BIRD SOUND PREDICTION AI SYSTEM

- *Subtitle: Final Year Software Engineering Project presentation*
- *Name: Hansaka Nuwan Sithara Panagodage*
- *ICBT St. No: CL/BCSCD/25/80*
- *CMU St. No: st20267833*
- *Supervisor: Miss Upeka Wijeshine*

Introduction

Context:

- **Bird sound identification** plays a crucial role in ecological research, bird conservation, and environmental monitoring.
- **Problem:** Manual identification of bird species based on sounds is time-consuming and requires expertise.

Objective:

- Develop an **automated system** capable of predicting bird species from sound recordings, providing a user-friendly tool for researchers and enthusiasts.

Problem Statement

Challenges:

- **Complexity of Bird Sounds:** Birds produce a wide variety of sounds, making it difficult to identify species by ear, especially in noisy environments.
- **Existing Solutions:** Most existing systems lack the required accuracy or usability for non-expert users.

Goal:

- To create a system that addresses these issues by improving accuracy and ease of use.

Literature Review

Key Research:

- **Traditional Signal Processing:** Early methods (Fourier Transforms, LPC) analyzed sounds but struggled with complexity.
- **Machine Learning Approaches:** Recent advancements using CNNs show improved accuracy and robustness.

Gaps Identified:

- Limited accuracy due to inadequate training data.
- Insufficient focus on real-time usability for end-users.

Contribution:

- Utilizes a more effective machine learning model.
- Enhances usability for birdwatchers and conservationists.

Methodology

Data Collection:

- **Sources:** Open databases (Macaulay Library, Xeno-canto) and field recordings.
- **Diversity:** Varied species and habitats represented in the dataset.

Data Preprocessing:

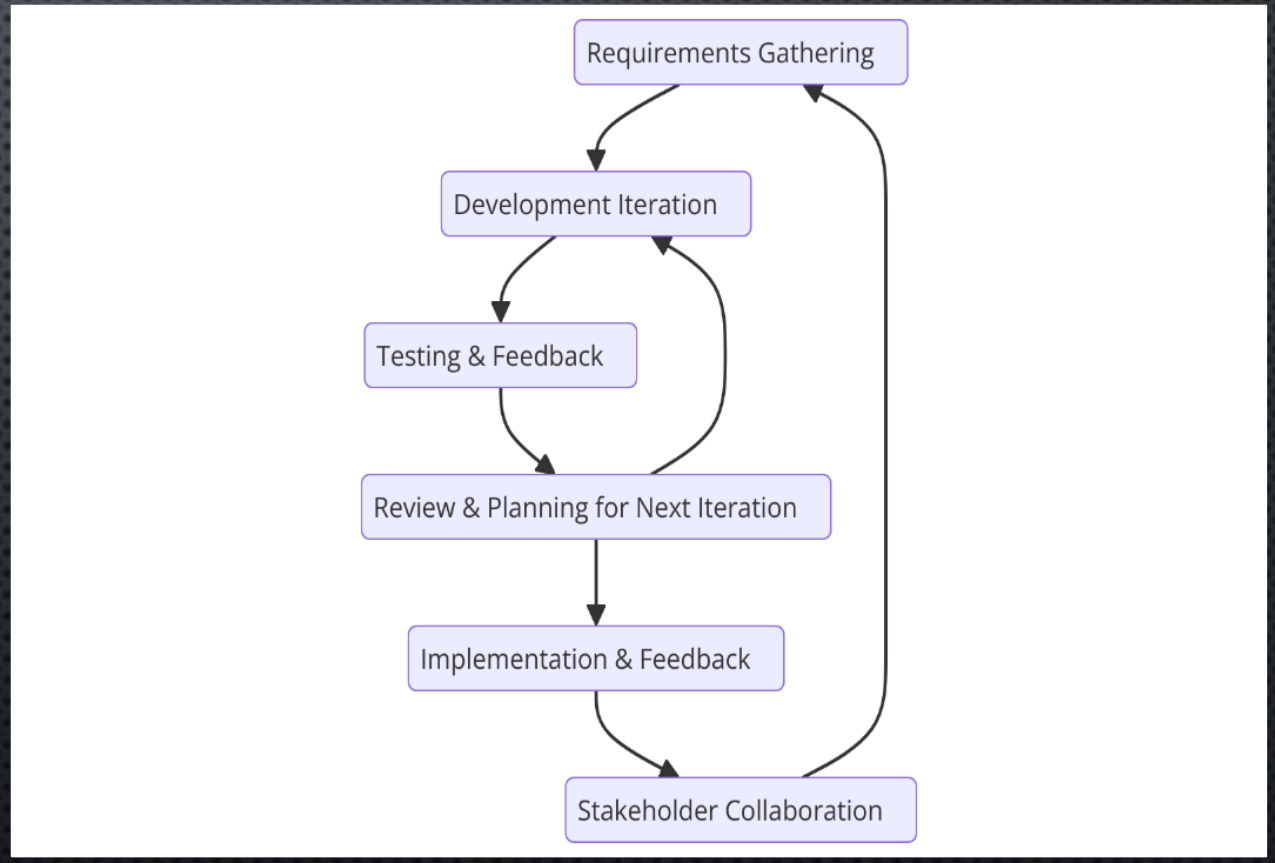
- **Noise Reduction:** Techniques to filter background noise.
- **Feature Extraction:** Utilizes MFCCs to capture audio features.

