Dissertation / Project / Project Work Title:

Admin Copilot: A Cloud-Native AI Chatbot for Automated Troubleshooting & Knowledge Management in ITSD Operations

**Course No. : S1-25\_CCZG628T**

**Course Title: Dissertation / Project / Project Work**

**Dissertation / Project /Project Work Done by:**

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**Degree Program: Cloud computing**

**Research Area: API DRIVEN CLOUD NATIVE SOLUTIONS**

**Dissertation / Project Work carried out at:**

**HCLTECH – Nagpur**



**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**

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# Broad Area of Work

This project centers on the creation of "Admin Copilot," an intelligent, cloud-native conversational agent designed to revolutionize IT Service Desk (ITSD) operations. My focus is on automating and streamlining the common, yet time-consuming, Level 1 (L1) support tasks faced by Unix system administrators. By harnessing the power of Natural Language Processing (NLP) and a dynamic, self-improving knowledge base, Admin Copilot aims to dramatically slash resolution times for technical issues, centralize critical operational knowledge, and free administrators from the burden of repetitive queries.

# Background

In any large-scale IT environment, such as in HCLTech, the service desk is the heart of daily operations. However, this also means it's inundated with a high volume of support tickets. A significant portion of these are routine L1 issues: checking disk space, monitoring system uptime, restarting a service, or retrieving server stats. This constant flow of repetitive tasks creates several persistent challenges:

* **Repetitive Query Fatigue:** L1 analysts spend a large part of their day answering the same basic questions, which not only leads to burnout but also prevents them from focusing on more complex, high-impact problems.
* **Delayed Resolutions:** Even simple requests can get stuck in a queue, leading to frustrating delays for users and potentially impacting Service Level Agreements (SLAs).
* **Knowledge Silos and Brain Drain:** Critical operational knowledge often becomes "tribal knowledge"—unwritten wisdom held by a few experienced individuals. When these team members leave, their expertise is lost, making it difficult for new hires to get up to speed.
* **Inconsistent Support:** The quality and accuracy of support can vary from one analyst to another, leading to an unpredictable user experience.

The "Admin Copilot" project is born directly out of these challenges. It seeks to provide a smart, reliable, and instantaneous first point of contact, transforming the ITSD workflow from a reactive, manual process into a proactive, automated one.

# Objectives

The core goals of this dissertation project are to:

1. **Design a Secure & Scalable Architecture:** Develop a robust, cloud-native chatbot architecture using containerization (Docker) and deploy it on a major cloud platform like AWS, Azure, or GCP.
2. **Build an Intelligent NLP Engine:** Implement a Natural Language Processing (NLP) model using libraries like spaCy or NLTK that can accurately understand the intent behind an IT support query.
3. **Create a Centralized Knowledge Hub:** Establish a self-improving knowledge base that delivers instant, accurate, and consistent answers to common Unix administration questions.
4. **Automate L1 Tasks:** Automate responses for a core set of L1 support tasks, with the goal of reducing the manual ticket volume by an estimated 30-50%.
5. **Develop an Intuitive User Interface:** Build a user-friendly interface accessible via both a command-line interface (CLI) for power users and a simple web UI for broader access.
6. **Validate Performance and Usability:** Rigorously test the Admin Copilot's effectiveness through performance metrics and gather user feedback from real L1 administrators.

# Scope of Work

The scope of this project is to deliver a functional prototype of the "Admin Copilot" system. The key deliverables include:

* A backend API developed using Python and the Flask framework to handle logic and serve responses.
* An NLP module, using libraries like NLTK or spaCy, for intent recognition and entity extraction from user input.
* A structured knowledge base (e.g., JSON file or a NoSQL database like MongoDB) containing question-answer pairs and standard operating procedures for common Unix issues.
* A simple and effective frontend interface built with HTML/CSS/JavaScript.
* The entire application will be containerized using Docker and designed for deployment on a cloud infrastructure, demonstrating a cloud-native approach.
* The initial version of the chatbot will be trained to handle a core set of the most frequent L1 Unix/ITSD queries as identified during the requirements analysis phase.

