queries are answered quickly without unnecessary processing. The application layer also manages session handling, enabling continuity in user interactions. The Natural Language Processing component plays a critical role in interpreting user intent. It breaks down user queries into meaningful tokens, identifies keywords related to income, deductions, or tax regimes, and converts unstructured input into structured data. This structured data is essential for accurate processing by the tax simulation engine.

4. RESULT AND DISCUSSION

The Fig 2 represents the home page of the AI Tax Advisor system, which serves as the entry point for users. The interface features a clean and professional design with a prominent welcome banner titled "Welcome to AI Tax Advisor," highlighting the system's role as an intelligent financial planning partner. A navigation bar at the top provides easy access to user authentication options such as Register and Login, ensuring secure and personalized usage. Below the banner, the interface presents four main functional modules in the form of interactive cards. The AI Chatbot module allows users to ask tax-related questions and receive instant responses through an intelligent assistant. The Tax Simulation module enables users to simulate tax calculations and explore different income scenarios. The Tax Planner module helps users plan their taxes and manage important deadlines. The Reports module allows users to generate comprehensive tax reports in PDF format. Each module is clearly labeled with icons and action buttons, making navigation intuitive. Overall, the interface is user-friendly, visually appealing, and designed to simplify tax planning and advisory services for users of all backgrounds.
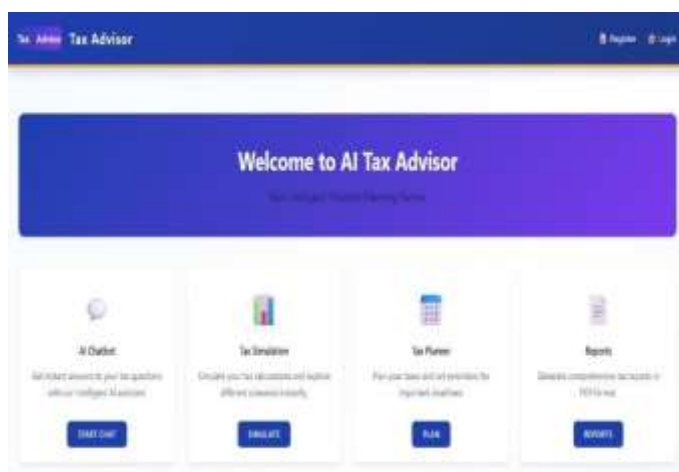

Fig -2: Home Page

The Fig 3 illustrates the interactive chatbot interface of the Intelligent Tax Advisory System. At the top, a clean and modern header identifies the system as an AI Tax Advisor, highlighting its capability to provide instant tax-related assistance with multilingual support. The interface is designed to resemble a conversational chat window, allowing users to communicate naturally with the system. A dedicated button labeled "Guide Me to File ITR" enables users to quickly access assistance for income tax return filing. The chatbot responds to user requests by providing clear, step-by-step guidance for filing an Income Tax Return (ITR). The displayed instructions include logging into the official income tax portal, selecting the appropriate assessment year, choosing the correct ITR form, and verifying personal details. The interface also guides users through pre-filled data verification, deduction selection, regime choice, and final submission steps. At the bottom, a text input field allows users to type queries directly, while an optional file upload feature supports document-based assistance. Overall, the interface ensures simplicity, clarity, and ease of use, making tax filing guidance accessible even to non-technical users.
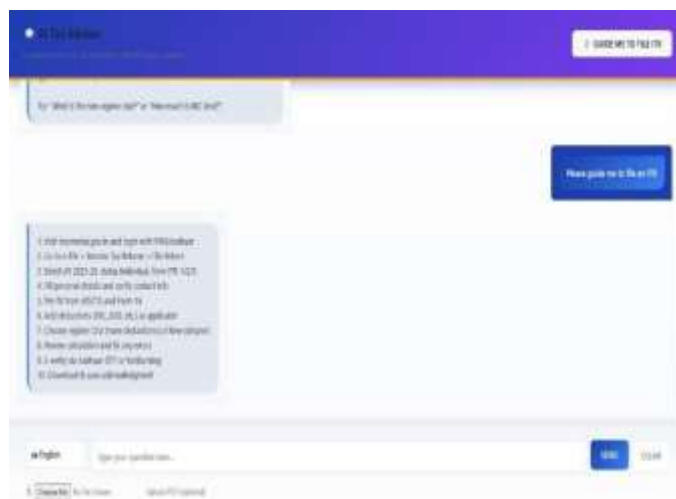

