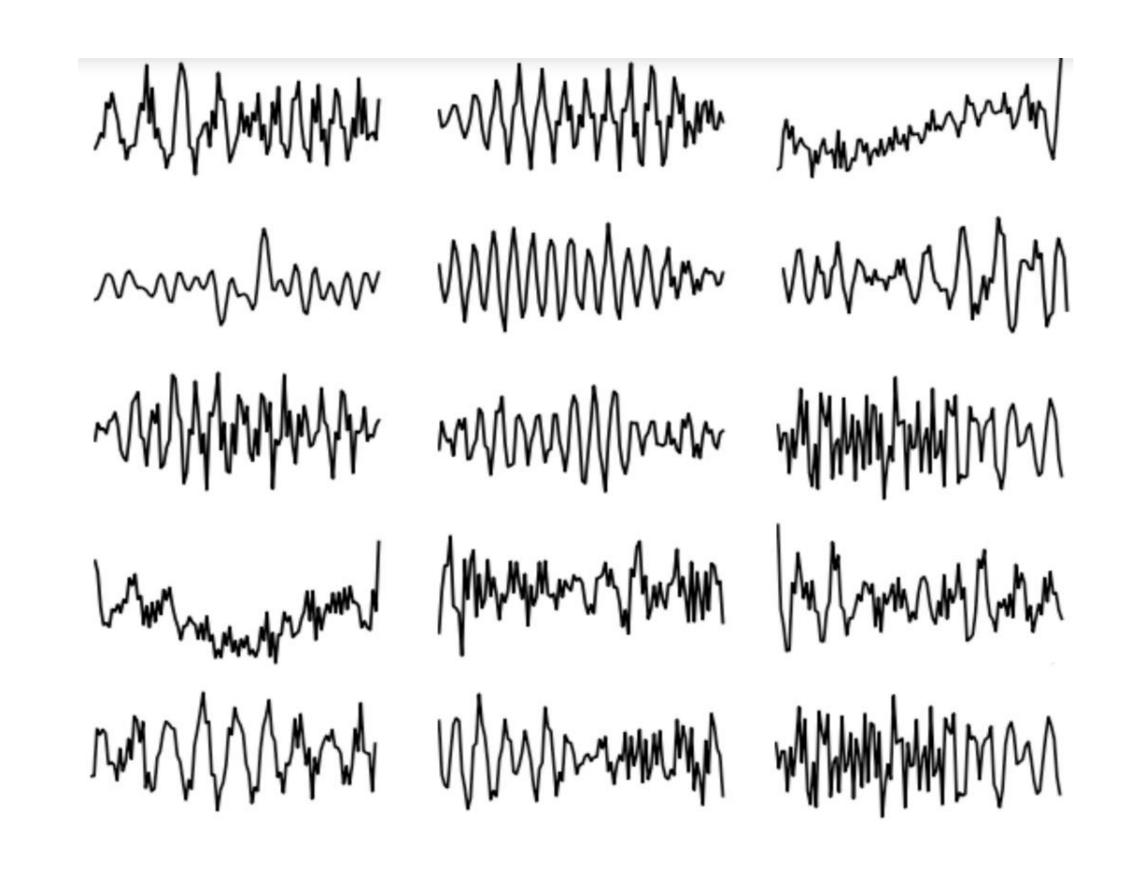
