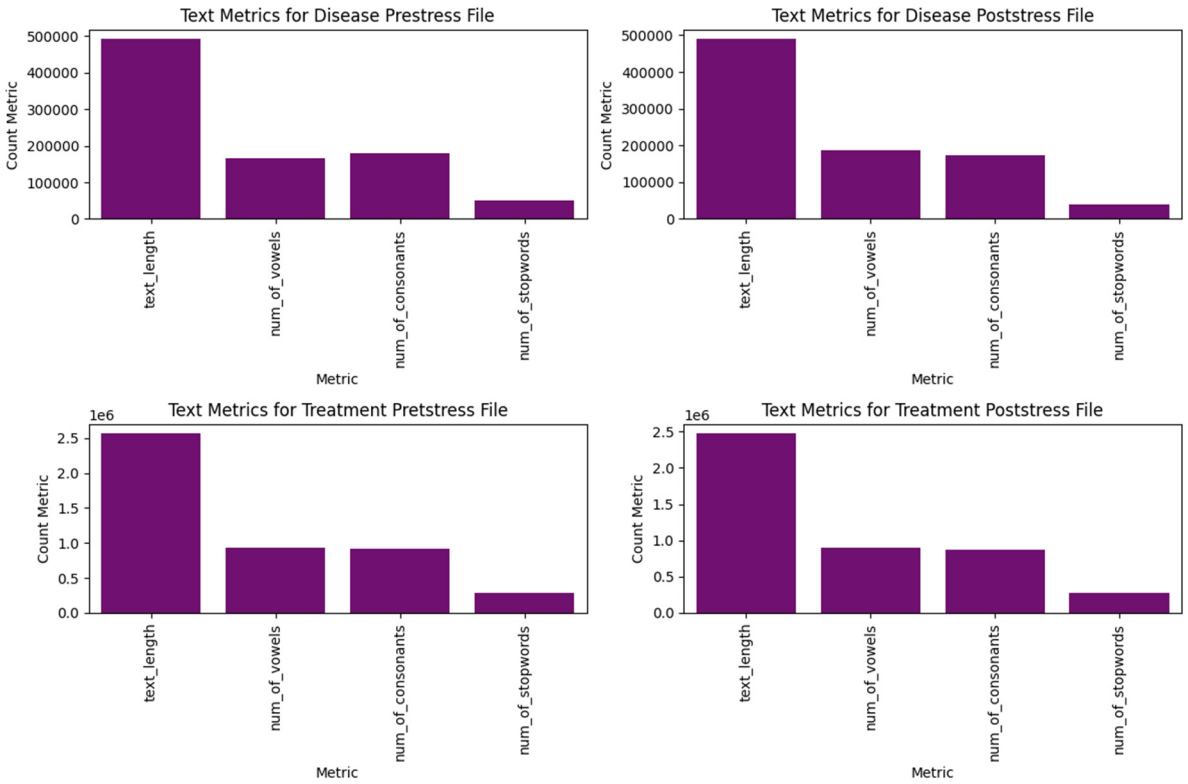



Figure S1: Comparative analysis of text metrics: text length, number of vowels, number of consonants, and number of stopwords across disease prestress, disease poststress, treatment prestress, and treatment poststress. This figure visualizes four key text metrics across four different phases—disease prestress, disease poststress, treatment prestress, and treatment poststress—revealing variations in overall text length, vowel and consonant usage, and stopword frequency. Such metrics highlight the phonetic and lexical shifts occurring in vocalizations as chickens move through different stress or treatment states.

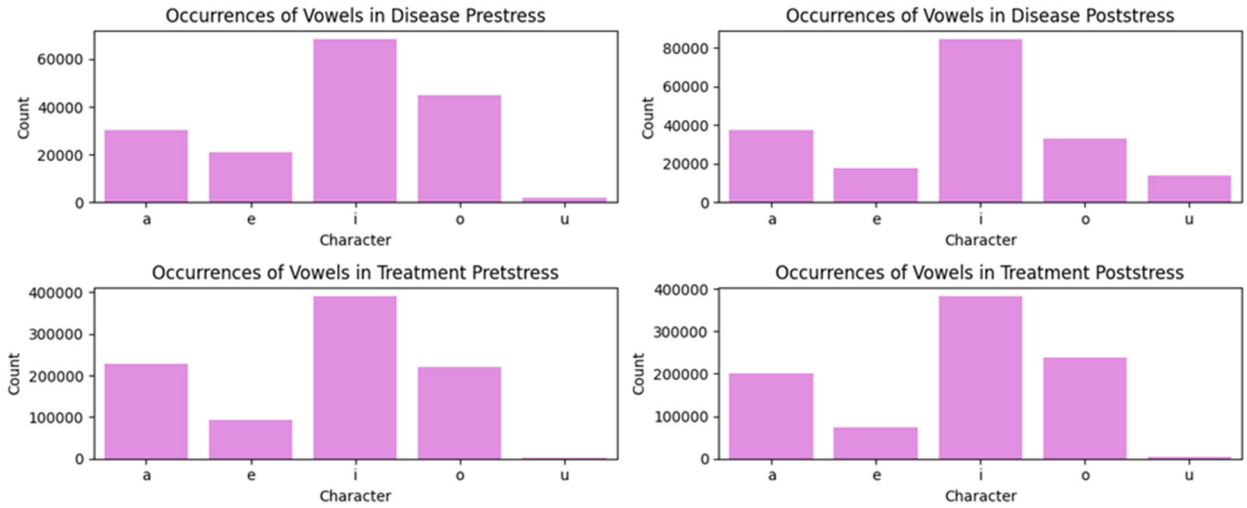



Figure S2: Distribution of vowel frequencies across different stages of stress and treatment. This figure focuses on vowel occurrence in the transcribed text, comparing disease prestress, disease poststress, treatment prestress, and treatment poststress phases. The data illustrate how certain vowels dominate or fluctuate under changing stress or

health conditions in chicken vocalizations, offering insights into subtle phonetic patterns that may correlate with emotional or physiological states.