Fig -3: Chatbot Result Page

The Fig 4 presents the tax calculation output generated by the Intelligent Tax Advisory System. On the left side, the interface displays a detailed tax breakdown, showing slab-wise tax computation in a structured and readable format. Each income slab is clearly labeled along with its applicable tax rate, helping users understand how tax is calculated step by step. The exemption slab up to ₹2,50,000 is shown with zero tax, reinforcing transparency in calculations. The next slab, ₹2,50,001 to ₹5,00,000, shows the calculated tax amount at 5%, followed by the higher slab taxed at 20%.The interface also highlights the cess at 4%, which is displayed separately to avoid confusion with slab-based tax. This separation helps users clearly identify additional charges beyond basic income tax. On the right side, a donut chart visualization provides a graphical representation of the tax distribution across different slabs. Each color segment corresponds to a specific tax slab or cess component, making the data visually intuitive.The combination of numerical values and visual charts enhances user understanding and improves financial clarity. Overall, this interface simplifies complex tax calculations and enables users to quickly analyze their tax liability in an informative and user-friendly manner.
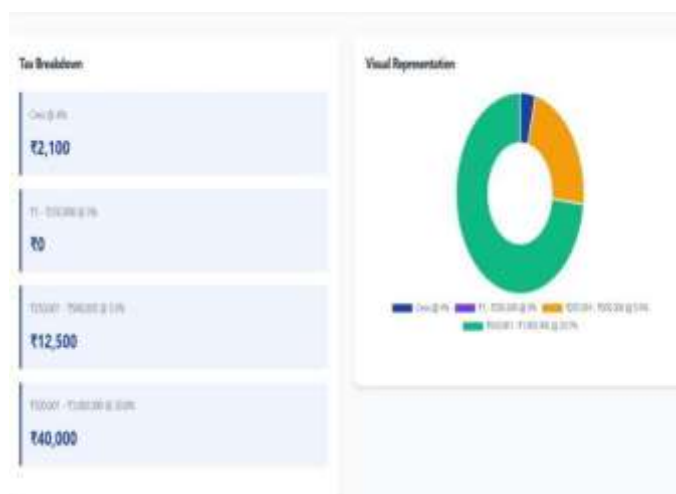

Fig -4: Simulation Result Page

5. CONCLUSION AND FUTURE WORKS

This project successfully presents an Intelligent Tax Advisory System that simplifies tax planning and decision-making through the use of artificial intelligence and simulation-based computation. The system integrates an AI-powered chatbot, rule-based tax calculation, and interactive visualizations to provide users with clear and personalized tax guidance. By enabling comparison between the Old and New Tax Regimes, the system helps users choose the most beneficial option based on their income structure and deductions. The user-friendly interface and automated report generation enhance transparency and reduce dependency on manual tax consultation. The system demonstrates how AI can improve accessibility, accuracy, and efficiency in financial advisory services. It is especially beneficial for individuals with limited tax knowledge, offering real-time assistance and step-by-step guidance for filing income tax returns.

As part of future enhancements, the system can be extended to support voice-based input, enabling hands-free interaction and improving accessibility for users who prefer spoken communication or have physical limitations. Voice integration would allow users to ask tax-related questions, provide income details, and receive guidance without manual typing, making the system more user-friendly and inclusive. In addition, the system can be expanded to support a wider range of financial document types, such as salary slips, bank statements, investment proofs, and loan documents. This enhancement would enable automated extraction and analysis of financial information, further reducing manual effort and improving accuracy. Together, these advancements would significantly enhance usability, efficiency, and the overall intelligence of the tax advisory system.

REFERENCES

[1] T. Brown, B. Mann, N. Ryder, M. Subbiah, J. D. Kaplan, P. Dhariwal, A. Neelakantan, P. Shyam, G. Sastry, A. Askell et al.,"Language models are few-shot learners,"Advances in neural information processing systems, vol. 33, pp. 1877–1901, 2020.

[2] A. Leszczylowska, "Microsimulation as an instrument for tax policy analyses," Business Economic Horizons, vol. 11, no. 1, pp. 14–27, 2015.

[3] A. J. Auerbach, I. Grinberg, T. Barthold, N. Bull, W. G. Elkins, P. Moomau, R. Moore, B. Page, B. Pecoraro, and K. Pomerleau, "Macroeconomic modeling of tax policy:A comparison of current methodologies," National Tax Journal, vol. 70, no. 4, pp. 819–836, 2017.

[4] R. Mellado-Silva, A. Fa´undez-Ugalde, and M. B. Lobos, "Learning tax regulations through rules-based chatbots using decision trees: a case study at the time of covid-19," in 2020 39th International conference of the chilean computer science society (SCCC). IEEE, 2020, pp. 1–8.

[5] B. Mytnyk, O. Tkachyk, N. Shakhovska, S. Fedushko, and Y. Syerov, "Application of artificial intelligence for fraudulent banking operations recognition," Big Data and Cognitive Computing, vol. 7, no. 2, p. 93, 2023.

[6] A. L. Martinez, "Artificial intelligence in tax administration: Enhancing compliance, transparency, and ethical governance," Transparency, and Ethical Governance (June 08, 2025), 2025.

[7] M. A. Habib, S. Amin, M. Oqba, S. Jaipal, M. J. Khan, and A. Samad, "Taxtajweez: A large language model-based chatbot for income tax information in pakistan using retrieval augmented generation (rag)," in The International FLAIRS Conference Proceedings, vol. 37, 2024.

[8] M. Muslim, "Income tax and work incentives: A literature review," Advances in Taxation Research, vol. 1, no. 3, pp. 159–171, 2023.