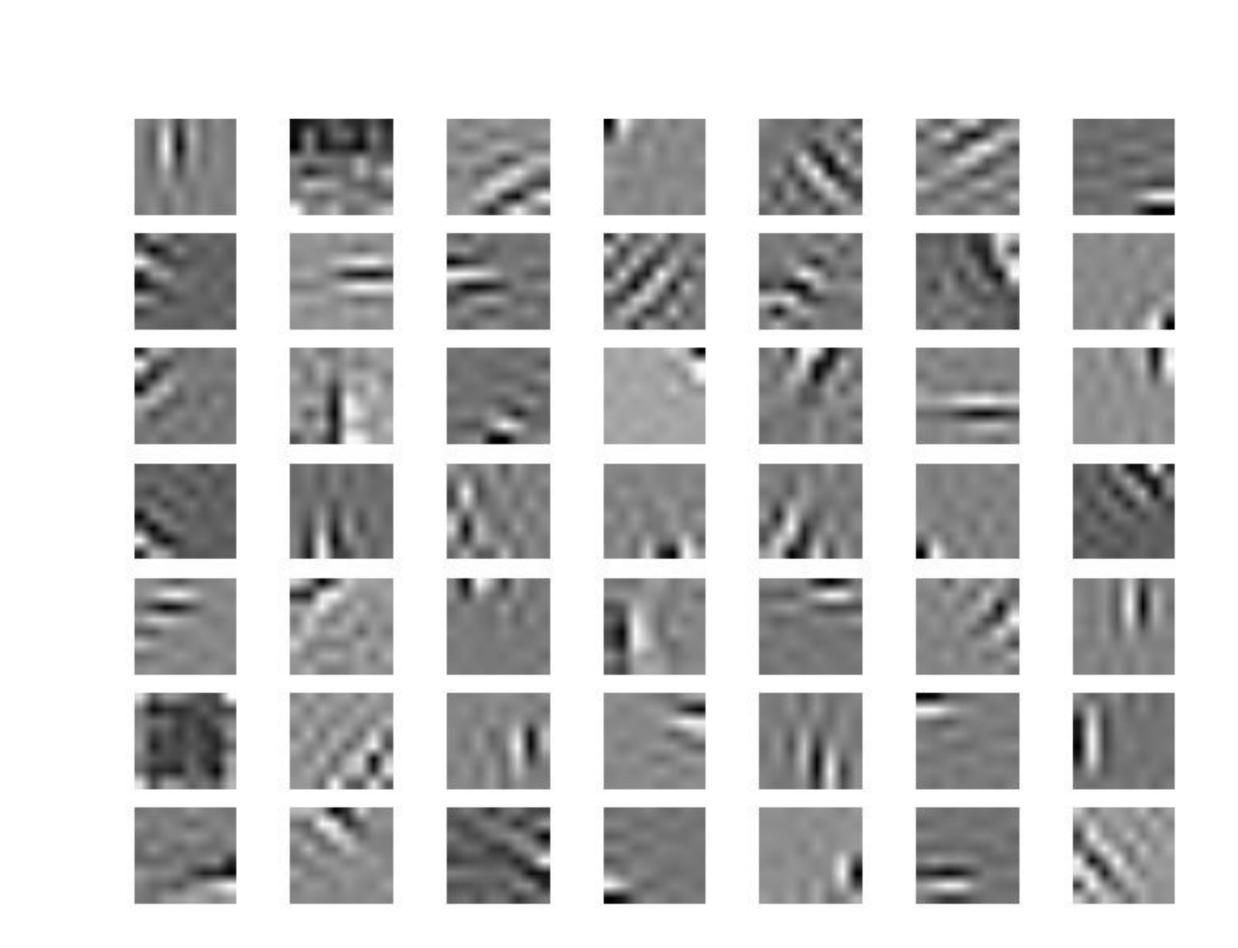
Efficient Coding (%)