Model Selection:

- **Algorithm:** Convolutional Neural Networks (CNNs).
- **Rationale:** Effective in recognizing patterns in audio spectrograms.

SOFTWARE DEVELOPMENT LIFE CYCLE

The Agile approach is the development process paradigm that was chosen for this project. Agile is preferred because of its adaptability, iterative development methodology, and focus on input and cooperation from customers.



System Development

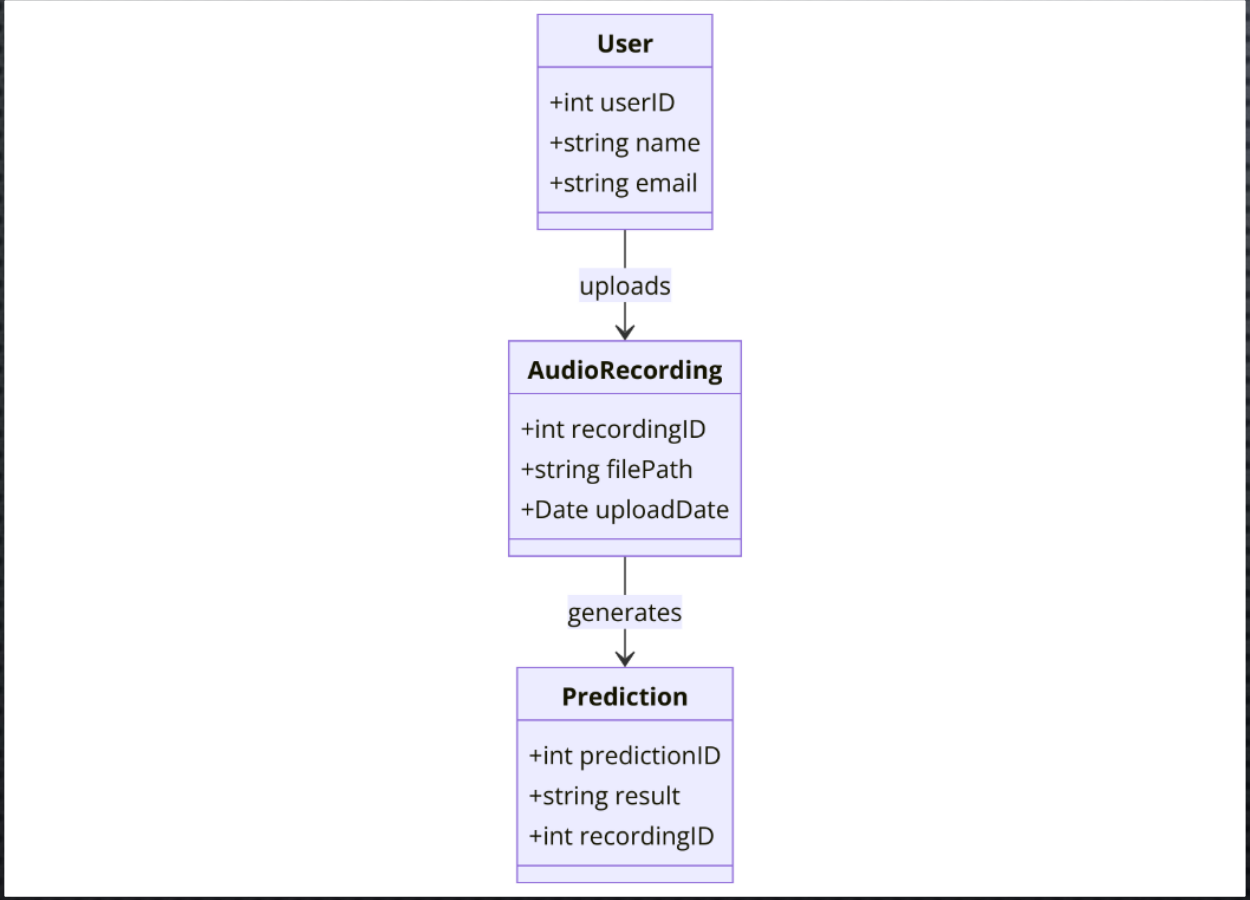
Architecture:

- Input: Raw sounds
- Preprocessing: Noise reduction, feature extraction
- Model: Processes features
- Output: Predicted species

Tools & Technologies:

