Project Proposal

Github dependencies Visualization

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Project Proposal

## Version Table.

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# Abstract

The proposed project aims to develop a comprehensive dashboard system that addresses the challenges faced by individuals and companies utilizing GitHub repositories. The primary focus is on visualizing code dependencies across repositories and providing a vulnerability notification system to enhance code quality, security, and collaboration. The project involves developing a Python-based codebase that interacts with GitHub APIs, fetching repository and dependency information, and generating intuitive visualizations. Additionally, a vulnerability detection system will be integrated to identify vulnerable dependencies and send real-time email and SMS notifications. The project also includes the creation of documentation, step-by-step guides, and a user-friendly dashboard interface. The technology stack involves Python, GitHub APIs, Splunk, and potentially additional libraries for data visualization and dashboard development. Through research and exploration of dependency visualization techniques, vulnerability detection methods, and user experience design, the project aims to contribute to the existing knowledge base in these areas while providing practical solutions to improve code understanding, security, and collaboration on GitHub repositories.

GitHub Dependencies Visualization

# 1.Problem/opportunity analysis

## Introduction

I am proposing the development of a comprehensive dashboard system to address the challenges faced by individuals and companies who utilize GitHub repositories for code sharing and collaboration. This project aims to enhance the understanding of code dependencies and facilitate the identification of vulnerable dependencies, thereby improving code quality, security, and overall project efficiency. The proposed solution includes a dependency visualization feature and a vulnerability notification system.

## Stakeholders

The stakeholders involved in this project include:

**Developers and coders**: They use GitHub repositories to store and share their code.

**Project managers**: They oversee the development process and ensure code quality and security.

**New employees and team members**: They join existing projects and need to understand code dependencies quickly.

**System administrators**: They manage the overall infrastructure and security of the GitHub repositories.

## Related Projects

While there are existing tools and features within GitHub to manage code dependencies and identify vulnerabilities, they often lack intuitive visualizations and real-time notification systems. My project builds upon these existing features and aims to provide a more comprehensive and user-friendly solution.

## 1.4 Problem/Opportunity Analysis

The current situation on GitHub presents the following problems and opportunities:

**Difficulty in understanding code dependencies**: Existing visualization methods on GitHub make it challenging to comprehend the connections between repositories and the dependencies they use. This hampers the onboarding process for new employees and team members who struggle to understand the codebase quickly.

**Lack of visibility on vulnerable dependencies**: While GitHub sends email notifications for vulnerable dependencies, it does not reach all project users, causing potential delays in addressing critical security issues. An SMS-based notification system would provide faster and more direct communication, ensuring prompt action when require.

## 1.5. Starting Situation and Affected Parties

The starting situation is one where GitHub users face difficulties in comprehending code dependencies and identifying vulnerable dependencies effectively. This situation affects developers, project managers, and new employees, leading to reduced productivity, increased onboarding time, and potential security risks.

## 1.6. Proposed Solution

I propose the development of a comprehensive dashboard system that addresses the identified problems and opportunities. The solution includes the following features:

**Dependency Visualization**: The dashboard will provide an intuitive graphical representation of repositories and their interconnected dependencies. This visualization will aid new employees and team members in understanding code relationships more effectively.

**Vulnerability Notification System**: The system will send real-time email and SMS notifications to relevant stakeholders whenever a vulnerable dependency is identified. This immediate and direct communication will ensure prompt actions can be taken to address the security risks.

By implementing this solution, we aim to enhance the overall code quality, security, and collaboration experience on GitHub repositories.

In conclusion, the project proposal seeks to address the challenges faced by GitHub users in understanding code dependencies and identifying vulnerable dependencies promptly. By providing a visual representation of repositories and implementing a comprehensive vulnerability notification system, we will improve the onboarding process for new employees, enhance code security, and promote efficient collaboration within GitHub projects.

# 2. Assignment

## 2.1. Initial Assignment:

The initial assignment is to develop a dashboard that visualizes GitHub user dependencies across all repositories. This dashboard will provide an intuitive graphical representation of the interconnectedness between repositories and the dependencies they use. It will also include a vulnerability notification system that sends real-time email and SMS notifications when vulnerable dependencies are identified.

