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Microservices-Based Architecture for an AI-Driven Social Listening System Supporting Internship Preparation

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Abstract

Internships in education are a necessary step between education and work life, but students face difficulties when making this transition. The paper describes i-listening, an intelligent listening social application created to improve pre-internship preparation. Through cutting-edge Artificial Intelligence techniques, such as Natural Language Processing, machine learning, and predictive analytics, the platform helps students to get actionable feedback about the workplace culture, industry trends, and employer expectations. This allows acquisition of practical and industry-based skills and competencies that can be helpful in the successful internship experiences. The paper identifies two key contributions in the study, namely the development and deployment of the i-listening application using advanced IT architecture, and its capacity to support recruits (management and IT students) into the workplace with less resistance. The results indicate that it is an AI-based paradigm of transformative pre-internship education.

Keywords: *Artificial Intelligence, Social Listening, Natural Language Processing, Machine Learning, Internship Preparation, Sentiment Analysis, Predictive Analytics.*

Introduction to pre-internship Experience

Internships represent a recognized method that combines classroom learning with career practice. Internship programs enable students to obtain first-hand practice in their academic subjects while building essential abilities which lead to better career achievements [1][2][3]. Many students perceive the shift from academic learning to professional work settings as daunting because they lack the preparedness to handle professional responsibilities. It is a well-known fact that internships are considered to be an essential part of higher learning as they give students a chance to use theoretical experience in the real working conditions. They are seen as a connector between the classroom experience and the work experience as they allow building the necessary skills and attaining practical experience.

Nonetheless, the academic setting to professional workplace setting is usually very challenging. Students feel anxiety and uncertainty because they have little knowledge of industry requirements, workplace environment and market trends. In attempt to solve these challenges pre-internship preparation has been identified as a useful solution in improving student preparedness. Social listening technology has a potential that is unique among the innovative strategies of pre-internship learning. Social listening is a technique that monitors and analyses online discussions in order to derive information about the trends in the industry, the consumer behavior, and the organizational operations. In combination with Artificial Intelligence (AI), social listening can be used as a highly useful educational tool, allowing students to receive real-time and data-driven information that can shape their knowledge about professional settings.

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This paper proposes an artificial intelligence-based social listening app, i-listening, which can be used to facilitate pre-internship training. Through methods such as Natural Language Processing (NLP), machine learning, and predictive analytics, the application will enable the students to acquire practically useful information concerning workplace dynamics and expectations on the employer. This social listening with AI is a paradigm shift in the field of experiential learning, and it will ease the process of career transition.

Role of AI in Social Listening

The field of social listening has been disrupted by the application of Artificial Intelligence (AI) to expand the level of analysis beyond traditional key-word-based monitoring. Implementation of Natural Language Processing (NLP) systems results in computational systems that perform sentiment analysis, detect nascent topical trends, and elicit contextual semantics in unstructured social media text.

Machine-learning applications enhance the accuracy of analysis by incorporating historical data trends, whereas predictive analytics provide future estimates of the trends of business and the expectations of employers.In the i-listening application, the volumetric social media data are processed by AI modules that consume platform APIs and then uses NLP to classify sentiment and topic model. Machine-learning models also tighten up trend detection and optimization in the generation of recommendations to the learners. These features allow students to have relevant, practical information in time, reducing the gap between theory and the industry. As a result, the incorporation of AI makes social listening a versatile pedagogic tool which enables individual learning, adaptation to industry needs, and coherent careering.

The problem of ethics, specifically, the issue of privacy and the bias in the algorithm, is addressed with the help of strict data handling measures and the further adoption of transparent model structures. The AI-powered approach described in the paragraphs below is a paradigm shift in pre-internship education, which provides scalability, relevance, and dynamic capability in an ever-changing professional environment [21]-[23].

Motivation to Design the I-listening Application

The rationale for developing the i-listening application has to do with a growing need to align the ideological teaching with the pragmatics of workplace preparation and has serveral purposes [4]-[6].Although the knowledge provided in the classroom is the basis, learners often find it challenging to adjust to the fluid industrial settings when placed on internship assignments. This difficulty explains the importance of pre-internship experience that simulates real-world situations and develops professional skills.

The i-listening application was developed with the aim of filling this gap with the implementation of Artificial Intelligence (AI) and social-listening applications. The application allows students to interpret discourse in the industry, isolate new trends, and pick up the expectations of employers in the job market through the inclusion of Natural Language Processing (NLP) and machine-learning algorithms, among others. The insights will enable the students to make better-informed choices about the career paths, acquire relevant technical and soft skills, and build confidence before joining a profession.

