

# BatLab: Automated Bat Species Identification Through Acoustic Analysis

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## GENERAL PROBLEM

- Bats exhibit niche partitioning in their echolocation call structure, with subtle local variations
- Manual call identification is time-consuming, while automated tools are unreliable in region-specific contexts
- Identify bat species from acoustic recordings based on region-specific echolocation call features using machine learning

## BACKGROUND

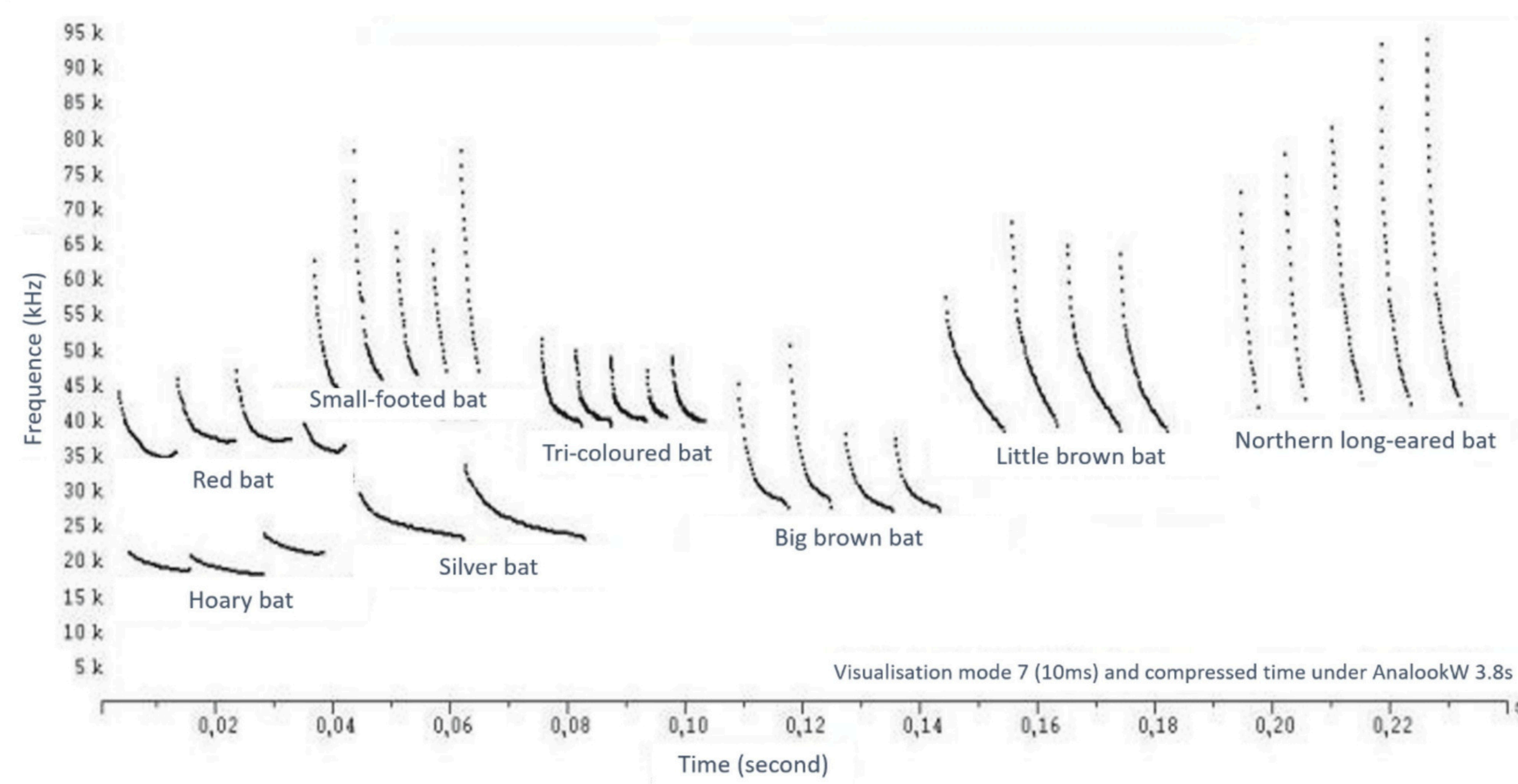
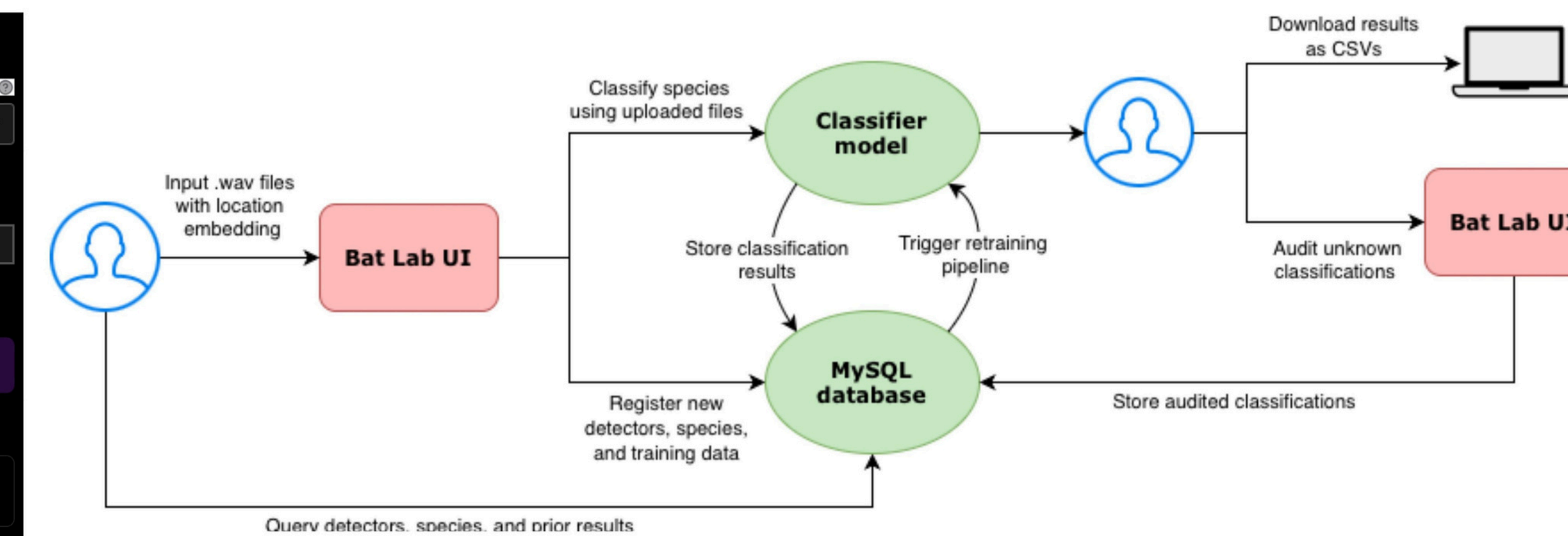
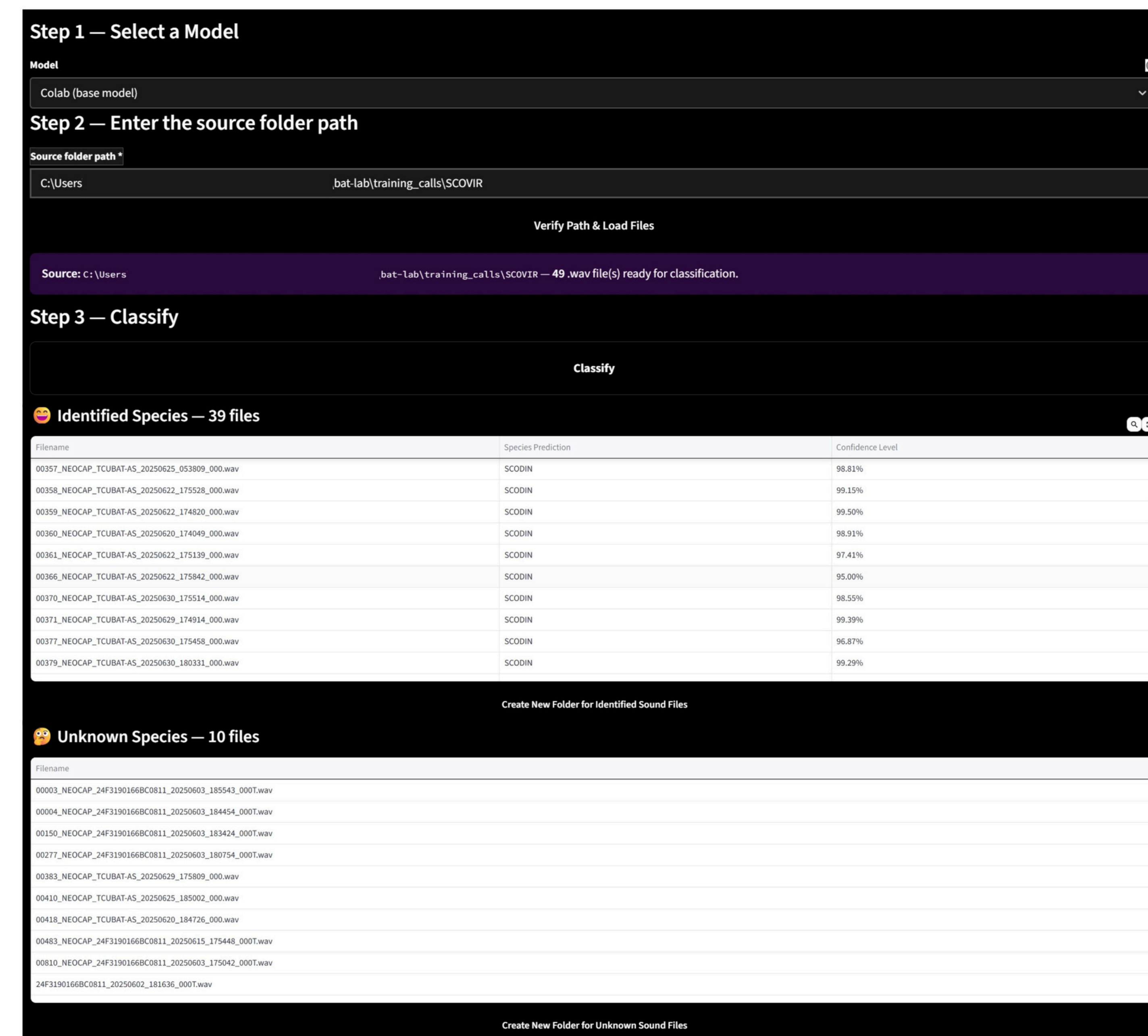


