Wildlife Detection System Roadmap

This document outlines the development roadmap for the Wildlife Detection System project, detailing planned features, improvements, and milestones.

Project Phases

Phase 1: Basic Recognition (Current Phase)

Target Completion: May 2025

Goals

- Create a robust annotation system for wildlife images
- Build the foundational database structure
- Implement basic species recognition capabilities
- Establish export pipeline for ML training data

Key Tasks

- [x] Database schema implementation
- [x] API endpoints for image and annotation management
- [x] Annotation interface development
- [x] COCO and YOLO export functionality
- [ ] Complete annotation of test_01 dataset
- [ ] Train initial YOLOv8 model
- [ ] Initial model evaluation and refinement

Phase 2: Advanced Recognition

Target Completion: August 2025

Goals

- Improve recognition of partial animals
- Implement environmental context analysis
- Enhance model performance in challenging conditions
- Add multi-object tracking capabilities

Key Tasks

- [ ] Enhanced image preprocessing for varied lighting conditions
- [ ] Part-based animal detection for partial views
- [ ] Vegetation and habitat type classification

- [ ] Environmental condition tracking (snow, lighting, etc.)
- [ ] Multi-object recognition improvements
- [ ] Model fine-tuning for challenging conditions

Phase 3: Behavior Analysis

Target Completion: November 2025

Goals

- Implement chronological tracking of species
- Add diurnal and seasonal activity analysis
- Develop behavioral pattern recognition
- Create comprehensive analysis dashboard

Key Tasks

- [ ] Chronological sequence tracking implementation
- [ ] Statistical analysis of activity patterns
- [ ] Correlation with environmental factors
- [ ] Predator-prey relationship tracking
- [ ] Seasonal behavior pattern analysis
- [ ] Interactive visualization dashboard

Phase 4: System Integration & Production

Target Completion: February 2026

Goals

- Deploy system for production use
- Implement user authentication and roles
- Create comprehensive documentation
- Optimize performance for larger datasets

Key Tasks

- [ ] User authentication system
- [ ] Role-based access control
- [ ] Cloud deployment infrastructure
- [ ] Performance optimization
- [ ] Comprehensive user guides
- [ ] API documentation
- [ ] Training materials for researchers

Feature Implementation Timeline

Feature	Priority	Target Start	Target Completion
Annotation Interface Improvements	High	April 2025	May 2025
Initial Model Training	High	May 2025	June 2025
Microhabitat Analysis	Medium	May 2025	July 2025
Partial Animal Recognition	High	June 2025	August 2025
Chronological Tracking	Medium	July 2025	September 2025
Diurnal Activity Analysis	Medium	August 2025	October 2025
Behavioral Pattern Analysis	Medium	September 2025	November 2025
User Authentication	Low	October 2025	December 2025
Dashboard Development	Medium	November 2025	January 2026
Documentation & Deployment	High	December 2025	February 2026

Milestone Deliverables

Milestone 1: Annotation System Complete

- Fully functional annotation interfaces
- Complete species database
- Export pipeline for major ML formats
- Initial dataset fully annotated

Milestone 2: Basic Model Deployment

- Trained wildlife detection model
- Integration with annotation system
- Automated annotation suggestions
- Initial performance metrics

Milestone 3: Advanced Analysis Features

- Environmental context integration
- Chronological sequence tracking
- Activity pattern visualization
- Habitat usage analysis

Milestone 4: Production System

- User management system
- Comprehensive dashboard

- Complete documentation
- Optimized performance for large datasets

Collaboration Plan

- **April-May 2025**: Collaborate with Prof. Peeva to refine annotation approach
- **May-June 2025**: Incorporate additional training data from field studies
- **July-August 2025**: Partner with wildlife experts for model validation
- **September-October 2025**: Field testing in real-world conservation settings
- **November-December 2025**: User feedback collection and system refinement
- **January-February 2026**: Final system validation and deployment

This roadmap is subject to adjustment based on progress, feedback, and emerging requirements from research partners.