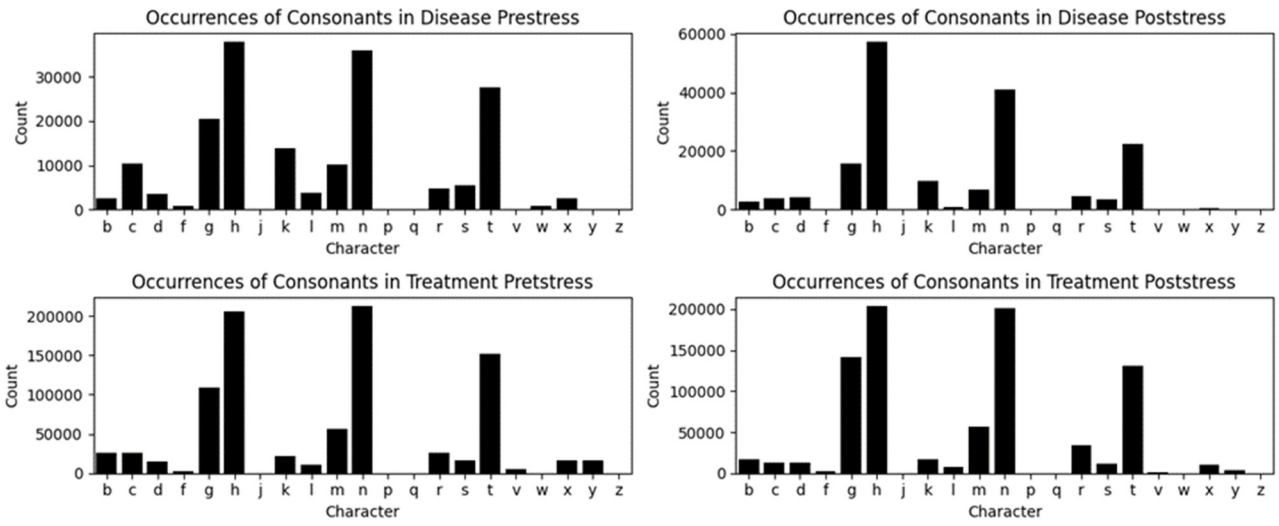



**Figure S3:** Consonant frequency analysis in various phases of stress and treatment. This figure examines consonant usage patterns across disease prestress, disease poststress, treatment prestress, and treatment poststress. Notable differences in consonant distribution reflect alterations in vocalization structure, potentially linked to stress responses or environmental factors affecting chicken well-being.

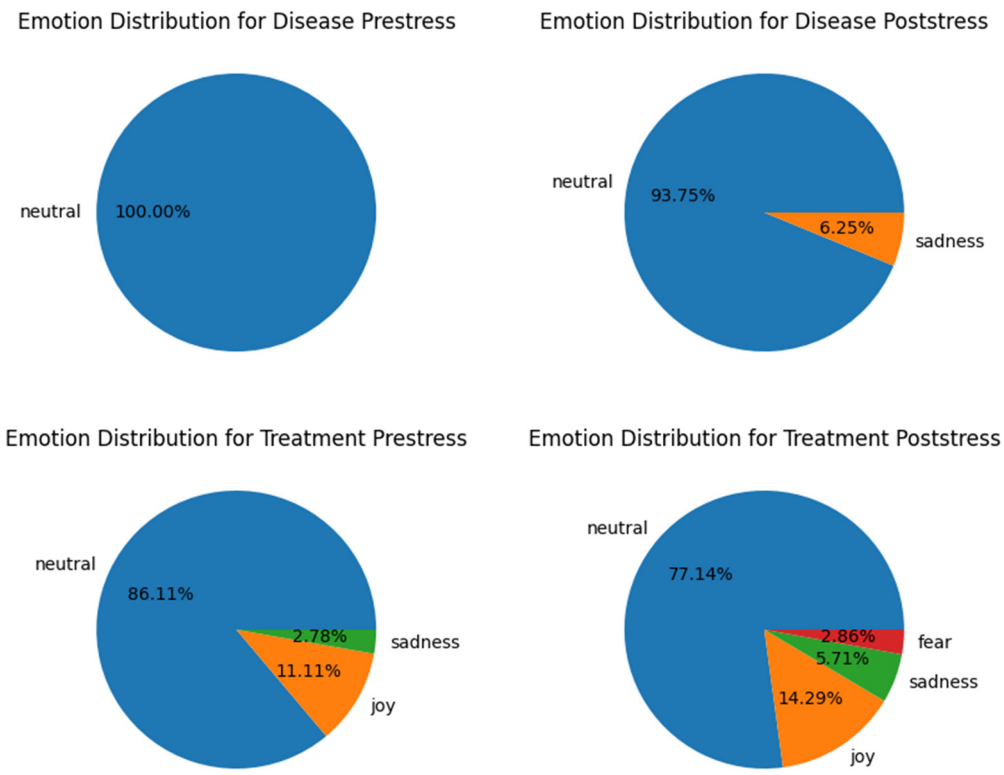



Figure S4: Emotional landscape of laying hens—pie chart analysis across phases. A series of pie charts illustrating how neutral, fear, sadness, and joy states vary in laying hens during disease prestress, poststress, and treatment

phases. These charts provide a snapshot of emotional shifts, highlighting how certain emotional expressions become more or less prevalent following medical interventions or stress exposures.