Moreover, the application provides students of Information Technology with the opportunity to work with software development, data analytics, and integration of AI and students of Marketing with the ability to work with sentiment analysis, brand monitoring, and campaign performance evaluation. This interdisciplinary approach not only enhances proficiency in technical skills but also creates collaboration and problem-solving skills—critical attributes for success in today's competitive job market [7] [3].

Objectives and Functionalities

The i-listening application was developed with the main purpose of improving readiness of students in workplace by filling the gap between academic studies and job competence. It aims to offer an active, technology-based platform that uses Artificial Intelligence (AI) to deliver practical insights in the trends of the industry, employer expectations, and organizational culture. The application allows analysing social media discussions in real-time, classifying sentiment, and predicting market dynamics by using modern methods: Natural Language Processing (NLP) and machine learning. These features help students to gain a better insight into the working conditions and make their choices in the career directions.

Along with analytical capabilities, the application includes interactive dashboards that visualise data with charts and trend maps, making otherwise complex data easier to understand. It also includes

simulation exercises that simulate real-life situations and enable students to undergo the process of decision-making and problem-solving in a controlled setting. Moreover, combined mentoring and feedback systems enhance teamwork among both faculty and students, thereby strengthening learning outcomes and facilitating interdisciplinary interaction. When these functionalities are combined, the i-listening application will turn the pre-internship education into a tailored AI-driven experience that would provide students with not only technical proficiency but also with practical knowledge that will make them successful in the current competitive job market.

Literature Review

Internships have been traditionally considered as an essential part of the higher education curriculum, and they can give a student invaluable experience in the field and a chance to learn how to apply the theory acquired at classes to the real life. A significant amount of literature proves that internships can provide the acquisition of skills, the development of professional networks, and the prospects of employability [1]– [3]. However, there are numerous problems faced by students in the process to bifurcate academic milieus to the professional workplaces, mostly because of inexperience with industry culture and work dynamics. This information vacuum highlights the need to have planned pre-internship programs that would equip students with sufficient knowledge on how to navigate the demands of the modern career environments.

The existing literature shows that the confidence, adaptability, and professional competence of students in the internship experience can be improved significantly by preparatory internship activities, such as career exploration workshops, networking events, and skill-building programmes [7]-[12]. Such interventions do not only reduce anxiety, but also enhance job performance and job satisfaction [10], [11]. In fields like hospitality where pre-internship programs have been carefully designed, it is empirically demonstrated that these programs help students understand their vocational desires, strengthen technical and soft skills, and match expectations with industry realities [8], [9], [14]-[17]. Furthermore, the virtual learning platforms along with simulated projects provide risk-free platforms on which students can practice problem-solving and decision-making skills without the consequences of real-life investment [9], [18].

Whereas the traditional pre-internship modalities emphasize on workshops and networking, current scholarship recommends integrating technology-based solutions to enhance workplace preparedness. Artificial Intelligence (AI), in this regard, has solidified to emerge as a key driver in the fields of educational technology and social-media analytics. AI methods, such as Natural Language Processing (NLP) and machine learning, can be used to perform advanced sentiment analysis, identify trends, and model predictive behaviour in the industry [21], [22], [23]. Empirical research by Ferrara et al. [23] and [22] shows how AI-based social-media mining can reduce actionable information on unstructured data, thus contributing to evidence-based decision making in business and education. Similarly, [21] suggest the detailed approaches to the usage of NLP and machine learning to social-media text, emphasizing their capability to provide real-time analytics and prediction.

Pedagogical payoffs are immense when AI is incorporated into social-listening apps. By studying the discourse of big-data social-media, AI-based tools may provide students with current data on employer expectations, newly developing skill sets, and organizational culture. This correlation is echoed by the work of G. S. M. et al. [24], who highlight the importance of predictive analytics in the planning of marketing and professional preparation. In its turn, AI-implemented social listening can be viewed as a paradigmatic shift in pre-internship education, which goes beyond passive observation to provide intelligent, data-driven learning experiences enabling the learners to be prepared to engage in dynamic professional environments adequately.

The current paper builds up on these insights and examines the design of the i-listening app, which combines AI-based analytics with interactive learning modules. The application is targeted to IT and marketing students and will support interdisciplinary collaboration, the development of technical skills, and learning outcomes appropriate to the industry. The i-listening application fills the gaps in the conventional pre-internship programs and changes the caliber of experiential learning in post-secondary education, by using AI to analyze sentiments and forecast trends, together with tailored advice.

Designing the I-listening Application

Design of i-listening application was done with a careful consideration of scalability, modularity, and AI-enabled features and thus provides a strong platform which supports pre-internship learning

through real-time social media analytics. This architecture was designed by a group of the information technology students, providing them with priceless practical experience in current software engineering practices, and at the same time providing them with practical feedback on the marketing curriculum. As a result, the dual-purpose architecture fosters an interdisciplinary teamwork and guarantees the alignment of technical and business goals of the university in general in the broader context of pedagogy.

