Chapter 3: Methodology

3.1 Research Approach

This study adopts an empirical, quantitative approach to investigate which acoustic features of

Experimental Design:

1. Extract standardised acoustic features from speech recordings

This approach was chosen over deep learning methods specifically because the research question

3.2 Dataset Selection

The ANDROIDS Corpus

The ANDROIDS (ANDRoid corpus fOr Identification of Depression and Suicide risk) corpus was

Corpus Composition:

Group   Reading Task   Interview Task   Total

Why ANDROIDS?

  - **Dual speech tasks:** Both reading and interview recordings from same participants

Speech Tasks

Reading Task: Participants read a standardised Italian text aloud. Provides controlled

Interview Task: Semi-structured interviews on daily routines, emotions, and future plans.

Ethical Considerations

The ANDROIDS corpus is publicly available for research. All recordings were collected with

3.3 Feature Extraction

The eGeMAPS Feature Set

Acoustic features were extracted using the extended Geneva Minimalistic Acoustic Parameter Set

Why eGeMAPS?

1. Standardisation: Enables comparison with published literature

Feature Categories

Category   Example Features

Extraction Process

Feature extraction used the openSMILE toolkit via Python bindings:

1. Load WAV file (16-bit PCM)

The "functionals" level computes statistical summaries (mean, std dev, percentiles) across the

3.4 Classification Methods

Support Vector Machine (SVM)

SVMs find the hyperplane that maximally separates classes. An RBF (radial basis function)

Configuration:

Random Forest

Ensemble of 100 decision trees, each trained on bootstrap samples with random feature subsets.

Configuration:

3.5 Evaluation Strategy

Cross-Validation

All results use 5-fold stratified cross-validation:

  - Stratification maintains class distribution in each fold

Evaluation Metrics

Accuracy: Proportion correctly classified

Feature Importance Analysis

Two complementary measures identify predictive features:

Gini Importance: Total decrease in node impurity across Random Forest trees. Efficient but can

Permutation Importance: Accuracy decrease when feature values are shuffled. More reliable

3.6 Reproducibility

All code available in project repository:

Random seeds fixed for all stochastic processes.

3.7 Summary

This methodology enables systematic investigation through:

  - Carefully selected corpus with both speech modalities

Estimated length: 4-5 pages