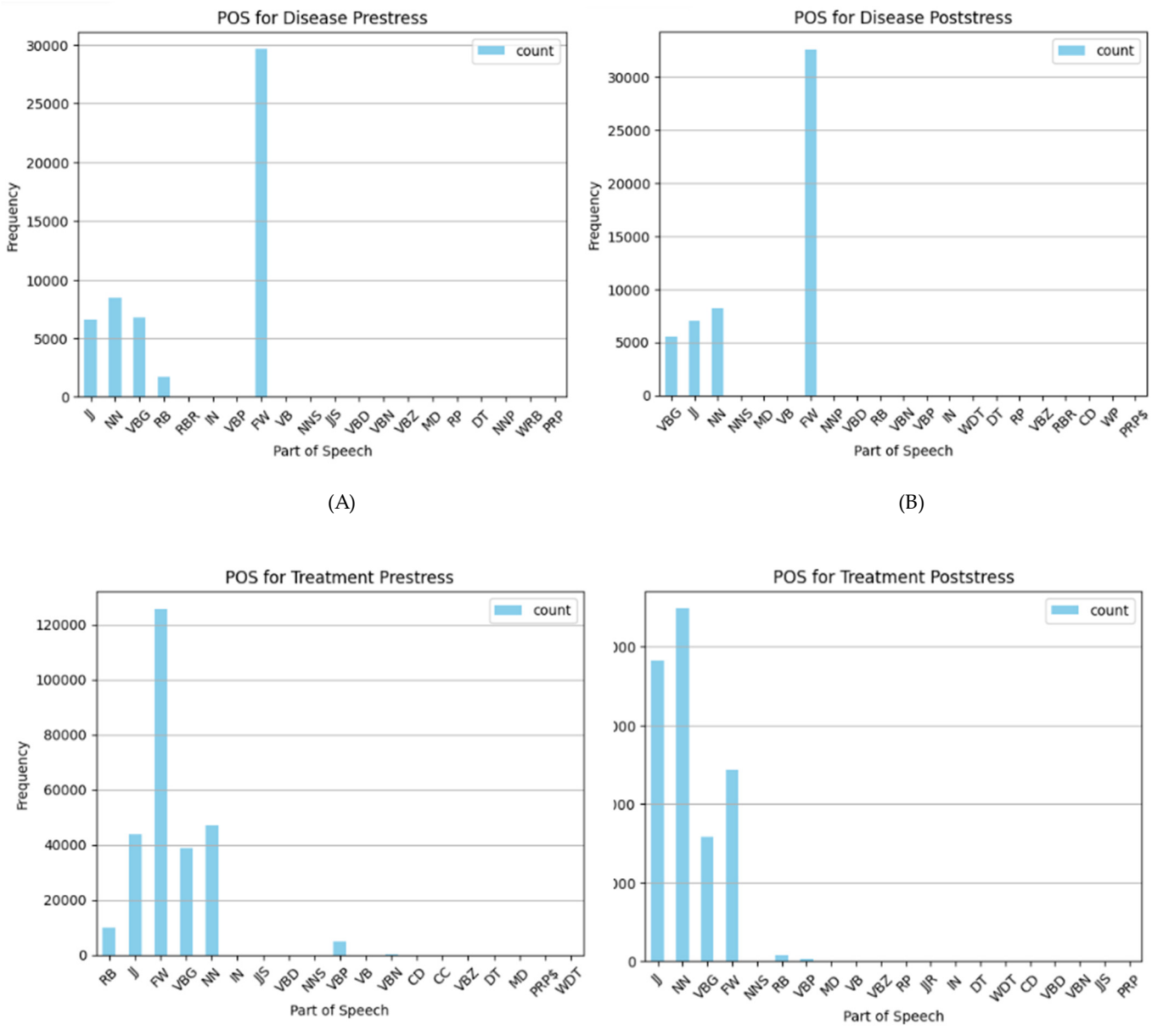



Figure S5: Comparative distribution of parts of speech in chicken vocalizations across disease and treatment phases. Panels (A) through (D) detail how different grammatical categories—such as adjectives, nouns, and verbs—are represented in Whisper-generated transcripts for disease prestress, disease poststress, treatment prestress, and treatment poststress. The data underscore the syntactic variability that arises from distinct environmental or physiological conditions.

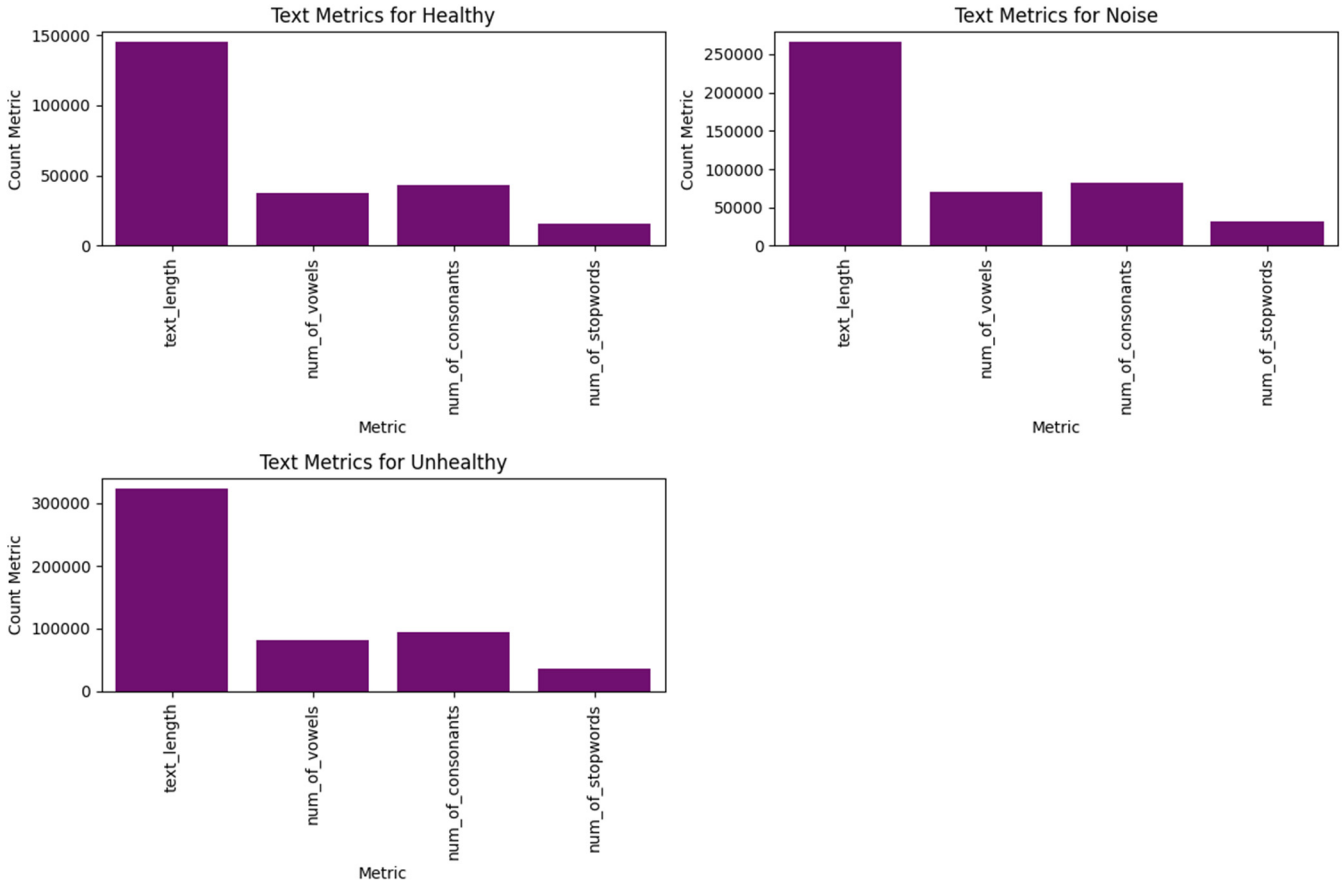



Figure S6: Comparative analysis of text metrics—healthy vs. noise vs. unhealthy phases. This figure focuses on healthy, noise, and unhealthy categories instead of disease and treatment phases. It contrasts text length, vowel/consonant counts, and stopword usage, revealing how external noise or health compromise influences the transcribed vocal data in chickens.

