REI504M: Final Project - Kristinn Roach - krg47@hi.is

Sample Prepper: Cloud-Based Audio Processing

Project Access

- Notebook: Google Colab
- Client App: Test Client
- Repository: GitHub

Business Understanding

- Problem: Manual audio sample preparation is time-consuming
- Solution: Cloud-based audio processing pipeline with optional GPU acceleration
- Cloud Benefits:
  - Scalable processing power
  - No local installation
  - Cloud storage integration
  - Optional GPU acceleration

Technology Stack

Cloud Services (PaaS/IaaS):

- Google Colab (PaaS) - Compute
- Firebase Storage - File storage
- Vercel - Client hosting
- Ngrok - Endpoint tunneling
- JSC Cloud - Planned deployment target

Core Processing:

- PyTorch/Torchaudio
- Librosa (pitch detection)
- FFMPEG/SOX
- FastAPI/Uvicorn

System Dependencies:

- Python 3 with pip
- libsndfile1
- sox
- ffmpeg
- libportaudio2
- 4GB swap space

Implementation Features

Audio Processing:

- Peak normalization to [-1, 1]
- Intelligent silence trimming
- Pitch detection and correction
- Async processing with background tasks
- Cross-origin resource sharing (CORS)
- Error handling and logging

API Documentation

GET /process

- Health check endpoint

POST /process

- Input: Audio file + options JSON
- Options:
  - normalize: amplitude normalization
  - trim: silence trimming
  - tune: pitch correction
  - outputFormat: output format
  - saveToFirebase: cloud persistence
- Output: Processed audio file

Cloud Architecture

Development Environment:

- Google Colab notebook with GPU support
- FastAPI backend
- Ngrok for endpoint exposure
- Firebase Storage integration

Client Application:

- Hosted on Vercel
- Simple testing interface

Evaluation & Results

Successfully implemented:

- Cloud-based audio processing service
- Optional GPU acceleration
- Async processing pipeline
- Cloud storage integration
- Cross-platform client access

Future Work

- JSC Cloud deployment
- Container orchestration
- CI/CD pipeline
- Load balancing
- Batch processing

Conclusion

This project demonstrates practical implementation of cloud computing concepts including:

- Platform as a Service (PaaS) utilization
- Cloud storage integration
- RESTful API design
- Scalable architecture
- GPU acceleration
- Cross-platform deployment