# 2.2 Goals:

The goals of this project are as follows:

Enhance the understanding of code dependencies for GitHub users.

Improve the onboarding process for new employees and team members by providing a clear visualization of repository dependencies.

Facilitate the identification of vulnerable dependencies and enhance code security.

Increase collaboration and efficiency by providing a comprehensive dashboard solution.

# 2.3 Scope:

The scope of this project includes:

Developing a Python-based codebase that interacts with GitHub APIs to fetch repository and dependency information.

Designing and implementing a user-friendly dashboard interface for dependency visualization.

Integrating a vulnerability detection system that scans dependencies and sends notifications.

Providing documentation and step-by-step guides to enable users to understand and utilize the dashboard effectively.

Ensuring compatibility with different operating systems and browsers for seamless user experience.

## 2.4 Products to be Delivered/Realized:

The following products will be delivered/realized as part of this project:

**Python codebase**: This will include the necessary scripts and modules to fetch repository and dependency information from GitHub, perform dependency analysis, and generate visualizations.

**Documentation**: A comprehensive documentation guide that explains the setup process, dependencies, and usage instructions for the codebase and dashboard.

**Steps Guide**: A step-by-step guide that provides detailed instructions on how to reiterate the process and customize the dashboard to suit specific requirements.

**Dashboard**: The primary deliverable, a visually appealing and user-friendly dashboard interface that displays repository names, their dependencies, and their interconnectedness.

**Vulnerability Notification System**: A system that detects vulnerable dependencies and sends real-time email and SMS notifications to relevant stakeholders.

## 2.5 Technology to be Used:

The following technologies will be used for this project:

**Python**: The primary programming language for developing the codebase and dashboard.

**GitHub APIs**: APIs will be utilized to fetch repository and dependency information from GitHub.

**Splunk**: Splunk will be used as a backend tool to analyze and process the fetched data for visualization.

**Additional libraries and frameworks**: Depending on specific requirements, additional libraries and frameworks may be used for data visualization and dashboard development.

By utilizing these technologies, we will create a robust and efficient solution that addresses the visualization and vulnerability notification needs of GitHub users, while providing a seamless user experience and enhancing code security

# 3. Relation to research

The assignment to build a dashboard that visualizes GitHub user dependencies across repositories may require a research attitude in the following areas:

**Dependency Visualization Techniques**:

Research may be required to explore and identify effective techniques for visually representing code dependencies. This could involve investigating various graph-based visualization methods, clustering algorithms, or network analysis approaches to create an intuitive and informative visualization of the interconnectedness between repositories.

**Potential research questions in this area could include**:

What are the most effective graph visualization techniques for representing code dependencies?

How can clustering algorithms be applied to group repositories based on their dependency relationships?

Are there any novel approaches or algorithms that can enhance the visualization of complex dependency networks?

Vulnerability Detection and Notification Systems:

Research may be needed to understand and develop efficient methods for detecting vulnerable dependencies within GitHub repositories. This could involve exploring existing vulnerability databases, analyzing dependency metadata, and identifying patterns or heuristics to detect potential security risks. Additionally, researching effective notification systems, such as SMS alerts, and integrating them into the dashboard could require investigation into relevant APIs and best practices.

**Potential research questions in this area could include**:

How can vulnerability databases and APIs be leveraged to identify potential security risks in GitHub dependencies?

What are the most efficient methods for scanning and analyzing dependency metadata to detect vulnerabilities?

How can real-time notification systems, such as SMS alerts, be effectively integrated into the dashboard to ensure prompt action is taken when vulnerabilities are identified?

By conducting research in these areas, it will be possible to enhance the effectiveness and efficiency of the proposed dashboard solution, address user needs, and contribute to the existing knowledge base in code visualization, vulnerability detection.

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# 4. Guidance

I would be guided by the software/AI coaches and will have weekly meeting twice to create the proposed system.