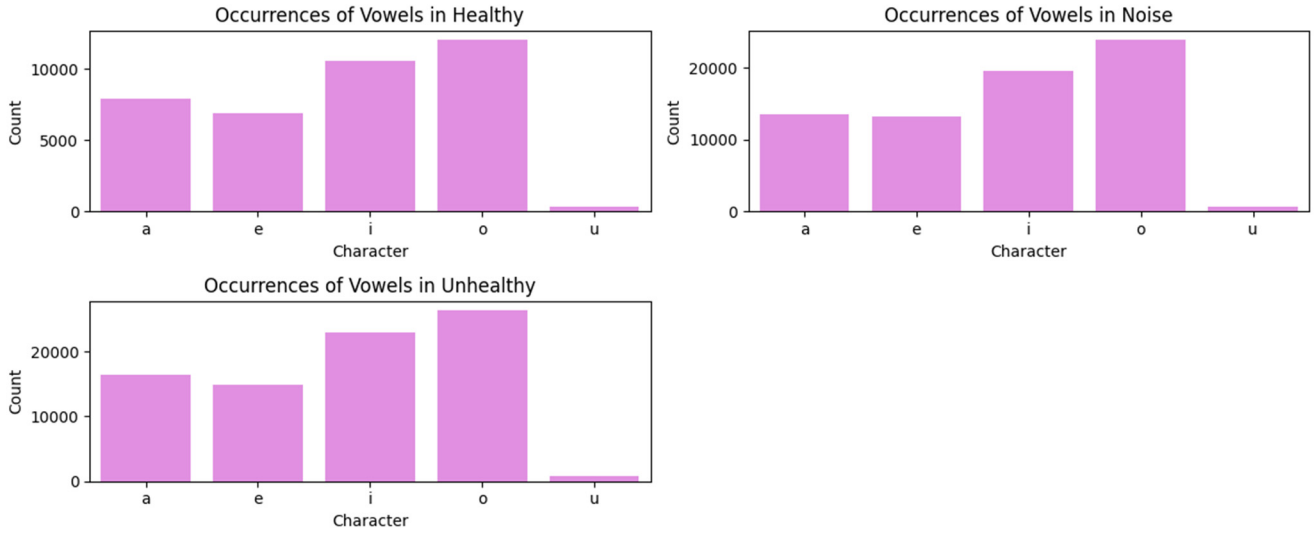



Figure S7: Distribution of vowel frequencies across different stages of chicken vocalization—healthy, noise, and unhealthy dataset analysis. Highlighting differences in vowel usage, this figure compares three principal categories (healthy, noise, and unhealthy). The patterns of vowel frequency help illustrate how environmental disruptions or health ailments may alter fundamental acoustic features captured by Whisper.

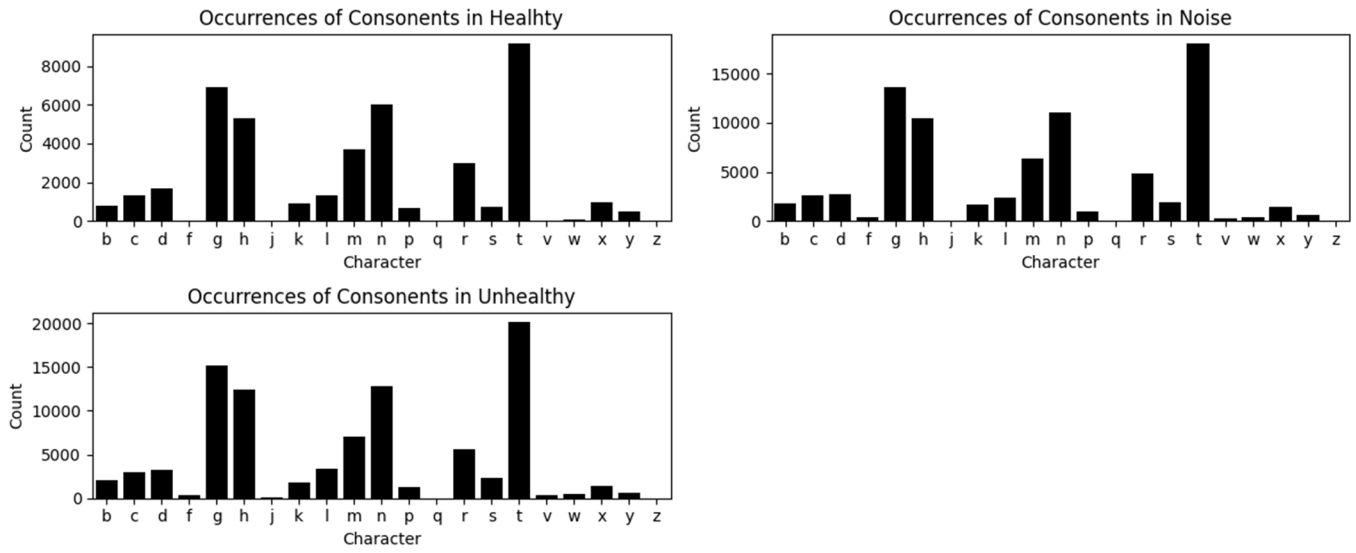
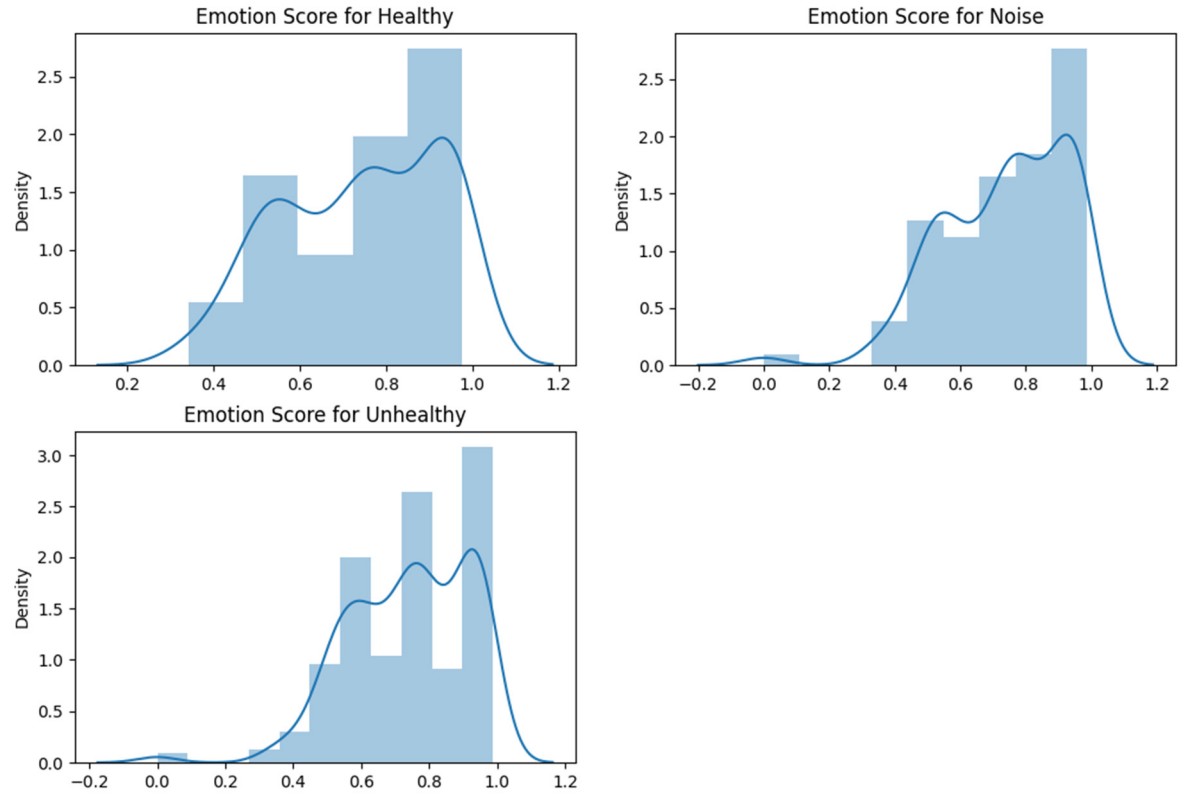
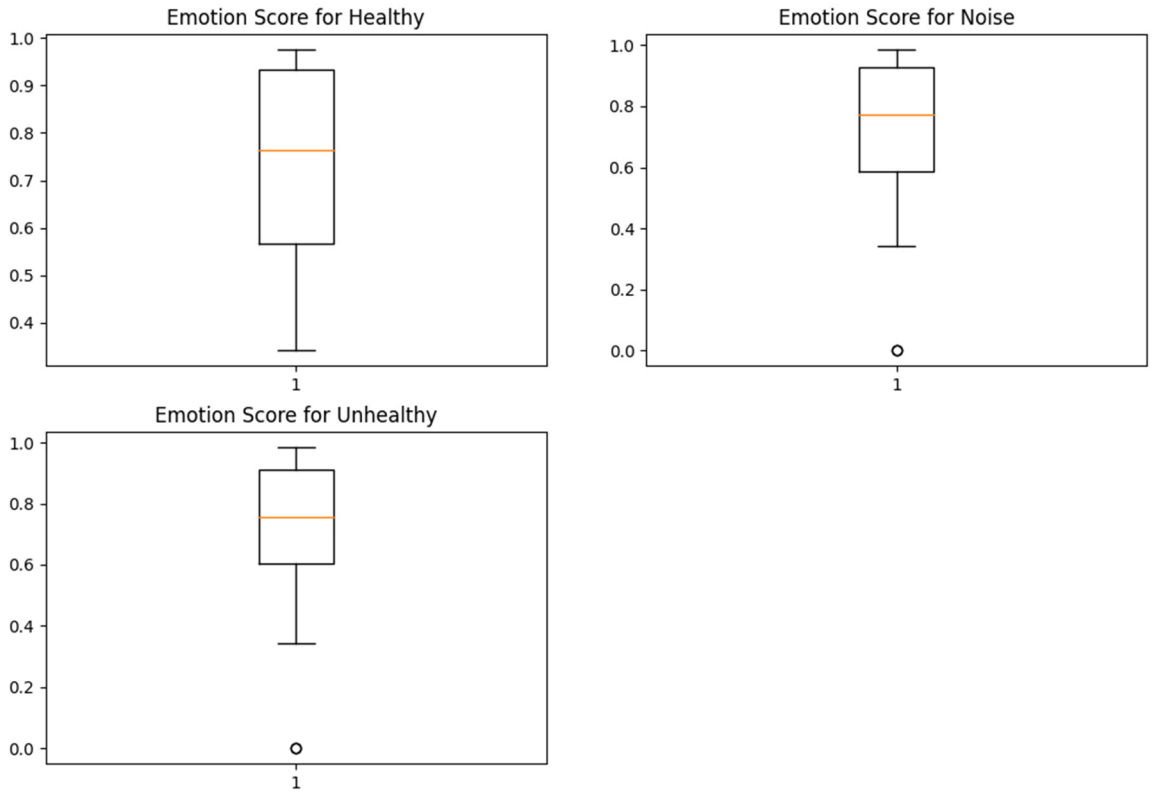