Team Eyes Wide Shut: Nelson Alfaro, Kale Bruton, Jeremy Lynch, Brandon Staley Sponsor: Dr. Mark V. Albert, Computer Science & Engineering Department of Computer Science and Engineering, University of North Texas

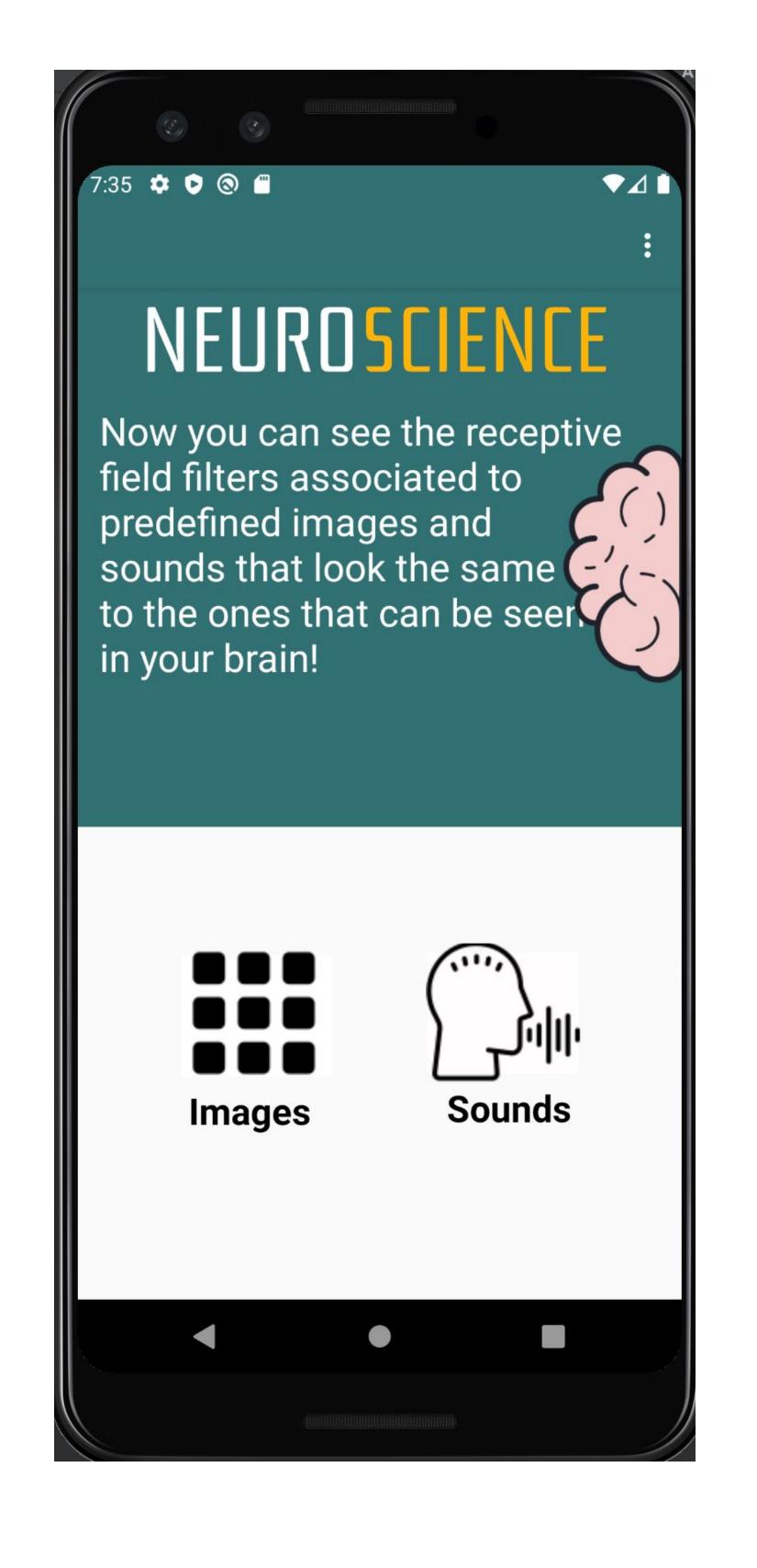
Background

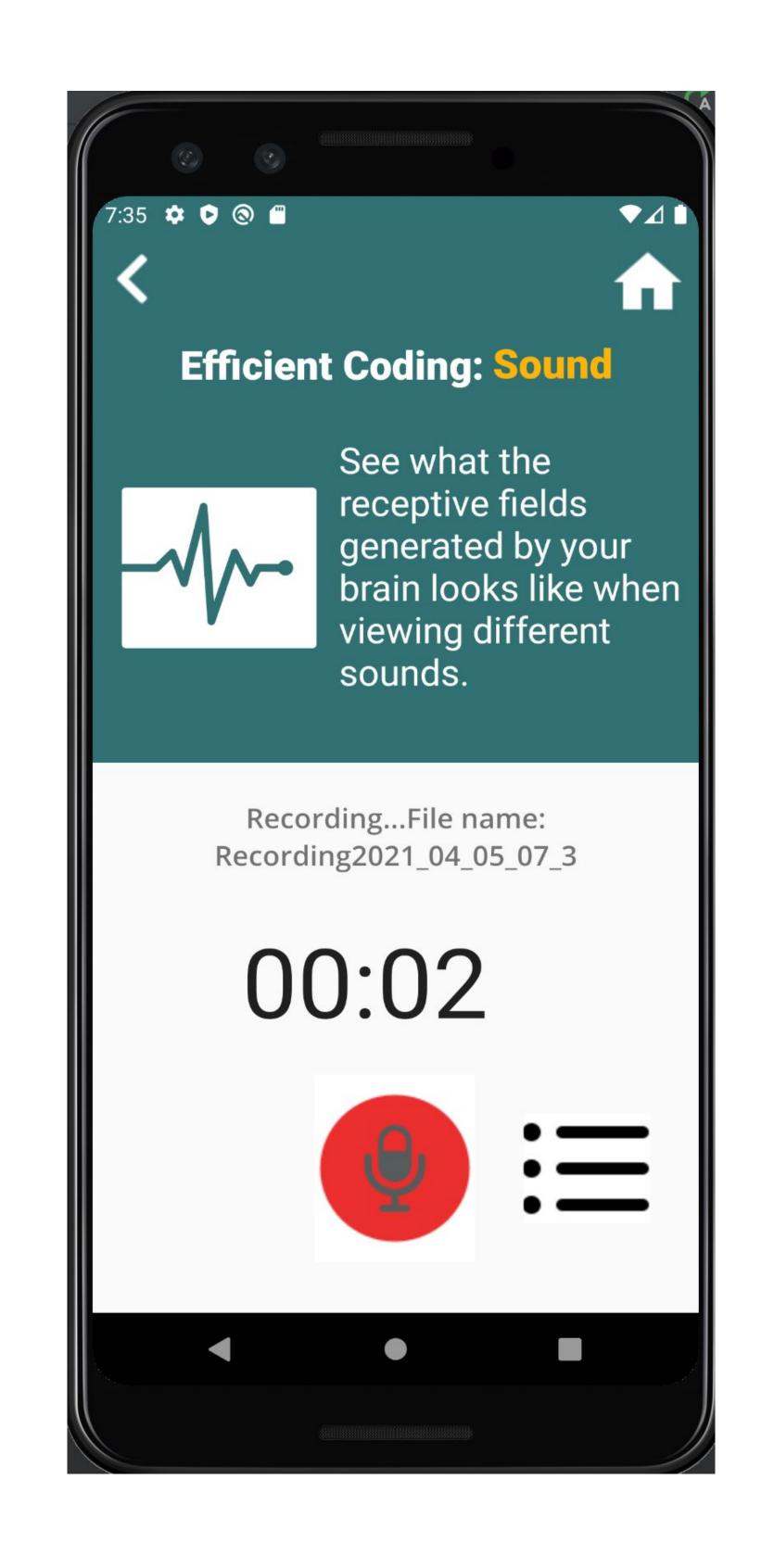
An app demonstrating the role of efficient coding in understanding sensory neuroscience. The application uses computational tools such as ICA to efficiently code visual and auditory information to simulate the neural coding process done in living creatures and sounds.

