Human Animal Communication

Project Documentation | Current MVP: DogBridge

Current working name: DogBridge

Public project name: Human Animal Communication

Stage: Early MVP / PNL project listing

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Short Description

Human Animal Communication is a research and technology project exploring how AI can interpret animal signals, behaviors, and needs to improve understanding between humans and animals.

Project Overview

Human Animal Communication, currently implemented as DogBridge, is an MVP for personalized dog-human communication research. The project records dog audio, stores owner-provided context and labels, trains a simple baseline model, predicts a dog's likely intent for new clips, and lets the owner confirm or correct the result.

The project does not claim to translate dog language into English. Instead, it estimates possible intent from patterns in audio and context, then improves through owner feedback over time.

Problem

Humans often misunderstand animal communication signals such as vocalizations, body posture, stress behaviors, and repeated routines. This can lead to missed needs, weaker human-animal relationships, and less informed care decisions.

Proposed Solution

DogBridge collects short dog audio clips and context from the owner, then uses machine learning to estimate the most likely intent. The system returns suggestions with confidence scores, asks the owner to confirm or correct predictions, and uses that feedback to improve future results.

MVP Intent Labels

- `outside_bathroom`: The dog may want to go outside to urinate or defecate.
- `food_water`: The dog may want food or water.
- `play`: The dog may want active play.
- `attention`: The dog may want social contact or engagement.
- `stress_discomfort`: The dog may be stressed, uncomfortable, or in distress.
- `unknown`: The model is uncertain or the intent is unclear.

Low-confidence predictions are returned as `unknown`. Predictions must be treated as suggestions, not absolute truth.

Current Product Components

Backend

The backend is built with FastAPI and supports:

- Dog profile creation and storage.
- Audio clip uploads.
- Owner labels, outcome labels, and contextual metadata.
- Prediction requests for uploaded clips.
- Owner confirmation or correction of predictions.
- SQLite-backed persistence for MVP development.

Mobile App Skeleton

The mobile app is an Expo/React Native skeleton with screens for:

- Home and navigation.
- Dog profile setup.
- Recording flow placeholder.
- Context labeling and clip submission.
- Prediction review.
- Confirmation and correction feedback.

Data and Model Pipeline

The project includes scripts for:

- Extracting audio features from real dog audio clips.
- Training a baseline model.
- Evaluating the trained model.
- Generating placeholder metadata for testing workflows.

The baseline model uses MFCC, chroma, spectral centroid, spectral bandwidth, zero crossing rate, and RMS energy statistics. It trains a `RandomForestClassifier` and saves the model for inference.

Basic User Flow

1. The owner creates a dog profile.
2. The owner records or uploads a short dog audio clip.
3. The owner adds context such as location, situation, notes, and their best label.
4. The backend stores the clip and metadata.
5. The model predicts a likely intent and confidence score.
6. The owner confirms or corrects the prediction.
7. The corrected data improves the dataset for future training.

Data Schema Summary

The current schema includes:

- `Dog`: dog profile data such as name, breed, age, notes, and creation time.
- `AudioClip`: stored audio file path, dog ID, context, owner label, outcome label, prediction label, confidence, confirmation, notes, and timestamps.
- `Prediction`: predicted label, confidence, top likely labels, model version, and creation time.

Context fields include location examples such as `door`, `kitchen`, `couch`, `crate`, and `outside`, plus situation examples such as `before_walk`, `before_food`, `owner_leaving`, `stranger_nearby`, and `toy_visible`.

Safety and Ethics

The project is designed around careful, honest language:

- It estimates likely intent; it does not literally translate dog language.
- Confidence scores are model estimates, not guarantees.
- `stress_discomfort` is not a veterinary diagnosis.
- Unusual, persistent, or concerning behavior should be handled with a veterinarian.
- Animal feedback tools should be used to support care, not punishment or control.

Future Roadmap

Phase 1: Data Collection MVP

- Build backend support for profiles, clips, labels, predictions, confirmations, and stats.
- Build the mobile app skeleton for collecting real dog audio.
- Store owner labels and outcome confirmations.

Phase 2: Dog-Specific Baseline

- Train a baseline model on confirmed clips.
- Evaluate per dog and per intent label.
- Use owner corrections to improve the dataset.
- Return `unknown` when confidence is low.

Phase 3: Multimodal Context

- Add collar IMU movement signals.
- Add phone camera posture analysis.
- Add richer location and context metadata.
- Add time-of-day and routine patterns.

Phase 4: Bidirectional Communication

- Let the phone send tone or vibration cues.
- Help dogs learn cue meanings through repetition.
- Track response outcomes.
- Keep cues simple and ethically safe.

Phase 5: Collar Prototype

- Explore ESP32-S3 or Raspberry Pi Zero 2 W prototypes.
- Include microphone, IMU, vibration motor, speaker or buzzer, BLE/Wi-Fi, and rechargeable battery.
- Prioritize waterproofing, comfort, battery life, privacy, and skin-safe materials.

Current Limitations

- The project requires real labeled dog audio before meaningful training.
- The baseline model is simple and may perform poorly with small or imbalanced datasets.
- Mobile audio recording is scaffolded but not production-ready.
- There is no true streaming inference yet.
- The current MVP focuses on dogs, even though the broader project name supports future expansion to other animals.

PNL Listing Summary

Human Animal Communication is an early-stage research and technology project using AI to interpret animal signals and behavior. The current MVP, DogBridge, focuses on personalized dog-human communication by collecting audio, owner context, and feedback to estimate likely dog intent over time.