Figure S8: Frequency analysis in various phases of chicken vocalizations—healthy, noise, and unhealthy dataset comparisons. Focusing on vowels, this figure explores consonant occurrences across healthy, noise, and unhealthy conditions. Shifts in consonant frequencies can serve as proxies for vocal stress or disruption due to coughing, rales, or extraneous sounds in the environment.

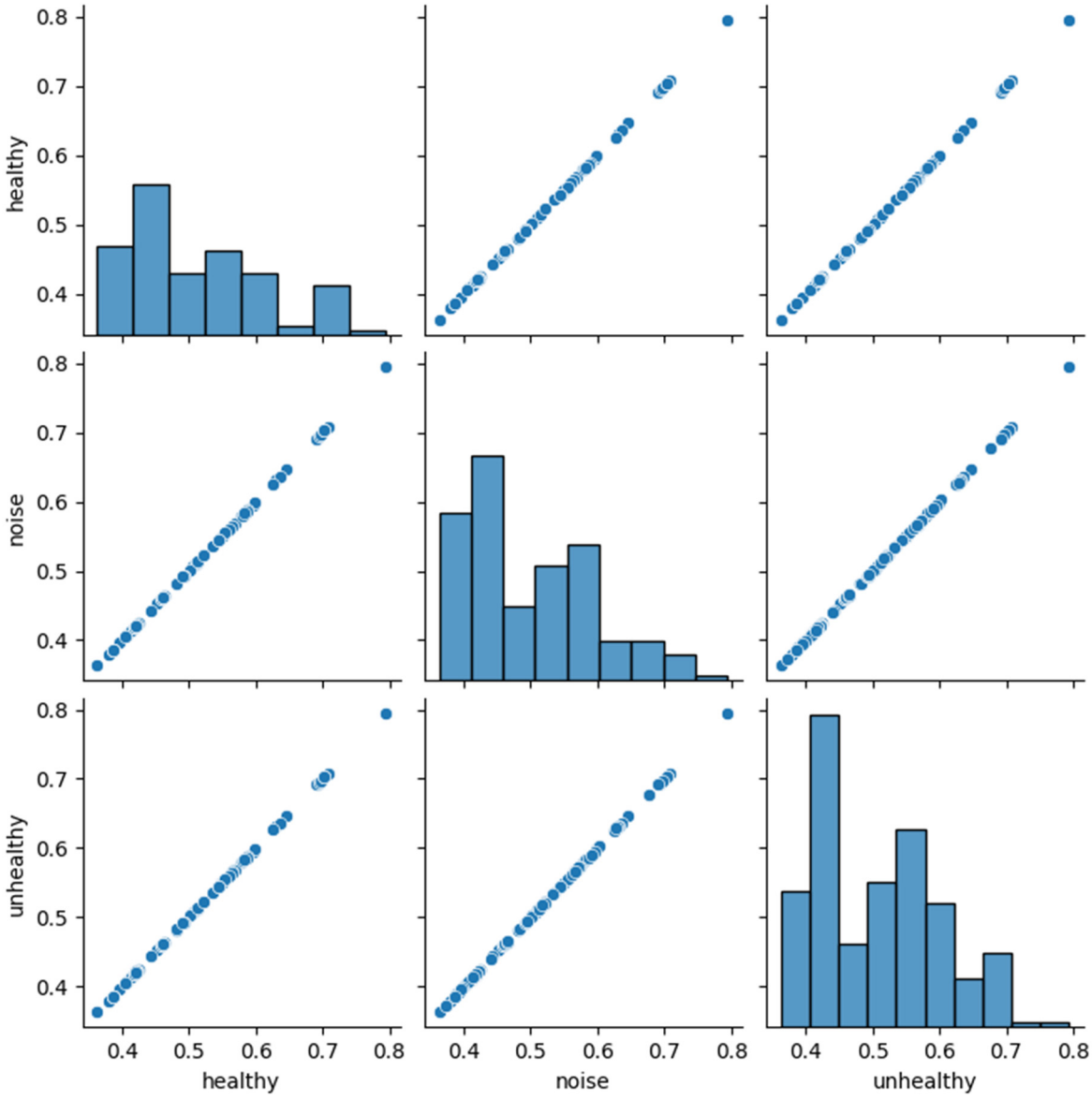



(A)