Figure 1: Example of echolocation pulses from different species

## PROJECT GOALS

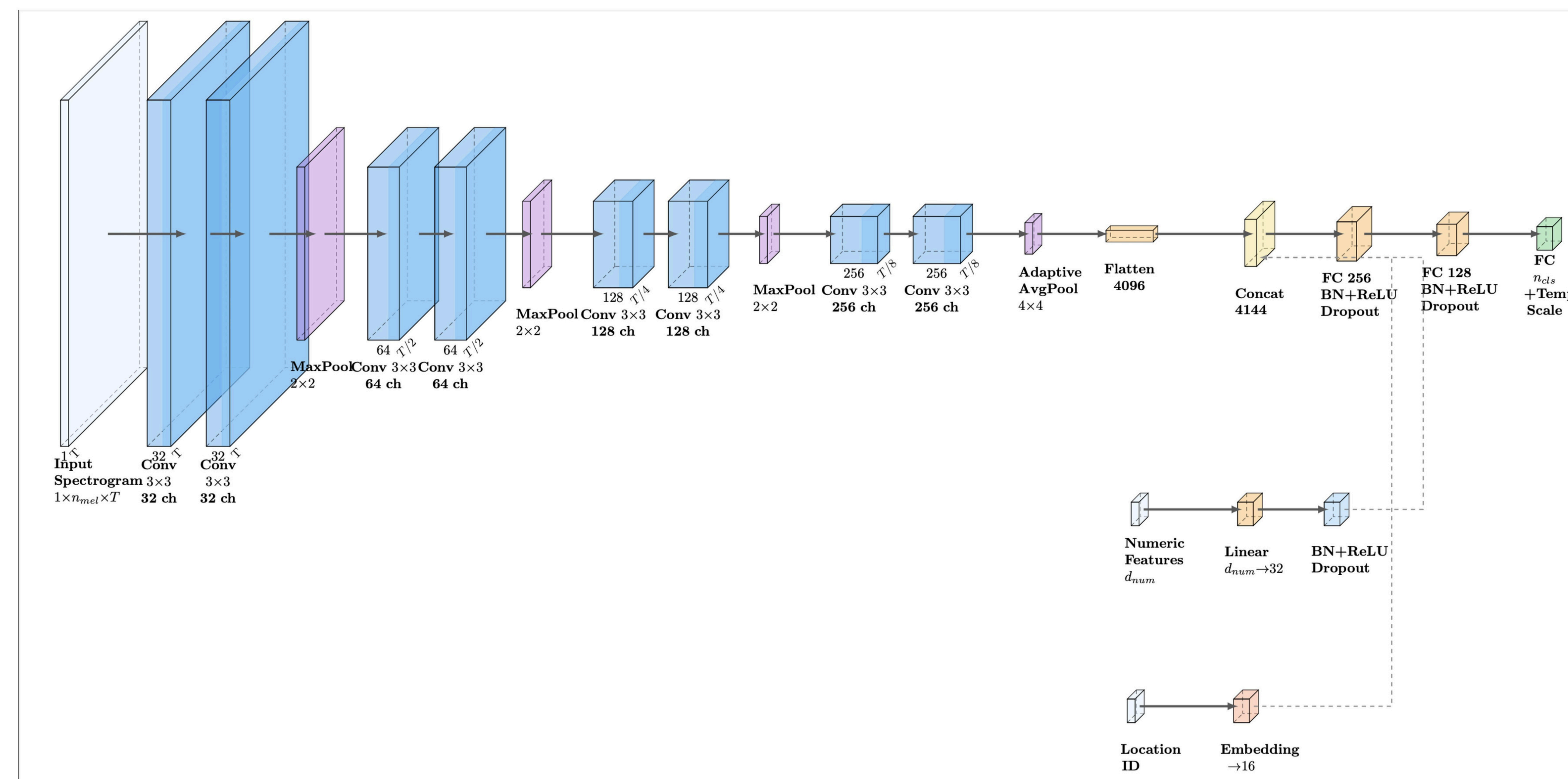
- Develop and train a machine learning model to accurately predict a bat species based on an unknown acoustic recording
- Design an interactive user interface to upload files to a dedicated database and request predictions on uploaded acoustic recordings
- Implement a dedicated database to house uploaded acoustic recordings, bat species, and location data
- Maintain a localized system to provide ease of access and reduce reliance on third parties

## PROJECT WORKFLOW



The Bat Lab UI allows researchers to upload .wav files with location metadata for automated species classification. A CNN-based model processes each file and stores results to a MySQL database. Low-confidence classifications are flagged as unknown and routed for researcher review. Audited labels are then stored and used to trigger a retraining pipeline that improves model performance.

