Group 21

VenomVerse

Project Proposal

Group Project Details

1. Group number: **21**

2. Group members:

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TABLE OF CONTENTS

Details of Project Supervisor, Co-supervisor, Advisors, and Clients

Proposed Project Supervisor

Name of the supervisor: Mr. Akila Gamage

Signature of the supervisor: 

Date: 18.06.2023

Proposed Project Co-Supervisor

Name of the co-supervisor: Mr. D.A.D. Vithanage

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1. Project Title

VenomVerse: Empowering Communities with Snake Detection, Snake Education, and Professional Catching via Mobile App

2. The Goal and Objectives

The goal of the "VENOMVERSE" mobile app is to enhance safety and promote a balanced relationship between humans and snakes. The app aims to achieve this by enabling communities to identify snakes in their surroundings, access educational materials about snakes, and establish connections with professional snake catchers for secure snake removal.

Objectives:

- Train and optimize a machine learning algorithm capable of accurately identifying different snake species based on uploaded photos.
- Minimize false positives and false negatives in snake identification results.
- Collaborate with local snake experts and professional snake catchers to create a database of trusted professionals available for snake removal.
- Verify the credentials and expertise of the snake catchers to ensure the safe handling and relocation of snakes.
- Enable users to connect with professional snake catchers quickly and easily through the app for safe and humane snake removal.
- Increase community awareness and knowledge about snake species, behavior, and safety measures.

3. Tentative Problem Definition

We are dealing with the escalating issue of snake-human conflict. Snakes can injure or kill people because they are frequently feared and misunderstood. The software will assist in reducing people's fear of and misunderstanding snakes by educating them about them. Additionally, it will offer a secure and efficient means of getting rid of snakes from places where they pose a danger to people.

4. A Brief Introduction to the Project

“VENOMVERSE” is a mobile app that empowers communities to detect snakes in their area and connect with professional snake catchers. Additionally, you can learn about snakes which features a variety of educational resources, including articles, videos, and quizzes. The app uses machine learning algorithms to identify snakes in photos. Users only need to upload a photo of a snake, and the software will scan it, identify it, and provide details. The app allows users to report any snakes they encounter, and qualified snake catchers will be sent to remove them securely.

The goal of the project is to make neighborhoods safer and more snake-friendly. Snakes should not be feared or attacked because they are an essential part of the environment. The software will contribute to changing people's perceptions about snakes and fostering more peaceful coexistence between people and snakes.

The app has several features, including:

- Snake scanner: The app uses a state-of-the-art snake detection algorithm to identify snakes in photos. This allows users to identify snakes quickly and easily in their area.
- Educational resources: The app features a variety of educational resources, including articles, videos, and quizzes. These resources will cover a wide range of topics, including snake biology, behavior, and ecology.
- Professional snake catching: Users will be able to report any snakes they see to the app. Professional snake catchers will then be dispatched to remove the snakes safely.
- Community forum: The app features a community forum where users can share information and experiences about snakes. This forum will provide a space for users to learn from each other and build relationships.

5. The scope of the Project

The project primarily centers around snake identification, engaging professional catchers for safe removal, while also providing a platform for users to share their knowledge and experiences about these fascinating creatures through a vibrant forum. Additionally, valuable educational resources are available to enhance understanding.

Users:

1. **User** - Scan and easily identify the snakes. Able to study about various types of snakes.
2. **Snake Expert** - Snake experts represent the pinnacle of knowledge and expertise, serving as the ultimate aspiration for passionate amateurs looking to elevate their understanding of these remarkable creatures.
3. **Professional Zoologist** - A professional zoologist exemplifies an individual who possesses a profound understanding and comprehensive qualifications specifically focused on the captivating realm of snakes.
4. **Snake catcher** - Within our system, a snake catcher is a distinguished individual who holds official registration and possesses the expertise required to skillfully capture and handle snakes with utmost proficiency.
5. **System Administrator** - System admin can generate reports.
6. **Community Administrator** - Community administrators can manage people who joined the community.

In-Scope:

1. User registration

   All users are required to register and log in to the system to get a service from our system.

2. Snake identification

   Every User can easily identify the snakes by scanning them. Sinhala names of the serpents are also displayed. For the snake identification, 5 varieties of the most venomous serpents of the Sri Lanka and a few numbers of other serpents will be trained. For the learning purpose, the majority of the snakes in Sri Lanka will be displayed.

3. Make a connection with the snake catcher.

   If a user encounters a snake, they can promptly establish contact with nearby snake catchers, facilitating the swift and safe removal of the serpent from its present location.

4. Community

   There are amateurs, snake experts, and professional zoologists in the community. They can share their experiences and they can get advice from professional zoologists.