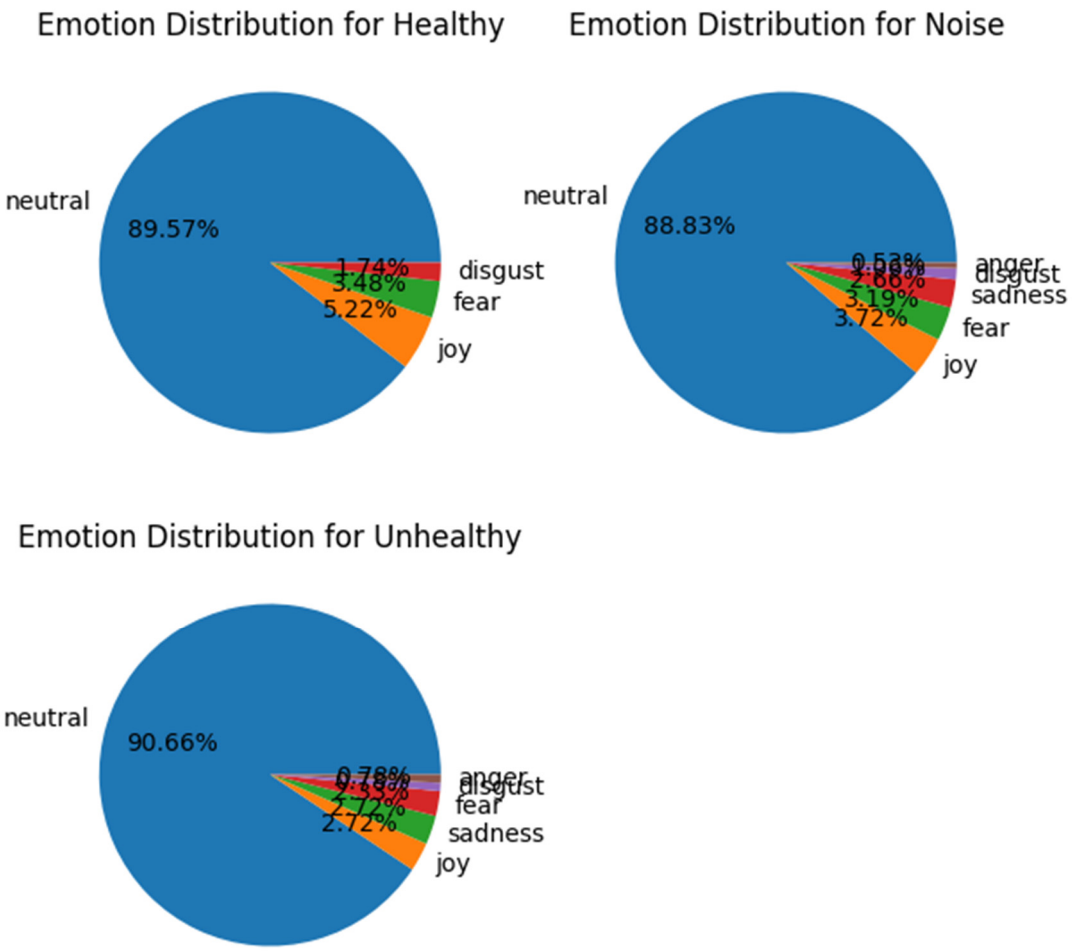



(B)

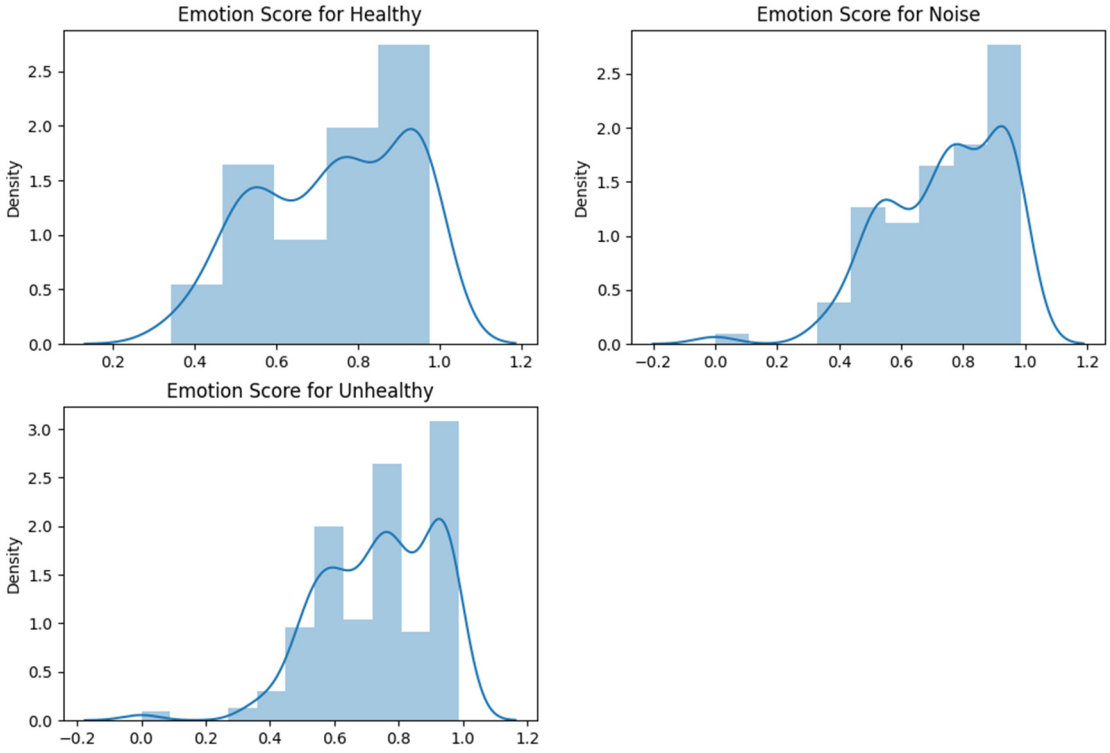
Figure S9: Distribution of sentiment scores and emotional profiles in healthy vs. noise vs. unhealthy phases. These panels provide detailed histograms and boxplots of positive, negative, and neutral sentiment scores associated with each recording category. They highlight how negative sentiment tends to increase in noisy or unhealthy contexts, aligning with observed vocal irregularities or distress signals.



