CIS6035

Software Engineering Dissertation Final Project Proposal

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BIRDY

AI-Powered Bird Sound Prediction Web application

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02. Introduction

This report outlines the proposal for developing a Bird Sound Prediction Web Application. The system aims to identify and classify bird species based on sound recordings uploaded by users. The document includes a problem statement, a literature review, the proposed solution, its justification, and detailed information on the system's scope, methodology, technology, resource requirements, limitations, and project timeline.

03. Problem Statement

Bird watching and ornithology enthusiasts often struggle to identify bird species based on their sounds, especially in regions with diverse bird populations. Existing solutions are either costly or lack accuracy. This project aims to address this gap by providing an accessible, user-friendly, and accurate web application that leverages machine learning to predict bird species from sound recordings.

04. Literature review

Several existing systems provide bird sound identification, such as the Merlin Bird ID app by the Cornell Lab of Ornithology and BirdNET by the K. Lisa Yang Center for Conservation Bioacoustics. These systems use advanced audio processing and machine learning techniques to classify bird sounds. Technologies used include convolutional neural networks (CNNs) for sound classification and various audio preprocessing techniques for feature extraction.

05. Proposed Solution

The proposed solution is a web application that allows users to upload bird sound recordings in WAV format. The system will process the audio files, extract relevant features, and use a trained machine learning model to predict the bird species. The application will provide immediate feedback to users with details about the predicted bird species.

06. Justification to the Solution

The proposed solution is justified by its potential to provide an accurate, accessible, and user-friendly tool for bird sound identification. By leveraging machine learning and web technologies, the system can offer high accuracy and fast predictions, making it valuable for both casual bird watchers and professional ornithologists.

07. Deliverable/ Scope of the System

Scope: The system will cover the following functionalities:

- User-friendly interface for uploading sound files
- Audio preprocessing and feature extraction
- Machine learning model for bird sound classification
- Display of prediction results with bird species information

Non-functional requirements:

- The system should be responsive and work across different devices
- Ensure data security and privacy for user-uploaded files

08. Methodology and Technology

Methodology: The project will follow the Agile Software Development Life Cycle (SDLC) to allow for iterative development and continuous feedback.

Technology Stack:

- **Backend:** Python, Flask
- **Frontend:** HTML, CSS, JavaScript
- **Machine Learning:** TensorFlow/PyTorch for model training
- **Database:** SQLite/PostgreSQL (if needed for user data)
- **Development Tools:** Visual Studio Code, Git

09. Resources requirement and Allocation

Hardware:

- Development machines with sufficient processing power for model training
- Servers for hosting the web application

Software:

- Python and relevant libraries (Flask, TensorFlow/PyTorch)
- Frontend development tools (HTML, CSS, JavaScript)
- Database management system (SQLite/PostgreSQL)

10. Limitation of the Project

- The accuracy of bird sound predictions depends on the quality and variety of the training dataset.
- Limited by the number of bird species included in the training data.
- Potential challenges in processing noisy or overlapping sounds.

11. Gantt chart & Risks

Expected Schedule:

- Week 1-2: Requirement analysis and system design
- Week 3-4: Backend development (Flask setup, file upload handling)
- Week 5-6: Frontend development (HTML/CSS/JavaScript)
- Week 7-8: Machine learning model training and integration
- Week 9-10: Testing and bug fixing
- Week 11-12: Deployment and user feedback

Risks:

- Delays in model training due to large datasets
- Potential integration issues between backend and frontend
- Unforeseen technical challenges in audio processing

12. References.

- S. Kahl, T. Wilhelm-Stein, H. Klinck, M. K. Obrist, S. Stober, and K. T. Schindler, "BirdNET: A deep learning solution for avian diversity monitoring," Ecological Informatics, vol. 61, 2021.

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Thank you!

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