iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** V **Month of publication:** May 2025

DOI: https://doi.org/10.22214/ijraset.2025.70693

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue V May 2025- Available at www.ijraset.com

Review Paper on JARVIS: A Desktop Assistant

Aditya Kumar[1], Anika Bisht[2], Vibhanshu Shekhar Singh[3], Sartima Prajapati[4], Mohd Naqui[5]
[1, 3, 4, 5]*B.Tech Scholars,* [2]*Assistant Professor, Department of Information Technology, Goel Institute of Technology and Management, Lucknow, India*

Abstract: ***JARVIS is a desktop assistant powered by AI, made to enhance human-machine interaction through task simplification and enhanced efficiency. Unlike conventional virtual assistants, JARVIS seeks to incorporate sophisticated features like speech recognition, natural language processing and learning ability, rendering it a more intelligent and responsive system. It can recognize natural speech, perform voice commands, handle emails, schedule events, manage system operations and integrate smoothly with smart home appliances, boosting productivity through automation.***
This paper reviews the existing developments in AI assistants and highlights the unique vision of JARVIS, particularly its potential hardware implementation. By extending beyond software automation and leveraging IoT connectivity, this project envisions a system that can interact with smart devices, offering a hands-free and intuitive experience. However, achieving such a system involves overcoming challenges like improving voice recognition accuracy, ensuring real-time responsiveness and implementing robust security measures.
Future improvements may include deeper personalization using AI, seamless synchronization across multiple devices and enhanced adaptability to real-world applications. This review consolidates existing knowledge and suggests new possibilities for making JARVIS a more advanced and practical AI companion for everyday use.
Keywords: AI Assistant, Natural Language Processing, Machine Learning, Smart Automation, IoT Integration

I. INTRODUCTION

A. Introduction and Background

The advancement of artificial intelligence has given rise to digital assistants that are capable of simplifying day-to-day tasks [1], [3]. However, most existing systems remain limited to software-level interactions, often requiring manual triggers and being confined to specific platforms [6]. JARVIS, inspired by the concept of intelligent virtual support, is designed as a desktop-based assistant that not only handles common digital tasks but also envisions real-world applications through potential hardware-level execution [9], [10].

This assistant integrates speech recognition, basic NLP, and user-friendly automation features to assist users in performing routine actions more efficiently. It draws inspiration from evolving AI ecosystems but remains focused on simplicity and practicality in its execution. The concept behind JARVIS is not just to replicate what other assistants do, but to extend its capability toward more physical-world integrations, like controlling appliances, system functions, and routine workflows using a voice-based interface.

B. Need for a Smart Desktop Assistant

In the current digital world, people interact with multiple devices and applications throughout the day. From checking emails and managing schedules to performing system-related actions, these tasks often consume time and demand constant attention. While there are tools available for each of these functions, users still face difficulty in managing everything smoothly in one place.

This creates the need for a smart assistant like JARVIS that can bring all basic utilities together in a single, easy-to-use platform. With voice commands and smart automation, JARVIS aims to reduce digital effort and save time by handling everyday tasks quickly and effectively [2], [5], [7]. It not only supports simple software actions but also holds the potential to connect with physical devices for a better, hands-free experience [9], [10].

C. Research Objectives

The objective of this review is to explore and present the potential of developing an AI-based desktop assistant that goes beyond just software interaction. The goals are:

1) To understand how current AI assistants function and where they lack adaptability.
2) To examine the feasibility of integrating hardware-level control and smart automation.
3) To design a concept that uses minimal user input for task execution while offering a personalized experience.
4) To encourage future development of assistants that are more independent, secure, and real-world ready.

II. LITERATURE REVIEW

In recent years, voice-based virtual assistants like Amazon Alexa, Google Assistant, and Apple Siri have become widely popular [3], [4], [5], [11]. These systems are designed to help users perform tasks through voice commands, such as setting reminders, searching the web, or controlling smart home devices. Most of these assistants are optimized for smartphones and smart speakers, offering convenience in mobility and home environments [4], [5], [12].