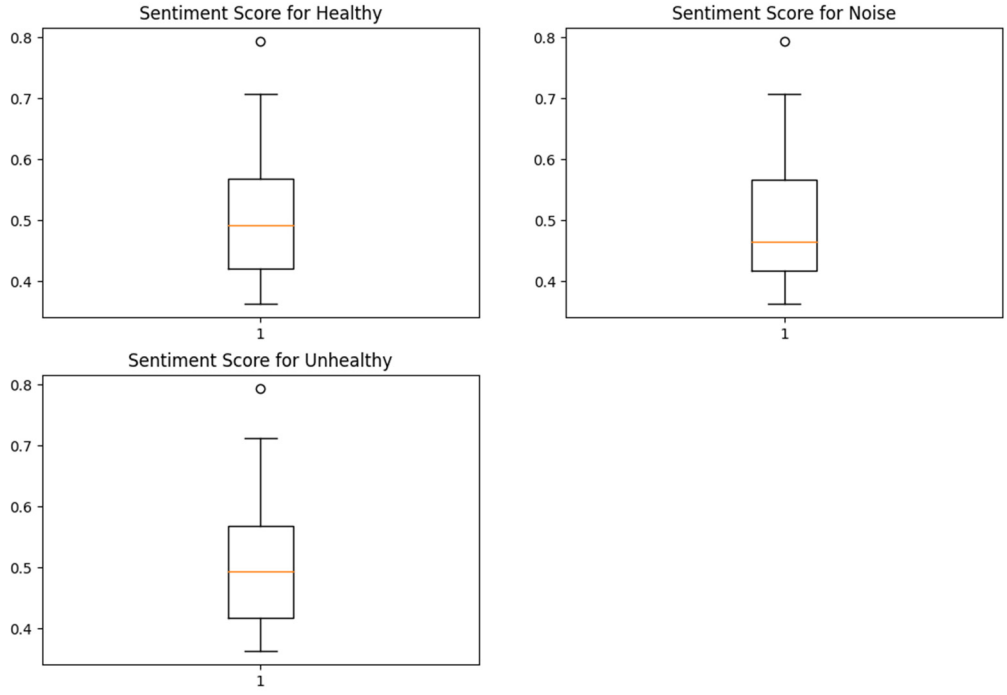

(A)


Emotion Distribution for Healthy
neutral
89.57%
1.74%
3.48%
5.22%
disgust
fear
joy
Emotion Distribution for Noise
neutral
88.83%
anger
disgust
sadness
fear
joy
Emotion Distribution for Unhealthy
neutral
90.66%
anger
disgust
fear
sadness
joy

(B)


Emotion Score for Healthy
Density
Emotion Score for Noise
Density
Emotion Score for Unhealthy
Density

(C)


Sentiment Score for Healthy
Sentiment Score for Noise
Sentiment Score for Unhealthy

(D)

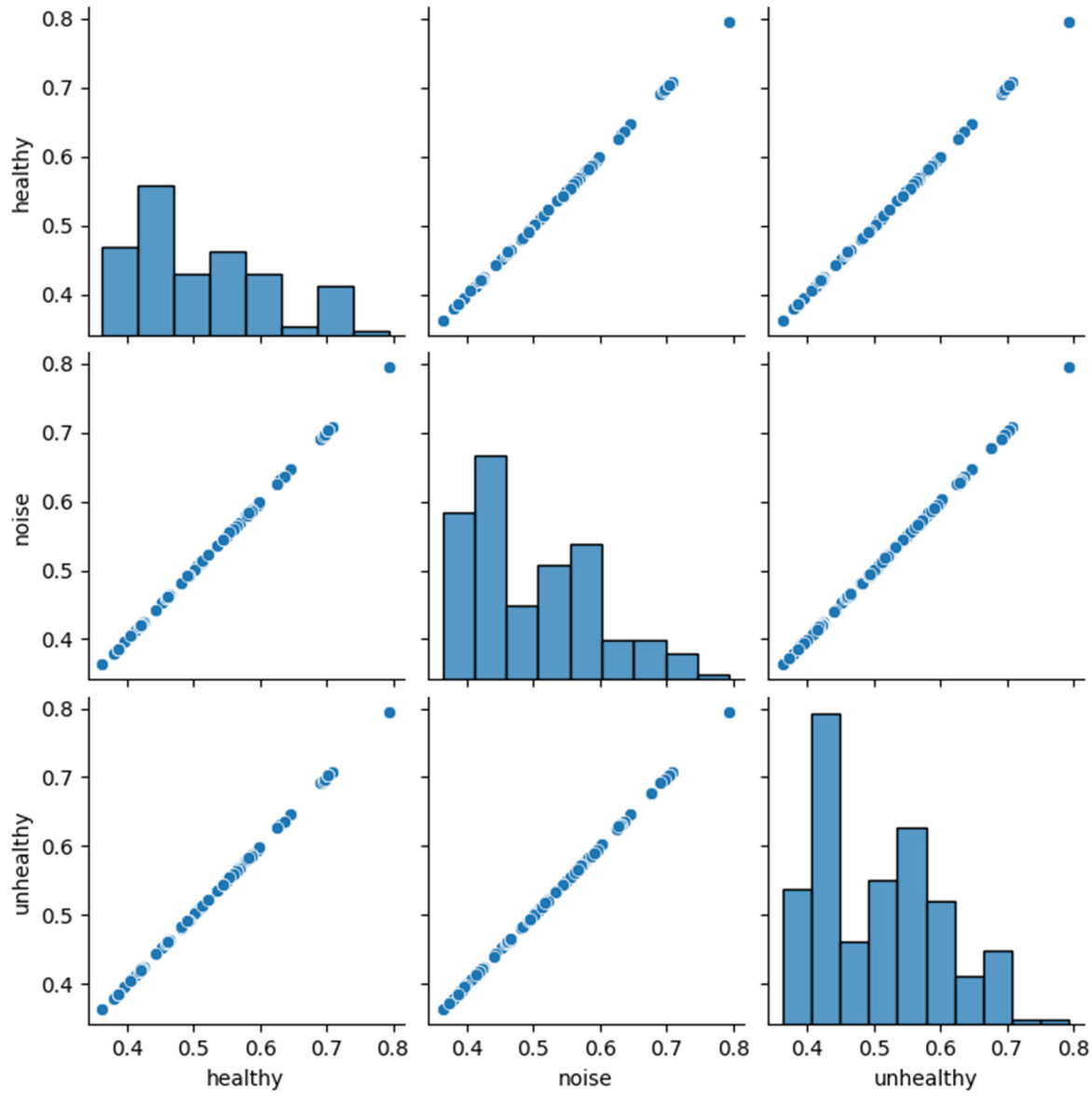



Figure S10: Extended correlation and emotional state analyses across chicken health phases. This figure includes correlation matrices and emotional state pie charts for healthy, noise, and unhealthy recordings, offering a nuanced view of how different emotional states (neutral, fear, sadness, joy) align with changes in acoustic outputs. It further emphasizes the potential for using NLP-derived sentiment as a stress or well-being indicator.