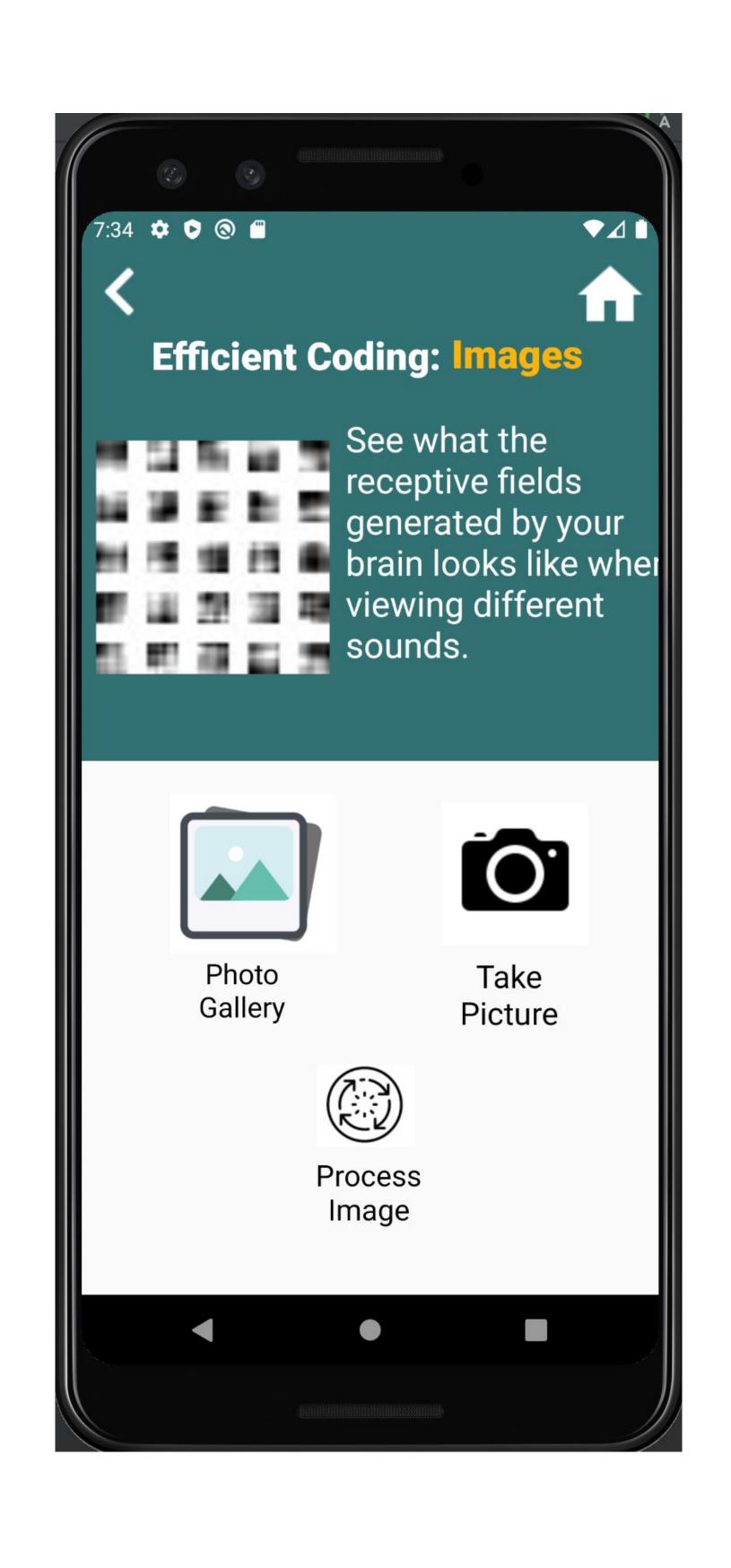




App Features





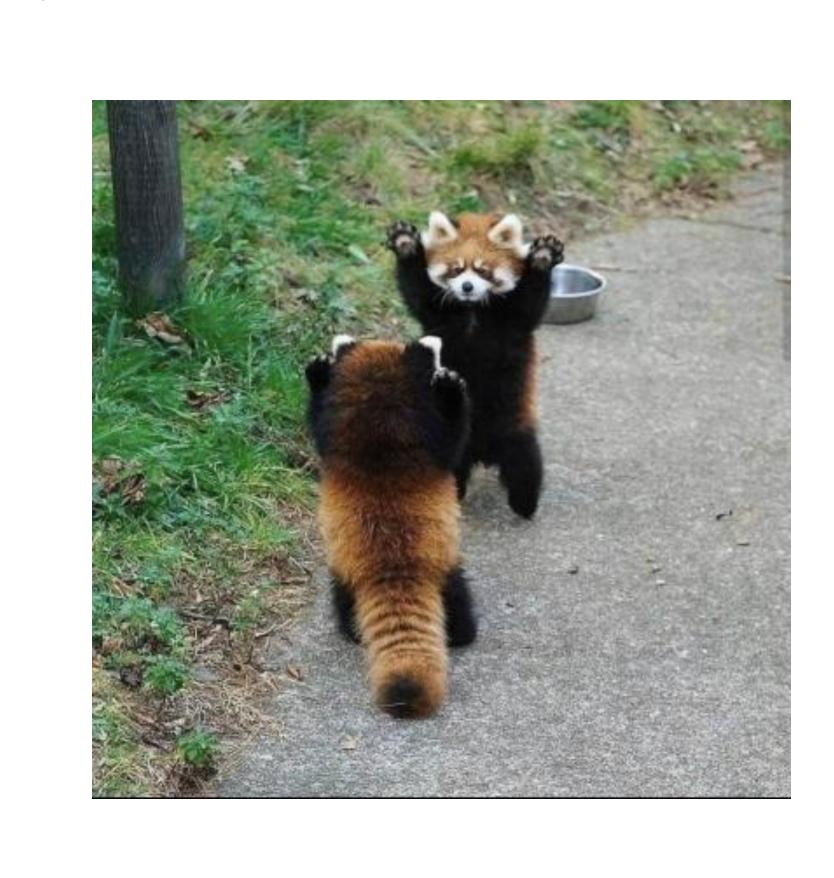


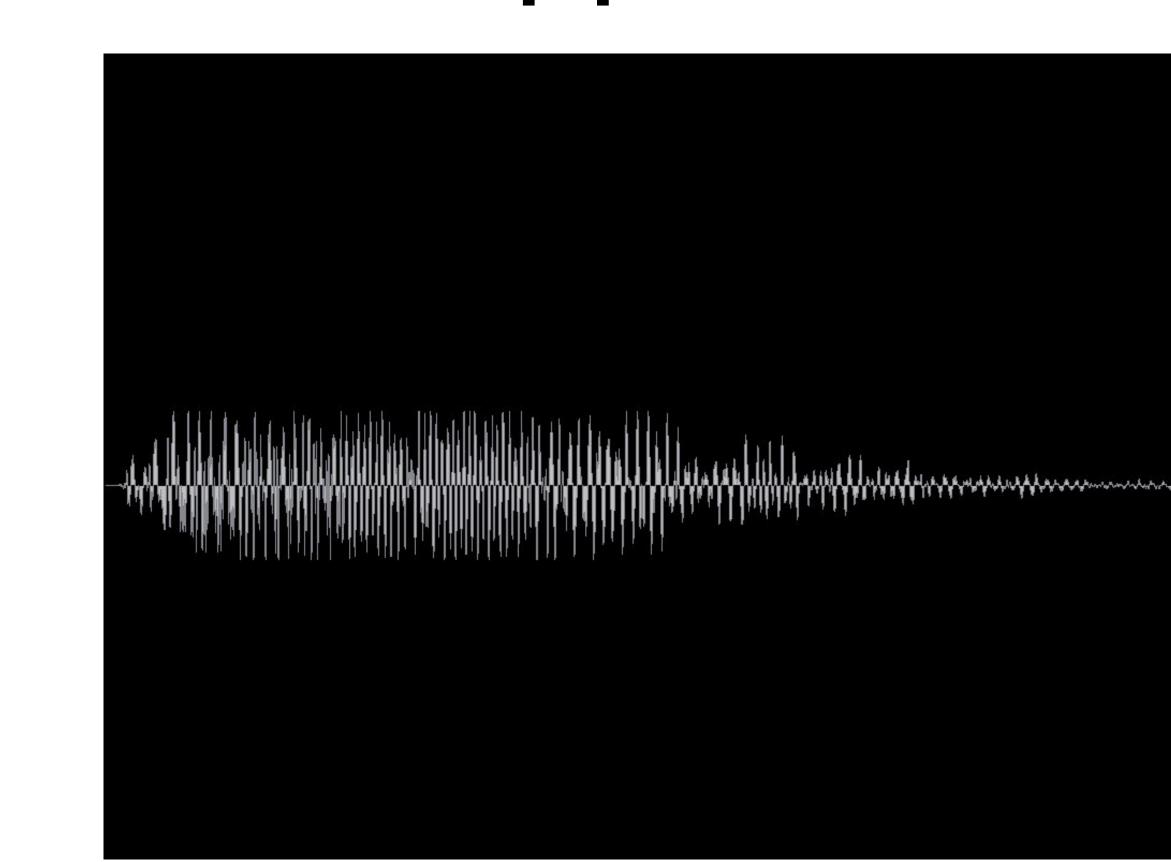
- fast ICA algorithm to process files
- Capture live image using the phone camera
- Capture live audio using the phone mic.
- Use user's own gallery images and audio files from the phone stoarge

Strategy

What is efficient coding? Image patches or sound files are efficiently encoded using Independent Components Analysis (ICA). We use this strategy to process either images or audio files that are taken live by the user.