5. Handle payments

   Users must give a subscription payment to unlock some educational resources in the system.

6. Profile management

   Users can update personal details, reset passwords, and edit close contacts and emergency contacts.

7. Generate reports.

   Admin can generate income reports, generate reports of caught snakes and generate reports of accidents.

8. Share knowledge.

   The app features a variety of educational resources, including articles, videos, and quizzes. These resources will cover a wide range of topics, including snake biology, behavior, and ecology.

9. Complaint-Handling

   Community administrators can view the complaints and they can remove users from the community, or they can give negative feedback to the users.

Out-Scope

- Payments for the catchers are done physically since the catcher and the user meet physically. Payment amounts also can be varied under several conditions such as distance and reachability.
- After catching a serpent, the serpent can be handed over to a zoo or a veterinary center by the catcher.

6. Tentative Technologies

Frontend	Flutter / Next.js
Backend	ASP.NET core
Database	PostgreSQL
Version Control	Git / GitHub
Project Management	Trello / Git / GitHub
Code Editor / IDE	Visual Studio Code / Android Studio / Visual Studio
Hosting	Azure
Diagram Editor	draw.io

7. Feasibility Study

7.1 Operational Feasibility

Operational feasibility for the VENOMVERSE mobile app involves ensuring the smooth and efficient functioning of its key functionalities. The snake scanner functionality relies on a machine-learning algorithm to identify snakes in photos. To ensure operational feasibility, it is crucial to develop and fine-tune an accurate and reliable snake detection algorithm. This will require access to a large dataset of snake images for training the algorithm. Creating and maintaining high-quality educational resources such as articles, videos, and quizzes requires a dedicated team of content creators and subject matter experts. Establishing a network of professional snake catchers, partnering with them, and implementing a system to track and manage their availability and response times are essential for safe snake removal operations. The community forum requires user-friendly software and active moderation to facilitate positive user engagement. To achieve operational feasibility, resource planning for human resources, collaboration with partners, development of a robust technology infrastructure, and continuous process optimization are crucial. Additionally, user support systems and feedback loops should be in place to address user concerns and iterate on the app's features based on user needs. By considering and implementing these operational aspects, the “VENOM VERSE” mobile app can be effectively and smoothly operated to fulfill its objectives.

7.2 Legal and Ethical Feasibility

The legal and ethical feasibility of “VenomVerse” is high. To eliminate any dangers or concerns linked to software licenses, the app will employ free and open-source software (FOSS). FOSS refers to software that is freely used, modifiable, and distributable. This indicates that using FOSS is free of any licensing costs or royalties. FOSS is frequently created and maintained by a community of developers, therefore there is a sizable reservoir of knowledge available to assist with creation and debugging.

The system will be developed from the ground up, which means that there will be no copyright issues associated with the project. This is because all the code and content will be created by the development team. In terms of ensuring that the snake catchers are licensed with a clean record, a security check will be carried out at the point of signing up with the application as a snake catcher. This will involve the snake catcher submitting documents, such as their national identity card (NIC) and driver's license, for authentication purposes. In terms of data privacy, a clear privacy policy will be developed, and user consent will be obtained before collecting any personal data. The privacy policy will explain how the data will be collected, used, and shared. The app will also promote snake safety and avoid promoting violence or harm against snakes. This will be done by providing information on how to identify venomous snakes, how to avoid snake bites, and what to do if you are bitten by a snake. By taking these steps, we ensure that the app is both legally and ethically feasible.

7.3 Scheduling Feasibility

We have allocated a four-month timeframe to complete our project, and we are confident in its scheduling feasibility. With a team comprising six dedicated members, each contributing eighteen hours per week, we estimate a total of approximately 1800 man-hours available for the project.

Number of weeks to complete project = 15 weeks
Number of working hours on weekdays = 8 hours
Number of working hours on weekends = 12 hours
Total working hours for a member per week = 20 hours
Number of members in the group = 6
Total working hours for a group per week = 20 * 6 = 120 hours
Total project duration = 20 * 6 * 15 = 1800 hours

We will concentrate on efficiently allocating our time to crucial tasks including requirement analysis, documentation, interface design, system design, implementation, and continuous testing. Because our project entails creating a mobile application, we will carefully choose the right technologies to guarantee the timely delivery of a product with the needed functionality. Our scheduling feasibility, in our opinion, is well-established for the effective completion of our project within the allotted time frame based on these factors.

7.4 Technical Feasibility

Technical feasibility is assuring that the system is producible and functional. It must be constructed in a well-organized manner with the appropriate technology to satisfy the requirements. The system must ultimately be able to handle a variety of information.