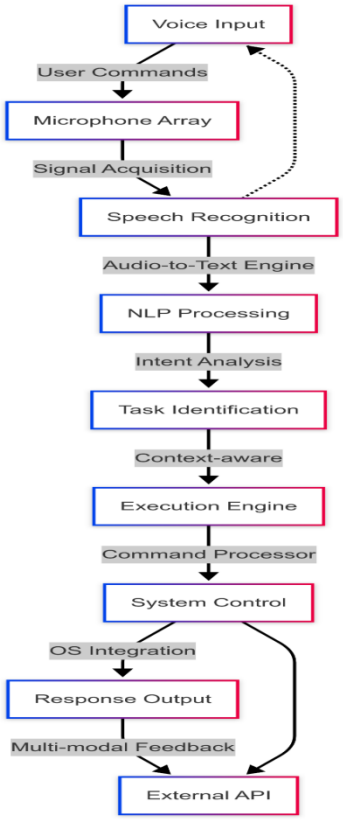
However, when it comes to desktop environments, the presence of intelligent assistants is still limited. While some tools like Cortana (Windows) and Google Assistant for Chrome exist, their integration with desktop-level applications and system functionalities is relatively shallow compared to their mobile counterparts [2], [6], [19].

A major gap in existing systems is the lack of deep personalization and full system control on personal computers. Current assistants often rely on internet-based responses and are not designed to manage local files, run desktop applications, or control hardware-level operations [13], [17]. Additionally, most of them are not customizable according to individual user needs or professional workflows. This gap presents an opportunity to develop an assistant like JARVIS, which is not just limited to answering queries but is capable of controlling the desktop environment, integrating with software, and even connecting with IoT hardware [7], [9], [15], [20]. The idea of creating a more context-aware, responsive, and modular assistant specifically for desktops remains underexplored in mainstream development.

III. SYSTEM ARCHITECTURE / PROPOSED METHODOLOGY

The proposed architecture of the JARVIS desktop assistant follows a modular, layered approach to ensure smooth interaction between the user and the system. The core workflow involves the following steps:

1) Voice Input Layer: Captures user voice through a microphone and processes it using a speech recognition module.
2) Command Processing Layer: Converts audio to text and applies natural language processing to understand the user's intent.
3) Action Mapping Layer: Matches the interpreted command with predefined actions such as opening applications, searching the internet, or controlling devices.
4) Execution Layer: Executes the mapped action through system APIs or third-party libraries.
5) Response Layer: Delivers output via text-to-speech or on-screen messages, depending on the interaction type.



Diag: System Flow Diagram

IV. TECHNOLOGY USED IN PERSONAL DESKTOP VOICE ASSISTANT

The JARVIS desktop assistant is developed using a set of technologies that enable smooth voice interaction, language understanding, and automation. These tools work together to create a responsive and user-friendly system:

1) Python: Used as the main programming language due to its simplicity, flexibility, and support for AI-related libraries.
2) SpeechRecognition: Captures voice input and converts it into text so that commands can be processed.
3) pyttsx3: Converts text responses into speech, allowing the assistant to reply to users with audio, even without an internet connection.
4) NLTK / spaCy: Help in understanding the structure and intent behind the spoken commands using basic natural language processing techniques.
5) Tkinter / Custom GUI: Provides an optional graphical user interface that displays responses or options visually, enhancing user interaction.
6) os & subprocess modules: Enable the assistant to interact with the operating system, such as opening applications, managing files, or executing terminal commands.
7) API Integrations: Allow the assistant to connect with online services like weather updates, email sending, or playing media from the internet.
8) IoT Libraries (e.g., MQTT, Blynk): These can be integrated in future versions to control smart home devices through voice commands, extending the assistant's use beyond the computer.

V. DISCUSSION

The development of JARVIS highlights the growing need for smart desktop-based assistants that go beyond simple query answering. Unlike mobile-focused assistants, JARVIS aims to improve how users interact with personal computers by using voice commands to perform common tasks. This makes it especially useful in environments where multitasking is important, such as offices or study settings.

One of the key advantages of JARVIS is its potential to integrate with both software and hardware. While most existing assistants are limited to online searches or mobile functions, JARVIS can control system operations, open applications, and even connect with smart home devices. This opens the door to more real-world applications and hands-free operation.

However, there are challenges that need to be addressed. Ensuring accurate voice recognition in noisy environments, handling real-time responses, and maintaining user privacy and data security are important considerations. Overcoming these challenges will be critical for creating a more reliable and adaptable assistant.

Overall, JARVIS offers a fresh perspective on desktop automation by blending simplicity, usability, and the potential for real-world integration.

VI. CONCLUSION

This review paper presented an overview of JARVIS, a smart desktop assistant built to simplify daily tasks through voice control, automation, and AI integration. The objective was to create a system that not only understands natural language but also assists users in scheduling, controlling devices, and accessing information efficiently.