Architectural Overview

The system is built as a microservices application that breaks down the system into loosely coupled, independently deployable services [29], [32]. This programming paradigm encourages modularity, scalability and maintenance, allowing different parts -like data extraction, sentiment analysis and visualization to be independent. The pattern of repository is an intermediate between data access layer and business logic, which provides a coherent data management as well as enables thorough testing and maintenance [29].

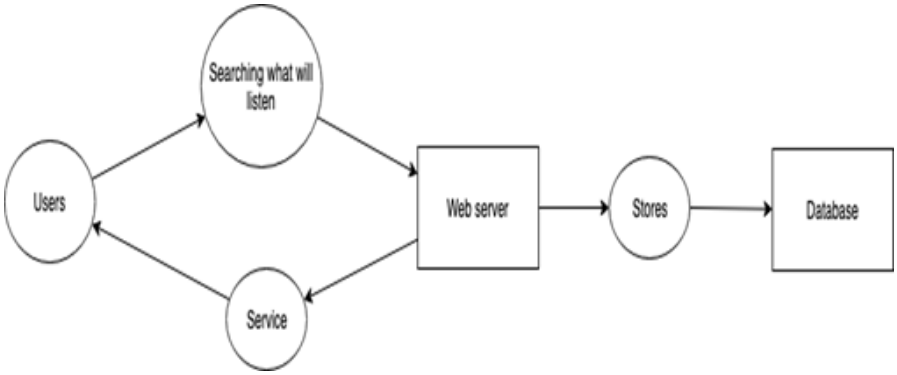

Figure 1. Logical View of I-Listening Applications

The Data Acquisition Layer is also charged with the responsibility of collecting social media data using platform specific API-s such as Twitter and Facebook [19], [20]. The Processing Layer uses AI-based methods, including Natural Language Processing (NLP), to categorize sentiments and machine learning algorithms to identify trends [21], [22], [23]. The Presentation Layer provides interactive dashboard-based student displays with charts, graphs and trend maps, thus helping them in coming up with intuitive results.

Data Extraction and Preprocessing

Data acquisition is a process of retrieving unstructured social media data and converting them into structured data that can be analysed [24], [28]. The system is designed to process a variety of data types and API constraints with the help of web scraping tools and API-based data processing [19], [20]. The data extracted gets stored in relational databases where they can be easily queried and combined with the analytical modules. The preprocessing involves the steps of tokenization, stop-word, and normalization of text to conduct NLP sentiment analysis [21].

Web Scraping system

An automated process of retrieving specific data from websites is not easy; to get a proper database, developers must transform unstructured or semi-structured web content into a structured format suitable for analysis or storage in databases. [24] these systems are crucial for efficiently collecting large amounts of online information with minimal human intervention. This information is then used to understand complex phenomena in the business field. The i-listening application permits Marketing students to study their target market and industry trends and assess their marketing campaign results. Students can optimize their marketing strategies and show analytical skills to potential employers by reviewing the application data [25][26][27].

The i-listening application creates a synergy between IT and marketing domains to enable student collaboration through which both learn valuable industry-relevant skills.

The system retrieves data through pattern identification in HTML source code. Maintaining complex websites becomes difficult through these methods even though they remain effective, stemming from the HTML source code. Several tools and libraries ease web scraping through easy-to-use interfaces and application programming interfaces for data retrieval functions. These tools often

handle tasks like web page navigation and data parsing [28], provide a survey of various web data extraction tools.