Our system, which is a mobile application, will be developed using ASP.NET Core for the backend with Flutter for the front end; and a web application will be developed using ASP.NET Core for the backend and Next.js for the front end. We are using this because our web pages and backend can be successfully implemented using those and all of our team members are familiar with most of these languages this project development will be an opportunity to share knowledge and self-learn. We have decided to use PostgreSQL as the database.

Required Resources and Technologies:

- Development tools: Visual Studio Code, Android Studio, Visual Studio
- Diagram Drawing: Draw.io
- Communication: Zoom
- Version Control Tools: Git, GitHub
- Project Management tools: GitHub, Git, Trello
- Documentation Maintenance: Google Drive

We are using our personal computers and mobile phones to complete this project; therefore, the hardware resources are readily available.
In conclusion, we chose readily available and accessible technical resources when deciding which resources to be used for the development, so we can conclude in our Technical Feasibility that we can create this system with the resources we have.

7.5 Economic Feasibility

To go ahead with our project, it is a must to consider whether the proposed mobile application is cost-free or not. Therefore, some tactics will be taken to make this a cost-beneficial project. The development of the proposed mobile application will be done at the lowest possible software cost because all technologies that will be employed are Free and Open-Source software. Upon payment of a subscription fee, we have chosen to unlock a selection of educational resources within this mobile application. Subsequently, a portion of the subscription fees may be allocated to compensate snake catchers for their services. The group members will be using their own devices (laptops, desktops, phones, etc.) for the development process, so the development process will not incur a hardware cost. Also, the group members are responsible for the development of the project, therefore personnel cost would be zero. Only messaging apps like WhatsApp will be used for communication. Zoom will be used for meetings with the supervisors and team meetings. The communication cost can be reduced using unlimited packages from internet providers and Zoom meetings are cost-free since the Zoom links are provided in collaboration with LEARN. Since all documentation is digital, the associated paper costs may also be kept to a minimum. We may therefore conclude that this project is economically feasible after considering these facts.

8. Main Deliverables of the System

- Complete working software and source code.
- Complete Software Requirement Specification
- A mobile app
  - That allows users to scan snakes, identify them, and get instructions on how to handle them safely.
  - A database of snakes, including their names, descriptions, distribution, and venomousness.
  - A system for connecting users with professional snake catchers.
  - A community platform where users can discuss snakes and get help from experts.
- A system for generating reports on monitoring statistics.
- User manual
- Administrators manual together with deployment instructions.
- License of the software

9. Project Plan

The following is the Gantt chart for the project,

No	Activity	May				June				July				August				September			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Problem Identification																				
2	System Analysis																				
3	System Design																				
4	System Development																				
5	System Testing																				
6	System Deployment																				
7	Maintenance																				

10. Technology Justification

10.1 Frontend

Flutter - Mobile Application

Single codebase for all platforms:
There is no need for separate codebases for Android and iOS. We can easily develop both Android and iOS applications using Flutter with a single codebase by selecting the OS. It also helps in quick application launching and is cost-effective because its framework is more responsive than others.

Access to native features:
Better native integrations are provided by Flutter. Platform-specific code or Flutter plugging can be used to interact with the devices such as cameras, location services, sensors, etc. It is much easier for the image scanning functionality in our proposed application.

Hot Reload Feature:
When using Kotlin/java, if a change has been made, we have to build and restart the application again and again. But with the Hot Reload feature, there is no need to build and restart the application again and again. So that it speeds up the development process and saves time. Productivity can be easily achieved as well as experiments can be done easily, through this feature.

Flutter DevTools:
Flutter has devtools like an inspector, a debugger, a performance monitor, a network monitor, a logger, and more. We can easily do inspections, debugging, performance checking, and testing with the help of these devtools.

Performance:
Flutter has a rendering engine and it helps to increase the cross-platform ability.

Reduced development time and cost:
Flutter also provides a large number of pre-built widgets and a flexible UI framework. This leads to cost-saving and time-saving development.

Next.js - Web Application for Admin panel

App/Directory for File-Based Routing:
In React we have to specifically create the routings. When using Next.js we can have the advantage of using file-based inbuilt routings.

Server-Side Rendering:
SSR has benefits such as a quicker initial page load, better SEO, accessibility, better performance on low-powered devices, security, code sharing, and increased performance for recurring visitors. Faster Load Time, Easy indexation by search engines.

Group Members are familiar with React.js:
Next.js is an open-source framework built on top of React. Our Group members have experience with React.js therefore it will be much easier to use Next.js for frontend.

Accelerated Development:
Because Next.js has so many built-in modules and components, we can create websites quickly.

10.2 Backend

ASP.NET core

Security:
This ASP.NET core is created by Microsoft because of that ASP.NET has built-in Security from Microsoft.