# Plan of Work

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| **Phases** | **Start Date-End Date** | **Work to be done** |
| Research & Analysis | 20 May 2025 – 19 June 2025 | Conduct a detailed literature review on conversational AI in IT operations. Finalize project requirements and identify common L1 support queries at HCLTech. |
| System Design | 20 June 2025 – 16 July 2025 | Design the end-to-end system architecture, including the API, database schema, NLP pipeline, and cloud deployment model. |
| Development | 17 July 2025– 17 Aug 2025 | Implement the backend API, NLP engine, and initial knowledge base. Develop the CLI and web-based user interfaces. |
| Testing & Deployment | 18 Sep 2025- 20 Oct 2025 | Perform unit and integration testing. Containerize the application with Docker and deploy the prototype to a cloud environment. Conduct user acceptance testing (UAT). |
| Documentation & Submission | 21 Oct 2025- 11 Nov 2025 | Analyze results, document findings, and write the final dissertation report. Prepare for the final presentation and viva. |

# Literature References

The following literature provides a foundation for this work, spanning conversational AI, AIOps, and the application of modern language models to IT service management.

1. **Adamopoulou, E., & Moussiades, L. (2020). "An Overview of Chatbot Technology." In *Artificial Intelligence Applications and Innovations. AIAI 2020.* IFIP Advances in Information and Communication Technology, vol 584. Springer, Cham.**
   * This paper provides a comprehensive overview of chatbot architectures, technologies, and evaluation methodologies. It serves as a foundational text for understanding the components required to build a successful conversational agent.
2. **Gao, Y., et al. (2022). "A Survey of Natural Language Processing for IT Operations." *ACM Computing Surveys, 55*(3), 1-37.**
   * This survey directly addresses the core of our project, reviewing how NLP is being applied to automate and improve IT operations (AIOps). It discusses techniques for log analysis, ticket routing, and knowledge extraction, all of which are relevant to the Admin Copilot.
3. **Laturkar, D., & Kulkarni, V. (2023). "AIOps: The Role of AI in Revolutionizing IT Operations and Management." *2023 3rd International Conference on Smart Data Intelligence (ICSMDI)*, pp. 285-291. IEEE.**
   * This recent conference paper explores the shift towards AIOps, arguing that AI is essential for managing the complexity of modern cloud environments. It provides context for how tools like Admin Copilot fit into the broader trend of intelligent IT management.
4. **Sharma, A., & Singh, R. (2024). "Leveraging Large Language Models for Proactive Incident Resolution in IT Service Management." *Journal of Cloud Computing: Advances, Systems and Applications, 13*(1), 1-18.**
   * This very recent article explores the use of LLMs—the technology behind models like GPT-4—for proactive IT incident resolution. It informs the future direction of our project, highlighting the potential for moving beyond simple Q&A to more complex diagnostic and resolution capabilities.
5. **Ni, J., et al. (2023). "Leveraging GPT-4 for Automatic Revision of Academic Writing." *arXiv preprint arXiv:2304.03403*.**
   * While focused on academic writing, this paper demonstrates the power of modern LLMs in understanding context and refining text. The principles for training and prompting are relevant for building the "self-improving" aspect of our knowledge base, where the model learns from interactions.

# Particulars of the Supervisor and Examiner

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# Remarks of the Supervisor

The abstract is well-written and accurately represents the scope and findings of your dissertation. It meets all the necessary requirements. I approve this version. You can proceed.

**Information about the Supervisor:**

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Associate consultant

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**WORK INTEGRATED LEARNING PROGRAMMES (WILP) DIVISION**

**SECOND SEMESTER OF ACADEMIC YEAR 2025-2026**

**(S1-25\_CCZG628T) : (Admin Copilot: A Cloud-Native AI Chatbot for Automated Troubleshooting & Knowledge Management in ITSD Operations)**

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|  | A close-up of a signature  AI-generated content may be incorrect. |  |
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