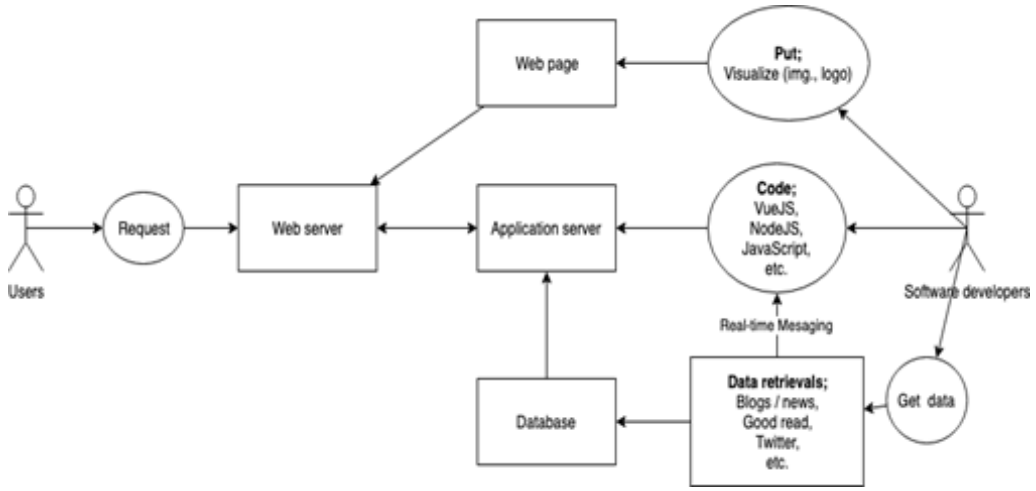

Figure 2. Use Case View of I-Listening Application Data Extraction

By combining the use of web-scraping and AI-based analysis, the i-listening application will enable marketing scholars to possess the necessary tools to query the current trends in the industry, conduct a rigorous evaluation of the campaign effectiveness, and tune the strategic imperatives based on the data-driven insights in real-time. At the same time, the information-technology students are introduced to the achievable data-engineering and software-development work, thus solidifying the fundamentally interdisciplinary nature of the project.

Analytics AI Integration

The fundamental analysis engine relies on machine learning algorithms to predict analytics and sentiment and topic modelling algorithms to analyse. These AI elements help the application to recognize new trends and make predictions about employer expectations as well as categorize user-created information with great precision [21], [22], [23]. With the integration of these features, the i-listening application will not be limited to the simple search of keywords but an intelligent, context-driven analysis which will give students meaningful information that can be acted upon in the preparation of their career.

User Interface and Visualization

The application also has interactive dashboards to maintain usability which will be used to display the real-time analytics by using visualization tools like graphs, charts, and heat maps. These properties enable marketing students to track brand sentiment and performance of the campaign, whereas IT students can delve into system architecture and data processing processes. Usability testing: It was proven that the interface is user-friendly and facilitates effective navigation [32].

Application Design: Repository Pattern and Microservices

The repository pattern acts as an intermediary between the data access layer and the business logic of an application. A developer can easily test and maintain the underlying data source through this abstraction. The i-listening application implements microservices architecture, so its distinct components work individually through personal storage and business functionality. Microservices architecture structures an i-listening application as a collection of loosely coupled, independently deployable services. [29][32] and support microservice API patterns and provide solutions to the problems. This approach enhances designed applications with modularity, scalability, and maintainability.

The repository pattern (IDE) is used because it allows the system to store data in a central repository accessible by all components. Components interact with the repository rather than directly with each other. An IDE utilizes the repository to organize information within a software tool that generates and makes data available. This pattern is ideal when dealing with huge data volumes must be stored for extended periods. It ensures consistent data management, including backups, as all information is stored in a single location.

Microservices architecture separates the application into loosely coupled services, each is charged with the responsibility of performing discrete functions, including data extraction, sentiment analysis, trend prediction, and the visualization. Such services communicate through standardized APIs and are thus independently just deployable, making it possible to scale the individual components independently. This architectural framework does not only boost the system performance level, but it also imbues the IT students with practical exposure to modern software engineering paradigms. The combination of the repository-pattern principles with microservices and artificial intelligence will result in the i-listening application of a robust and future-proof design that supports the needs of the dynamically changing educational requirements.

Ethical and Security issues

Being a sensitive area of the Internet, the app will use applications of the encryption of data by the SSL algorithm and safe authentication measures to avoid unauthorized access [32]. Data privacy and bias mitigation guidelines in AI models were adhered to make sure that the models are compliant with industry standards. The i-listening application provides a powerful platform of experiential learning through the combination of the microservices architecture, AI-based analytics, and user-oriented design. This design will not only provide students with technical and analytical competencies but will also prepare education results and outcomes with industry needs thus redefining the pre-internship preparation.

Integrating Data extraction into the Application

The i-listening application needs data extraction features, which the IT students can add through web data extraction frameworks and libraries explained in [30] and [31]. The tools that extract data through APIs enable developers to implement them within microservices frameworks for social media data management. An API gateway will connect microservices internally and external client systems through managed interfaces. The data extraction microservice obtains data from various social media platforms through structural transformations to store it within the application database. The service should implement methods for platform API utilization along with HTML parsing and rate limit and authentication requirement management.