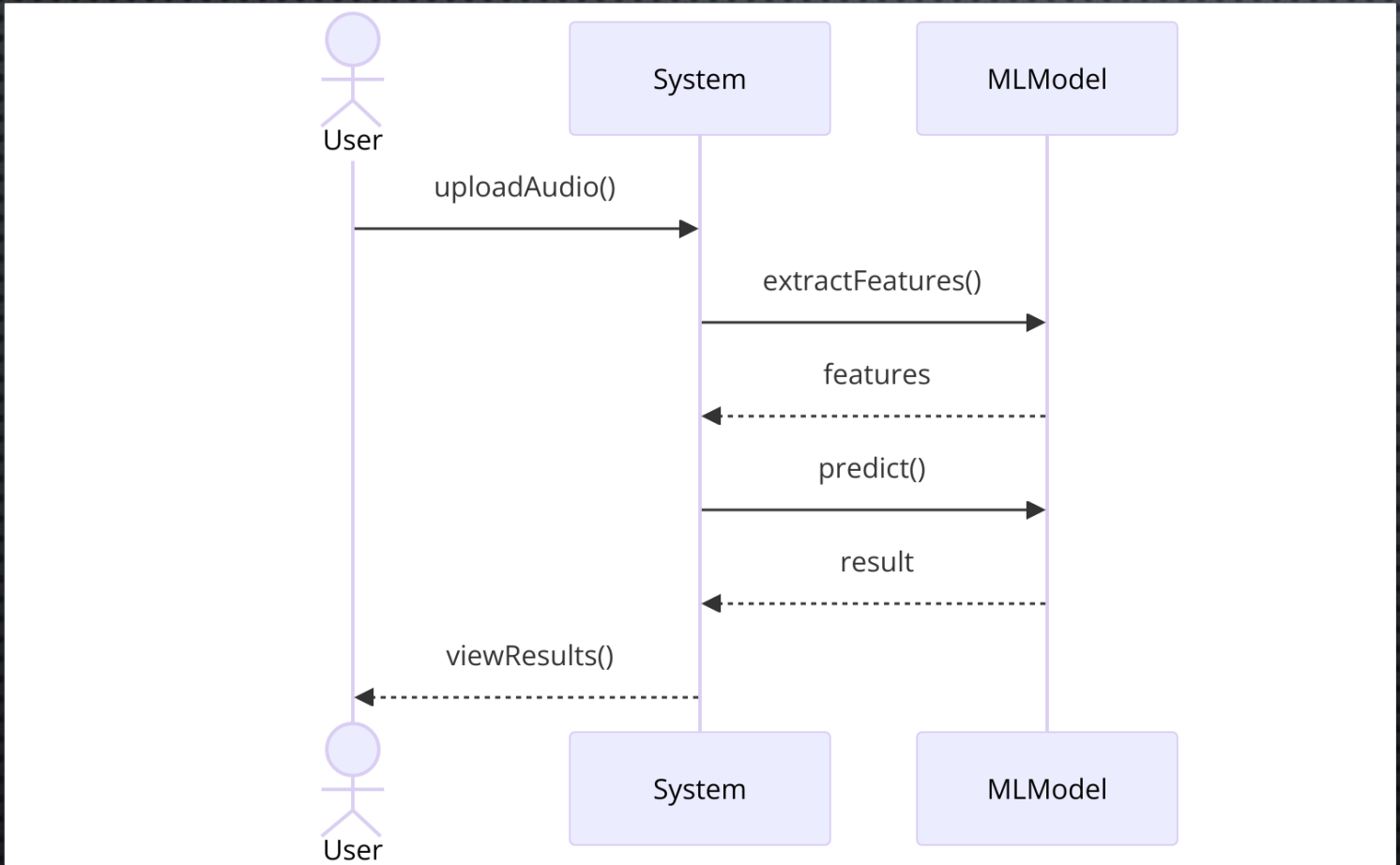
- **Programming Language:** Python, JavaScript, HTML & CSS
- **Développent Environnent:** Visual Studio Code (VS Code)
- **Libraries:** TensorFlow for CNN, Panda for analysis.

E-R- DIAGRAM



The data entities, their characteristics, and the connections between them are shown in the ERD.

SEQUENCE DIAGRAM



The sequence diagram, which focuses on the sequence of message exchanges, illustrates how objects interact in a certain use-case scenario.

Results & Evaluation

Performance Metrics:

- *Accuracy:* 95% (specific accuracy)
- *Precision/Recall:* Evaluates species differentiation
- *Confusion Matrix:* Visualizes model performance

Comparison:

- *Baseline Models:* Shows improvements over simpler models.
- *Key Insights:* Strengths and weaknesses identified.

Challenges:

- *Data Imbalance:* More data for some species affects generalization.
- **Real-world Noise:** Addressed with dataset augmentation and noise reduction.

Conclusion

Summary:

- Developed an accurate, user-friendly bird sound prediction system.
- Potential impact on wildlife conservation and community engagement.

Future Work

- **Improvements:** Expand the dataset, and enhance real-time processing.
- **Extensions:** Integrate with mobile apps for birdwatchers.

THANK YOU FOR YOUR ATTENTION

- *Subtitle: Final Year Software Engineering Project presentation*
- *Name: Hansaka Nuwan Sithara Panagodage*
- *ICBT St. No: CL/BCSCD/25/80*
- *CMU St. No: st20267833*
- *Supervisor: Miss Upeka Wijeshine*