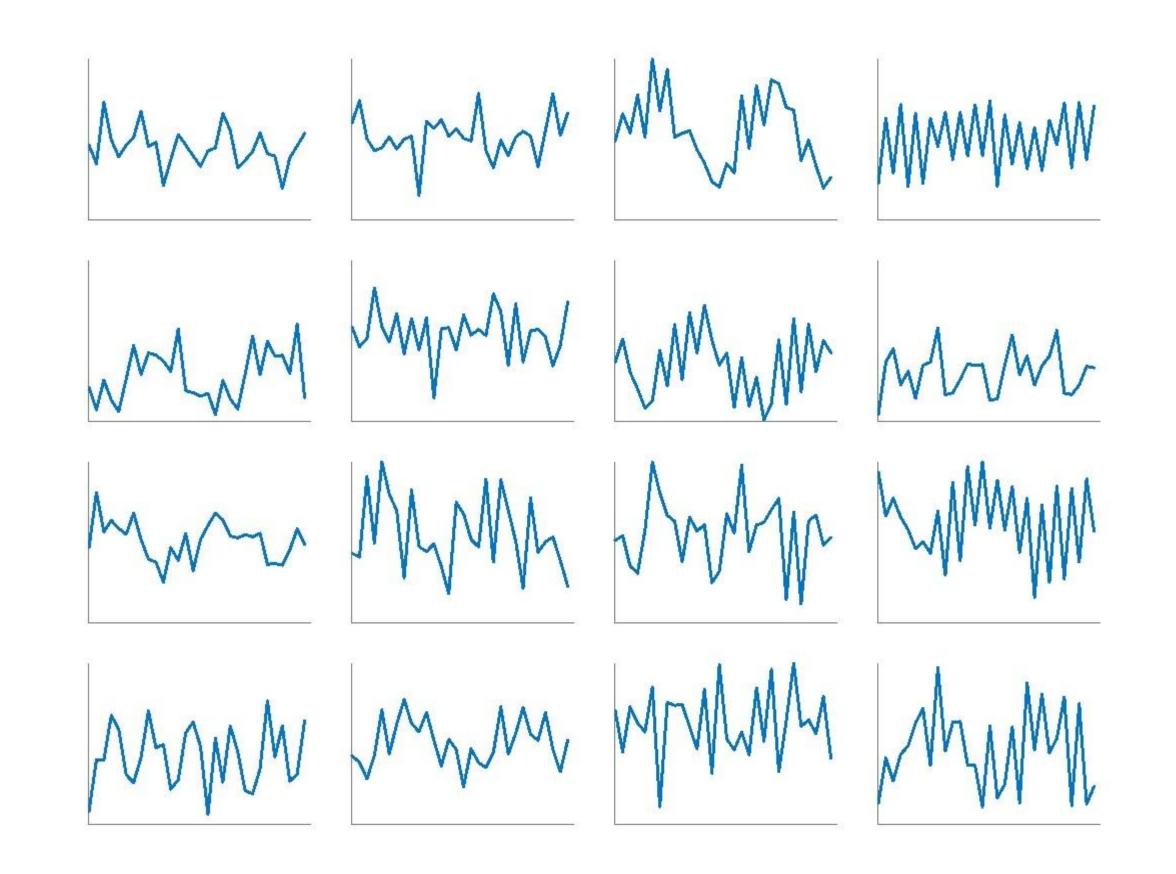
Data Collection: Images or sounds provided by the user are loaded into the app.





Patch Extraction: Extract 100,000+ patches of 8x8 pixels, each patch is transformed into a one dimensional array.





Efficient Encoding: Pass patches through fastICA algorithm using 25 components.

Display Filters: Display the resulting 25 patches created from the fastICA algorithm.





Results

Resulting filters that were captured naturally through the device's gallery and camera hardware are as decribed.

- When files are processed through FastICA, results are shown as matrices with black and white spatial properties
- Audio files are also processed though the FastICA algorithm and produce a result of different wave fragments within the matrices
- Results are different based upon images and sound files that are chosen or captured uniquely

Conclusion/Future Goals

- Though FastICA is a complex algorithm, it is still the best solution to process images and audio files to produce filters.
- Further work will be held to progress the efficiency of the algorithm for accurate results.

Technologies

- Android Studio
- Eclipse
- TrelloGitHub