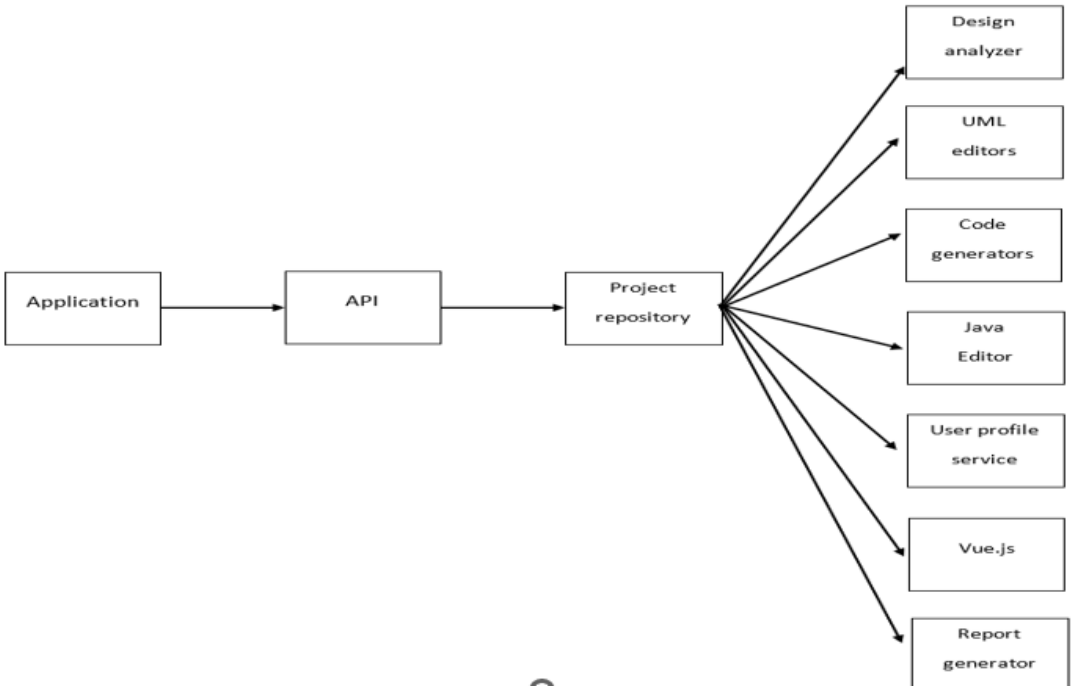

Figure3: Repository Architecture and microservice Pattern

The application interacts with a central API that forwards requests to the project repository and calls each microservice used to create the application. For example, when users enter information into the application to retrieve all available resources from the backend, the system fetches data through the project repository. Each previously developed program displays its respective design, function, and features on the web page, presenting the requested information gathered from multiple sources

Microservices do not have a strict definition of size but can store various data types, such as user profiles. Users provide their account information, such as username and password, together with extra details, including profile picture and address of any specific favourites. Breakdowns implemented through microservices allow teams to segment their responsibilities into smaller segments, which become easier to manage.

Testing the I-Listening Application

We have established a thorough testing plan, in order to ensure the quality, reliability, and security of the i-listening application. This plan included a number of levels of testing unit, functional, usability, security, and performance testing in accordance with the recommendations of [32].

Unit Testing

Unit testing - can be used to reduce cascading faults by testing individual elements (units) of the application separately. In this way, the reliability of every microservice and the modules that it contains data extraction, processing, and storage is guaranteed. The following table (Table 1) shows some sample unit test cases of authentication components:

Table 1. Unit Testing of the AI Driven I-Listening Application

Function name	Inputs	Expected outputs/resulting outputs
Username	Email Stamford	True if command gets set
Password	Random password, valid in 3 months	True if command gats set

To facilitate the integrity and adherence to high security standards, we did unit testing of essential modules, especially username validation and password generation modules. This intense test ensured that every part functioned as planned and met all applicable standards of security [32].

Functional Testing

The functional testing (as a systematic quality assurance system and a type of black-box testing) was performed as per the requirements of the software parts that were being tested. The i-listening Web site application, created to allow users to search a particular hashtag keyword, then creates an analysis display filled with various visualizations and graphical displays. The obtained data may be further analysed in CSV format so that students may proceed with further examination and analysis. In the microservices architecture, the services are designed to be highly limited in scope, with only one clearly defined responsibility, and the services are only connected to each other through well-designed API [32].

Usability Testing

Usability Testing - We conducted a usability test to determine how easily users would interact with the system and how intuitive the design of that system was. The learners were left to do representative tasks (e.g., make sentiment reports and create trend graphs) and the observers carefully recorded the performance metrics and qualitative feedback. The result of this assessment exercise was some essential usability feedback that was used to develop iterative improvements in the interface design and navigational ergonomics [32].