## CNN MODEL



## CHALLENGES

- Creating a system that corrects underfitting
- Adjusting grading metric for the uneven distribution of species
- Creating a CSV that is useful and correct for the different species and has the necessary information

## RESULTS

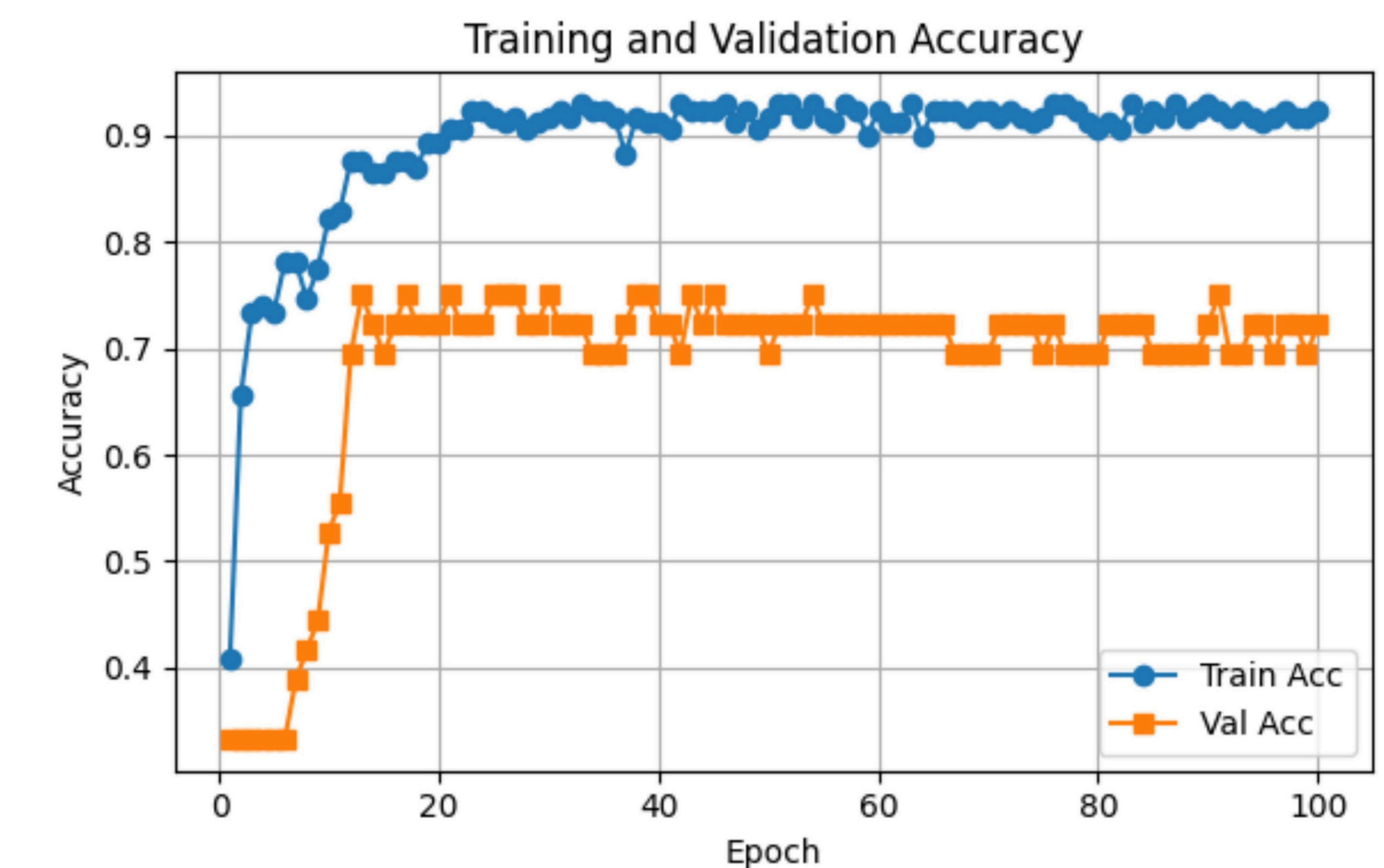
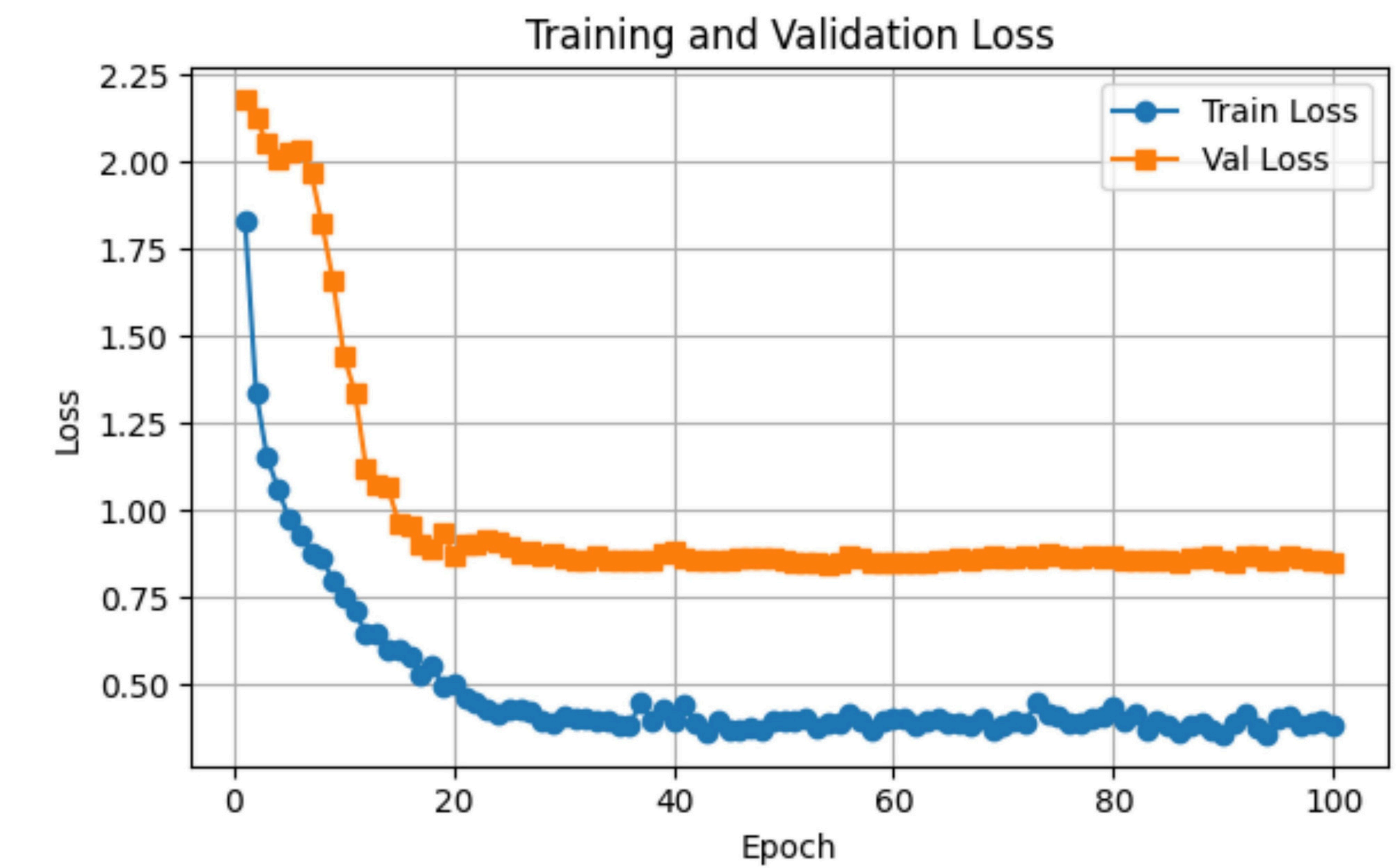


Figure 2: Training/Validation Loss and Accuracy

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