Support:
ASP.NET core has good community support like GitHub & Stack Overflow because of that it is much easier to find solutions and there are lots of tools and libraries we can use for development. And also ASP.NET Core supports many Microsoft products like Visual Studio and Visual Studio Code.

Hosting:
ASP.Net Core supports various hosting options since we using Azure for hosting and Azure is also from Microsoft, we have the advantage of hosting ASP.NET Core on Azure both are compatible with each other well.

Cross-platform support:
ASP.NET Core supports cross-platform since group members are using different platforms with cross-platform support it is easier to cooperate.

Developers can produce highly scalable, reliable, and flexible cloud-native applications by integrating ASP.NET Core with Azure. Faster development and deployment, automatic scaling, simple connection with other Azure services, and cost savings can be achieved with ASP.NET.

10.3 Image Recognition

TensorFlow

Scalability and performance:
Models and big datasets can be scaled with TensorFlow with its distributed computing capabilities and computational graph optimization.

Deployment Options:
For the trained image recognition models to be used in production, TensorFlow offers a variety of deployment options. TensorFlow enables exporting models to numerous formats and integrating them into various runtime environments, ensuring flexibility and compatibility for deployment scenarios whether they are carried out on cloud platforms, mobile devices, edge devices, or as web services.

Powerful Neural Network:
Many pre-built deep learning models and neural network architectures are available in TensorFlow that are tailored for image identification applications.

10.4 Database

PostgreSQL

Object-oriented database features:
we are planning to use classes and objects for our development because Object-oriented database features will be very helpful for our development process. We have to maintain relations with those classes, models we need to use a relational database for maintaining relationships with tables.

Reliability and Stability:
PostgreSQL transactions have Atomicity, Consistency, Isolation, and Durability properties. With these ACID properties, PostgreSQL can ensure Reliability and Stability.

Possible to process special data types:
PostgreSQL already has the datatypes of integer, character, Boolean, etc. Additionally, it also has special data types such as box, point, lseg, polygon, inet, and macaddar. From these special data types, the 'point' type might be used for coordinates.

Mainly focused on storing and processing structured datasets because of that it is more suitable to use SQL-type databases.

Has support from Azure:
Since we are hosting the application using Azure, it is more suitable to use PostgreSQL rather than other databases. We can have the advantage of using the features of Azure for the integration with PostgreSQL.

10.5 Hosting

Azure

Data Security:
Azure has improved security from Microsoft. Azure provides Confidentiality, Integrity, and Availability (CIA) with the data. Azure provides some useful features such as Azure Active Directory, network security, encryption, monitoring, threat detection, etc.

Support for ASP.NET:
Azure provides huge support for ASP.NET. Azure function, Azure SQL databases, Azure storage, and Azure active directory are some key features that support ASP.NET. The deployment, scalability, management, and monitoring of ASP.NET applications are made easier by the large array of services and tools offered by Azure, allowing developers to concentrate on creating their apps rather than handling infrastructure.

Support for PostgreSQL
Azure database, high availability, data protection, performance and scalability, security and compliance, monitoring and management are some features that are compatible with PostgreSQL.

10.6 IDE / Code Editor

Android Studio

Android Studio is the official IDE for Flutter Development. It provides huge support for developing Flutter applications. Flutter widget catalog, Flutter inspector, Flutter outline view, and Specific project templates are some features that provide huge support for Flutter development.

VS code & Visual Studio

Visual Studio is the most comprehensive IDE for .NET and C++
developers on Windows and VS Code is a lightweight and highly customizable code editor developed by Microsoft.
Intuitive User Interface, Cross-platform support, Version Control integration, debugging capabilities, Integration with Azure, and Customization and configuration are some advantages of using VS code & Visual Studio for ASP.NET development.

11. Justification for Claiming Adequate Scope for 3 Credits per Group Member

Members are going to learn the majority of the technologies and frameworks from the beginning as they have not been used by the members previously. There are a few user rolls and sub-user rolls for some users. All the user rolls and the sub-user rolls have functionalities that are specified to them. Training the model is going to be done completely by ourselves as there is no existing trained model for serpents in Sri Lanka. According to the period, we have assumed this workload is enough to obtain 3 credits in our project.

12. References

- https://www.nature.com/articles/s41598-021-96031-1
- https://dl.ucsc.cmb.ac.lk/jspui/handle/123456789/4473

13. Declaration

We as members of the project titled “VenomVerse”, certify that we will carry out this project according to guidelines provided by the coordinators and supervisors of the course as well as we will not incorporate, without acknowledgment, any material previously submitted for a degree or diploma in any university. To the best of our knowledge and belief, the project work will not contain any material previously published or written by another person or ourselves except where due reference is made in the text of appropriate places.

Name	Signature
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(ii) K.D.D.O.Thilakarathna	
(iii) U.G.B. Navanjali	
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