Table 1. Quality Attribute Scenario for the AI-Driven I-Listening Application

	Source	Stimulus	Artifact	Environment	Response	Response measure
Possible values	**Users**	**Wants to learn system features; minimize the**	**System**	**At runtime**	**Through its response function, the system provides users with symbols,**	**The time taken to retrieve data from the social media API depends on the number of comments**

	Source	Stimulus	Artifact	Environment	Response	Response measure
		impact of errors			**including text and brief descriptions to help them navigate webpage elements. The system enables users to download the data in CSV format to study the listening materials they need to explore. Students can find the three-month valid password on the blackboard page.**	**associated with the keyword users are searching for. If there are many comments, it may take longer (approximately 10–15 seconds). The time required to export data into a CSV file can vary based on the volume of data retrieved. If users search for many keywords and the system retrieves a large amount of data, it may take more time. However, if users search for many keywords but the system retrieves only a small amount of data, the process will be quicker.**

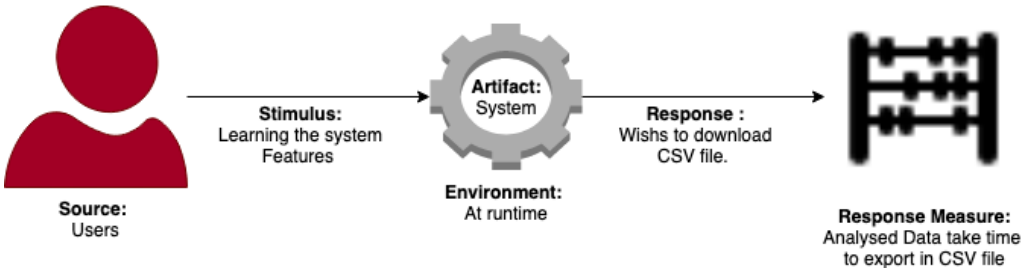

Figure4: Usability Testing

Security Testing

Security Testing- was done to confirm that i-listening application is not vulnerable to threats that tend to create cyber threats. The encryption system was implemented using the SSL encryption protocol to ensure that only authorized people with keys to use to encrypt sensitive data can access them. There was also further authentication of authentication protocols and data protection mechanisms to ensure sound security postures [32].

Table 3. Security Testing

Portion of Scenario	Possible Values
Source	An individual or system that is properly authenticated. (authorized / unauthorized access to the system)
Stimulus	Attempts to view data, modify/delete data, or access system services.
Artifact	Retrieved Data / Analyzed Data
Environment	Real-Time
Response	Verifies user identity; Grants access to data and/or services; Logs access to data/services by user identity; Encrypts data to ensure it is unreadable; Restricts availability of services.
Response Measure	The ability to access processed data within the system.

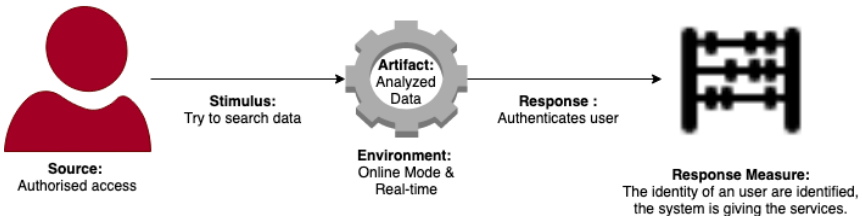

Figure5: Security Testing

7.5. Performance Testing

Performance Testing- was done to test the responsiveness, throughput and stability of the application when it was put to the expected operational loads. The early limitations, e.g. the restrictions on the single-word search options, were addressed by allowing the possibilities of multi-keywords searches and increasing the speed of downloading data. The additions to the systems significantly improved the system efficiency and user satisfaction [32].

Table4: Performance Testing

Portion of Scenario	Possible Values
Source	User
Stimulus	The system should perform more efficiently when downloading and searching for hashtags.
Artifact	System
Environment	Normal mode/ overload mode
Response	We use caching in the application to store data, allowing it to remember previous searches and display the searched words or data more quickly. Without caching, users would need to download the data again each time they revisit a previous search, preventing them from accessing that data easily.
Response Measure	The duration of searching for and retrieving data.

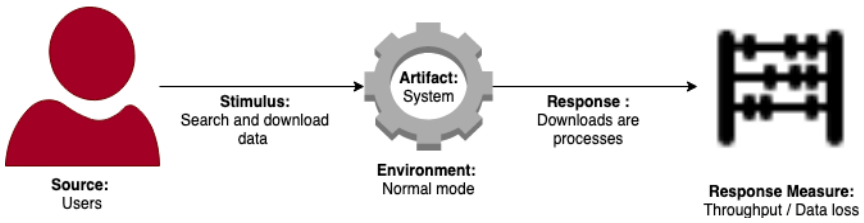

Figure6: Performance Testing

The i-listening application has achieved the greatest standards of functionality, usability and security by implementing this multi-layered approach of testing. The comprehensive and all-encompassing testing cycle will sustain the platform as being reliable, scalable, and give AI-driven insights that can be used in pre-internship training.