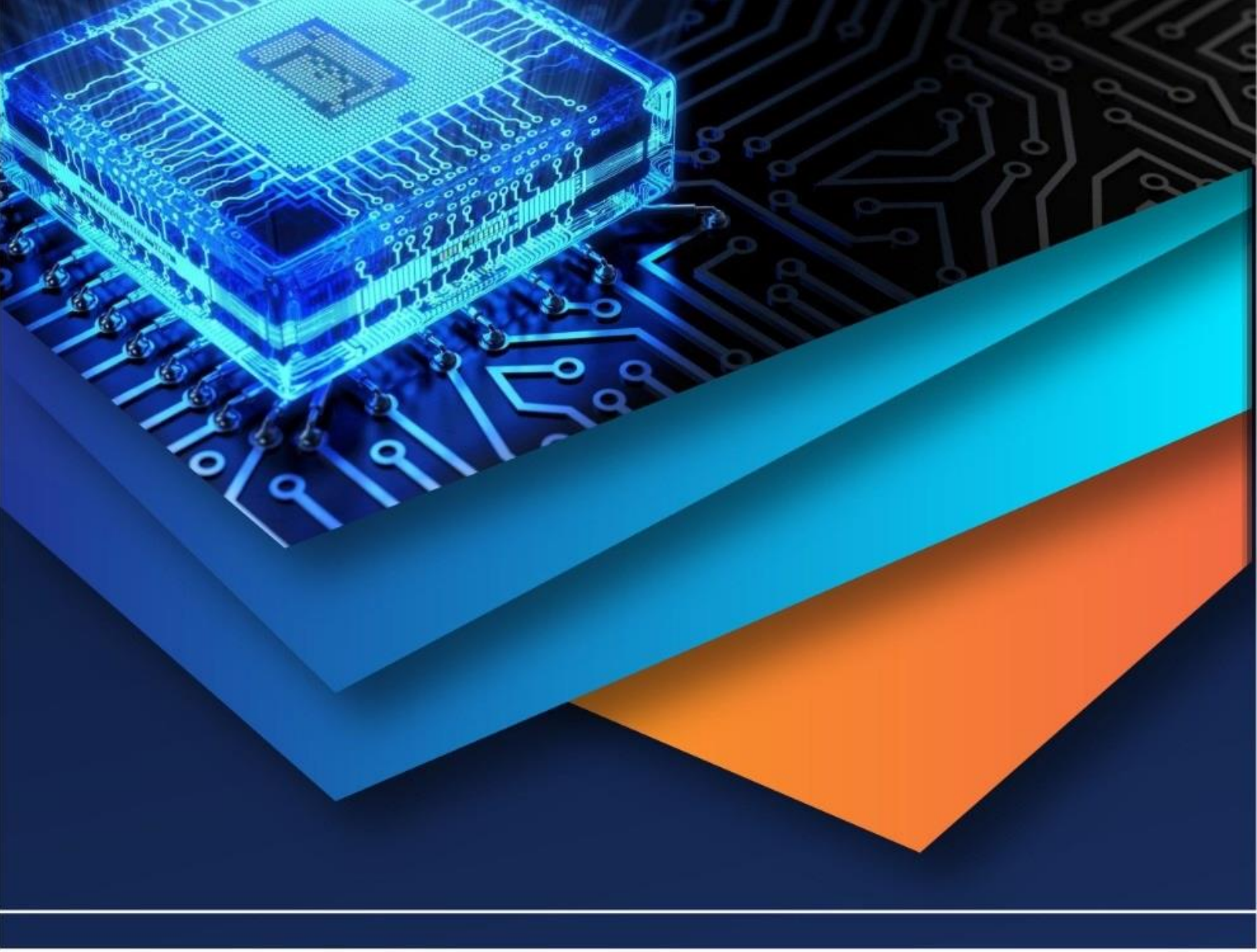
By reviewing existing technologies like Alexa and Siri, we identified the need for a more desktop-focused, customizable solution. JARVIS addresses this gap by providing offline functionality, personalization, and system-level control. The proposed methodology, features, and implementation details show that the assistant is a promising step toward enhancing productivity and accessibility in real-world scenarios.

Though challenges like accuracy and platform dependency remain, future enhancements involving IoT integration, multilingual support and advanced contextual AI can push JARVIS closer to becoming a truly intelligent personal assistant.