Unigram Word Cloud for Healthy




Unigram Word Cloud for Noise




Unigram Word Cloud for Unhealthy




(A)

Bigram Word Cloud for Healthy




Bigram Word Cloud for Noise

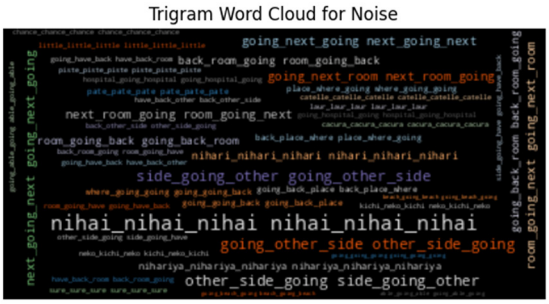


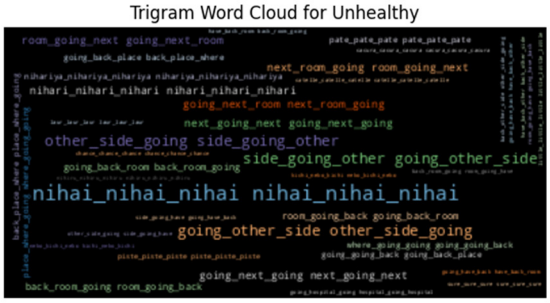

Bigram Word Cloud for Unhealthy




(B)

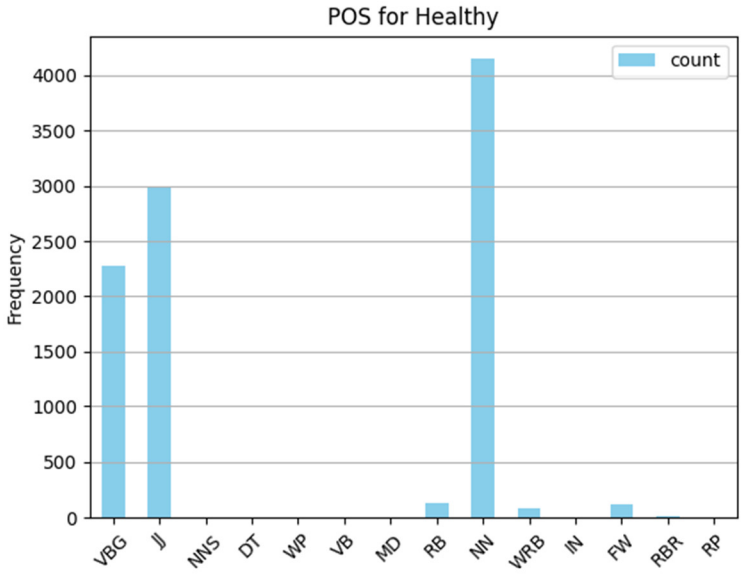


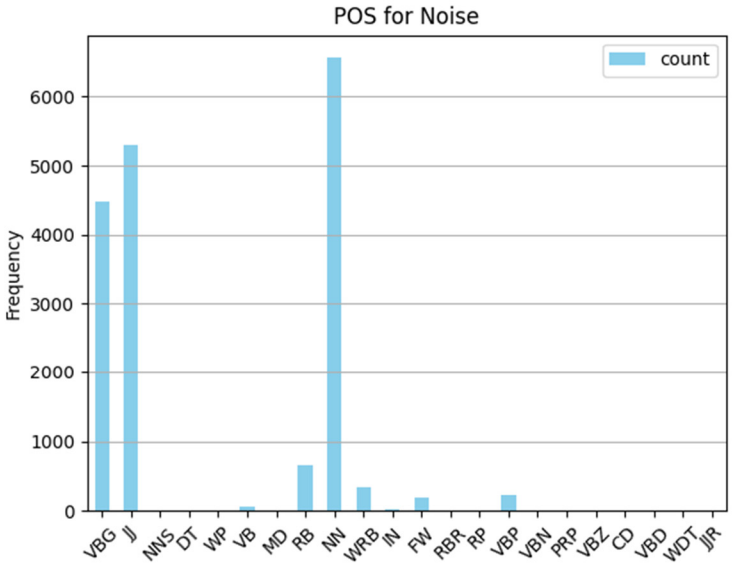




(C)

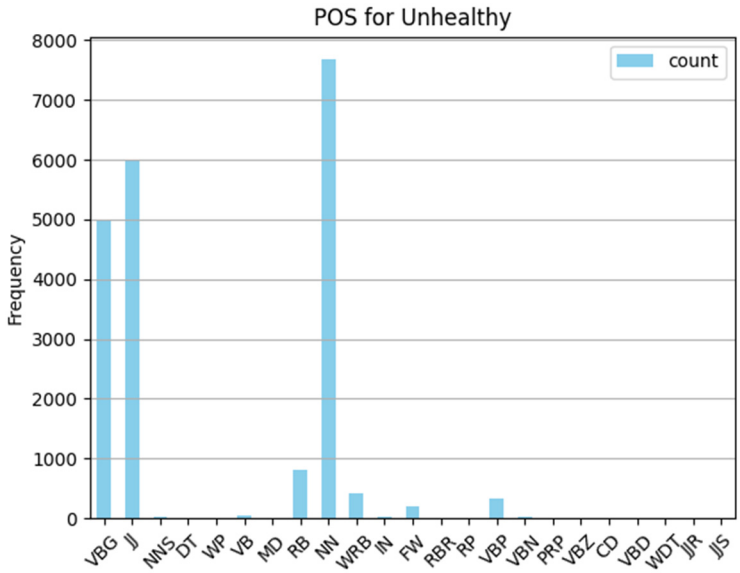
Figure S11: Additional unigram (A) , bigram (B), and trigram (C) word clouds for healthy, noise, and unhealthy phases. Expanding on the concept of lexical distribution, these word clouds explore how single words (unigrams), word pairs (bigrams), and triplets (trigrams) vary across healthy, noise, and unhealthy recordings. The visual representation highlights key thematic elements and recurring token structures that might correspond to altered vocal behaviors under different conditions.




(A)




(B)




(C)

Figure S12: Comparative distribution of parts of speech in chicken vocalizations—healthy, noise, and unhealthy phases. These graphs (Panels A, B, and C) demonstrate the frequency distribution of various parts of speech as processed by Whisper for healthy, noise, and unhealthy categories. They illustrate how the presence of environmental noise or compromised health may shift the syntactic "fingerprint" detected in the transcribed output.

Table S1: Comparative sentiment analysis of poultry vocalizations under varied stress and environmental conditions.

| Condition | Positive | Negative | Neutral | Positive Score | Negative Score | Neutral Score |
|---|---|---|---|---|---|---|
| Control Pre-stress | 3 | 2 | 11 | 1.62 | -0.97 | 0 |
| Control Post-stress | 2 | 1 | 13 | 1.85 | -0.51 | 0 |
| Treat_1 Pre-stress | 3 | 0 | 5 | 2.98 | 0 | 0 |
| Treat_1 Post_stress | 1 | 3 | 3 | 0.53 | -1.35 | 0 |
| Treat_2 Pre-stress | 5 | 0 | 22 | 1.92 | 0 | 0 |
| Treat_2 Post-stress | 3 | 1 | 25 | 2.98 | -0.36 | 0 |
| Healthy | 1 | 0 | 138 | 0.32 | 0 | 0 |
| Unhealthy | 2 | 0 | 119 | 1.56 | 0 | 0 |
| Noise | 10 | 0 | 76 | 6.65 | 0 | 0 |