Conclusion

The process of developing the i-listening application shows that the concept of Artificial Intelligence could reshape pre-internship education by converting traditional social listening into a smart, data-driven educational experience. The application allows students to derive actionable insights out of large-scale social media data by combining the latest methods like Natural Language Processing, machine learning, and predictive analytics. Such capabilities will enable the learners to comprehend the trends in the industry, the expectations of employers and the workplace culture real-time, thus closing the gap between the theory acquired in academics and the practice in the workplace.

Other than analysis capabilities, the application would offer IT students practical experience in AI-powered software development and marketing students experience with sentiment analysis and brand monitoring. This multi-disciplinary method promotes technical expertise, analytical skills and teamwork, which is part of competencies needed to succeed in the current competitive job market. Moreover, the AI-powered design is scalable, personalized, and flexible, which makes the platform a strong tool of experiential learning.

Finally, the i-listening app is a great example of how the pre-internship preparation should switch to the next stage of the paradigm shift, where it is fundamentally based on the active involvement of AI, rather than passive observation. Through the use of intelligent technologies, learning institutions can develop new learning spaces that equip students with dynamic, data-intensive professional environments.

References

[1] Clark, S. C. "Enhancing the Educational Value of Business Internships." Journal of Management Education, August 1, 2003. doi:10.1177/1052562903251350.

[2] Kapareliotis, I., Voutsina, K., and Patsiotis, A. "Internship and Employability Prospects: Assessing Student's Work Readiness." Higher Education, Skills and Work-Based Learning, February 20, 2019. doi:10.1108/heswbl-08-2018-0086.

[3] Vairis, A., Loulakakis, K., and Petousis, M. "The Role of Internships in a Higher Education Institute." QScience Proceedings, January 1, 2014. doi:10.5339/qproc.2014.wcee2013.27.

[4] Wang, F.-T., Lin, T.-W., Tsai, H.-F., and Yu-zhong, L. "Work Scene Learning Cooperated with School-Based Learning: A Case Study of Placement Courses Program for CSIE Undergraduate Students." IEEE International Symposium on Educational Technology, July 1, 2015. doi:10.1109/iset.2015.38.

[5] Nguyen, N., Muilu, T., Dirin, A., and Alamäki, A. "An Interactive and Augmented Learning Concept for Orientation Week in Higher Education." International Journal of Educational Technology in Higher Education, July 16, 2018. doi:10.1186/s41239-018-0118-x.

[6] Yahia, D. A. A., Zemmouchi-Ghomari, L., and Ghomari, A. R. "Towards an IT-centric Internship Process in Undergraduate Studies: The Case of ESI, Algiers." International Journal of Technology and Computer Science, January 1, 2017. doi:10.1504/ijtcs.2017.10009874.

[7] Kapoor, A., and Gardner-McCune, C. "Understanding CS Undergraduate Students' Professional Development through the Lens of Internship Experiences." ACM SIGCSE, February 22, 2019. doi:10.1145/3287324.3287408.

[8] Ko, W. "Training, Satisfaction with Internship Programs, and Confidence about Future Careers among Hospitality Students: A Case Study of Universities in Taiwan." Journal of Teaching in Travel & Tourism, June 6, 2008. doi:10.1080/15313220802033245.

[9] Zopiatis, A., and Theocharous, A. L. "Revisiting Hospitality Internship Practices: A Holistic Investigation." Journal of Hospitality Leisure Sport & Tourism Education, July 1, 2013. doi:10.1016/j.jhlste.2013.04.002.

[10] Wang, Y.-F., Chiang, M.-H., and Lee, Y. "The Relationships Amongst the Intern Anxiety, Internship Outcomes, and Career Commitment of Hospitality College Students." Journal of Hospitality Leisure Sport & Tourism Education, July 1, 2014. doi:10.1016/j.jhlste.2014.06.005.

[11] Gad, H. E. saad, and El-latief, M. F. A. "Did the Summer Internship Programs Meet the Hospitality Undergraduate Students' Expectations?" International Journal of Hospitality and Tourism, September 1, 2019. doi:10.21608/ijhth.2019.92791.

[12] Zopiatis, A., and Constanti, P. "Managing Hospitality Internship Practices: A Conceptual Framework." Journal of Hospitality & Tourism Education, January 1, 2012. doi:10.1080/10963758.2012.10696661.

[13] Zopiatis, A., Papadopoulos, C., and Theofanous, G. "A Systematic Review of Literature on Hospitality Internships." Journal of Hospitality Leisure Sport & Tourism Education, vol. 28, p. 100309, March 23, 2021. doi:10.1016/j.jhlste.2021.100309.

[14] Morrison, M., Dimpel, J., and Smith, E. "The Preternship – An Academic-Industry Partnership Model for Early Experiential Learning Experiences in Computer Science Curricula." IEEE International Symposium on Educational Technology, August 1, 2020. doi:10.1109/isec49744.2020.9280748.

[15] Ayoob, J. C., and Ramírez-Lugo, J. S. "Ten Simple Rules for Running a Summer Research Program." PLoS Computational Biology, vol. 18, no. 11, November 3, 2022. doi:10.1371/journal.pcbi.1010588.

[16] Minnes, M., Serslev, S. G., and Padilla, O. "What Do CS Students Value in Industry Internships?" ACM SIGCSE, March 9, 2021. doi:10.1145/3427595.

[17] Kapoor, A., and Gardner-McCune, C. "Barriers to Securing Industry Internships in Computing." ACM SIGCSE, January 23, 2020. doi:10.1145/3373165.3373181.

[18] Liu, C., and Houdek, R. "Teaching Computer Science Graduate Students Scholarly Literature Review Techniques." IEEE Frontiers in Education Conference, January 1, 2006. doi:10.1109/fie.2006.322349.

[19] Littman, J., et al. "API-based Social Media Collecting as a Form of Web Archiving." International Journal on Digital Libraries, December 28, 2016. doi:10.1007/s00799-016-0201-7.

[20] Cao, J., Adams-Cohen, N., and Alvarez, R. M. "Reliable and Efficient Long-Term Social Media Monitoring." arXiv, January 1, 2020. doi:10.48550/arxiv.2005.02442.

[21] Zhang, W., and Ram, S. "A Comprehensive Methodology for Extracting Signal from Social Media Text Using Natural Language Processing and Machine Learning." SSRN Electronic Journal, January 1, 2015. doi:10.2139/ssrn.2880834.

[22] Zafarani, R., Abbasi, M. A., and Liu, H. Social Media Mining: An Introduction. Cambridge University Press, 2014. doi:10.1017/cbo9781139088510.

[23] Desai, S., and Patil, S. T. "Efficient Regression Algorithms for Classification of Social Media Data." IEEE Pervasive Computing, January 1, 2015. doi:10.1109/pervasive.2015.7087040.

[24] Ferrara, E., Meo, P. D., Fiumara, G., and Baumgartner, R. "Web Data Extraction, Applications and Techniques: A Survey." Information Fusion, vol. 15, pp. 20–31, July 2014. doi:10.1016/j.inffus.2014.07.001.

[25] G. S. M., Akshay, U., et al. "Integrating Social Media Marketing with AI through Predictive Examination." International Journal of Engineering and Advanced Technology (IJEAT), vol. 9, no. 1S, pp. 1003–1009, December 2019. doi:10.35940/ijeat.a1003.1091s19.

[26] Kim, Y. "Developing a Work-Ready Social Media Marketing Analytics Course: A Model to Cultivate Data-Driven and Multiperspective Strategy Development Skills." Decision Sciences Journal of Innovative Education, April 1, 2019. doi:10.1111/dsji.12175.

[27] Bordawekar, R., Blainey, B., and Puri, R. Analyzing Analytics. Morgan & Claypool Publishers, 2016. doi:10.1007/978-3-031-01749-0.

[28] Laender, A. H. F., Ribeiro-Neto, B., da Silva, A. S., and Teixeira, J. S. "A Brief Survey of Web Data Extraction Tools." ACM Computing Surveys, June 1, 2002. doi:10.1145/565117.565137.

[29] Zimmermann, O., Stocker, M., Lübke, D., Pautasso, C., and Zdun, U. "Introduction to Microservice API Patterns (MAP)." OASIcs, January 1, 2020. doi:10.4230/oasics.microservices.2017-2019.4.

[30] Baumgartner, R., Gatterbauer, W., and Gottlob, G. "Web Data Extraction System." Encyclopedia of Database Systems, 2009, p. 3465. doi:10.1007/978-0-387-39940-9_1154.

[31] Lowry, O. H., Rosebrough, N. J., Farr, A., and Randall, R. J. "Protein Measurement with the Folin Phenol Reagent." Journal of Biological Chemistry, November 1, 1951. doi:10.1016/s0021-9258(19)52451-6.

[32] Lanka, S., Srivallop, A., and Pinto, C. A. "A Specialised Framework of Web Application for Efficient Data Retrieval on Social Media Tools." Proceedings of ICECA, 2021, pp. 161-166. doi:10.1109/ICECA52323.2021.9676101.