REFERENCES

[1] Preethi, G., Abishek, K., Thiruppugal, S., & Vishwaa, D. A. (2022). Voice Assistant using Artificial Intelligence. International Journal of Engineering Research & Technology (IJERT), 11(5), 1–5. Retrieved from https://www.ijert.org/voice-assistant-using-artificial-intelligence
[2] Kadam, P., Jadhav, K., Langhe, S., & Veer, V. (2023). Smart Desktop Voice Assistant Using Python. International Research Journal of Modernization in Engineering Technology and Science (IRJMETS), 5(2),1–6. Retrieved from https://www.irjmets.com/uploadedfiles/paper/issue_2_february_2023/33643/final/fin_irjmets1679063254.pdf
[3] Sharma, A., & Gupta, R. (2021). Voice Assistants: A Review of Current Trends and Future Directions. International Journal of Computer Applications, 175(1), 1–6. Retrieved from https://www.ijarsct.co.in/Paper25447.pdf

[4] Google Research. (2023). Improving Speech Representations and Personalized Models Using Self-Supervision. Google Research Blog. Retrieved from https://research.google/blog/improving-speech-representations-and-personalized-models-using-self-supervision/
[5] OpenAI. (2023). ChatGPT can now see, hear, and speak. OpenAI Blog. Retrieved from https://openai.com/index/chatgpt-can-now-see-hear-and-speak/
[6] Reddy, S. V., Chhari, C., Wakde, P., & Kamble, N. (2022). AI-Based Virtual Assistant Using Python: A Systematic Review. International Journal for Research in Applied Science & Engineering Technology (IJRASET), 9(2), 1–5. Retrieved from https://www.ijraset.com/research-paper/ai-based-virtual-assistant-using-python-a-systematic-review
[7] Amaravathi, K., Reddy, K. S., Datta, K. S. S., Tarun, A., & Varma, S. A. (2022). Voice Based System Assistant Using NLP and Deep Learning. International Research Journal of Modernization in Engineering Technology and Science (IRJMETS), 4(5), 1–6. Retrieved from https://www.irjmets.com/uploadedfiles/paper/issue_5_may_2022/23843/final/fin_irjmets1653653438.pdf
[8] Google Cloud. (2021). Google Cloud launches new models for more accurate Speech AI. Google Cloud Blog. Retrieved from https://cloud.google.com/blog/products/ai-machine-learning/google-cloud-updates-speech-api-models-for-improved-accuracy
[9] Dekate, A., & Killedar, R. (2019). Study of Voice Controlled Personal Assistant Device. International Journal of Emerging Trends & Technology in Computer Science, 8(3), 1–5. Retrieved from https://ijcrt.org/papers/IJCRT2210387.pdf
[10] Patel, D., & Verma, T. (2022). Application of Voice Assistant Using Machine Learning: A Comprehensive Study. Advances in Management, 219, 5063–5073. Retrieved from https://www.mililink.com/upload/article/1856195715aams_vol_219_july_2022_a18_p5063-5073_deepika_patel_and_toran_verma.pdf
[11] Hoy, M. B. (2018). "Alexa, Siri, Cortana, and More: An Introduction to Voice Assistants." Medical Reference Services Quarterly, 37(1), 81–88. https://doi.org/10.1080/02763869.2018.1404391
[12] Arora, A., & Sahu, R. (2020). "Voice Controlled Artificial Intelligent Assistant for Desktop Applications." International Journal of Scientific Research in Computer Science, Engineering and Information Technology, 6(2), 54–59.
[13] Zhang, Y., & Song, Y. (2019). "Natural Language Processing for Intelligent Virtual Assistants." Journal of Artificial Intelligence Research, 64, 53–78.
[14] Tan, C. M., & Goh, D. H. (2019). "Challenges in Voice Interface Design: A Review." International Journal of Human–Computer Studies, 128, 25–39.
[15] Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). "Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions." Future Generation Computer Systems, 29(7), 1645–1660.
[16] Google Developers. (2021). "Speech-to-Text API Documentation." https://cloud.google.com/speech-to-text
[17] Python Software Foundation. (2023). "pyttsx3 – Text-to-Speech conversion library in Python." https://pyttsx3.readthedocs.io/
[18] Varshney, U. (2014). "Smart Homes and Health Monitoring Technologies for the Elderly." ACM Computing Surveys, 46(4), 1–30.
[19] Microsoft. (2020). "Cortana: A Digital Assistant Designed for Productivity." https://support.microsoft.com/en-us/cortana
[20] Singh, S., & Kaur, G. (2021). "Smart Personal Assistants and their Application in Home Automation." International Journal of Computer Applications, 183(47), 15–20



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY