AI Audio Enhancement Research

Project Status & Future Roadmap

A comprehensive overview of our progress in digital audio processing and AI model development

What Went Well ✅

🎵 Deep Understanding of Digital Audio Processing

- Extensive research into **digital audio compression** techniques
- Comprehensive study of **audio quality metrics** and evaluation methods
- Strong foundation in **lossy vs. lossless** audio format differences

🤖 AI Model Development Progress

- Successfully initiated the **beginning stages** of our AI model
- Established baseline architecture for audio quality enhancement
- Created foundational framework for future iterations

Challenges Encountered ⚠️

📊 Dataset Limitations

- **Lack of diverse datasets** for comprehensive training
- Limited availability of high-quality audio samples
- AI model refinement

🔍 Objective Evaluation Metric Issues

- Current evaluation metric **sample rate too low** for our standards
- Performance metrics not meeting expected thresholds
- Self development of evaluation tools

Future Plans & Roadmap 🚀

🎯 AI Model Enhancement

- **Continue training** with expanded datasets
- Focus on improving model's ability to **distinguish between lossy and lossless** audio
- Refine neural network architecture for better performance

📱 Native Implementation

- **Deploy AI natively** on mobile phones and computers
- Optimize for real-time processing capabilities
- Ensure cross-platform compatibility

🌐 Streaming Simulation

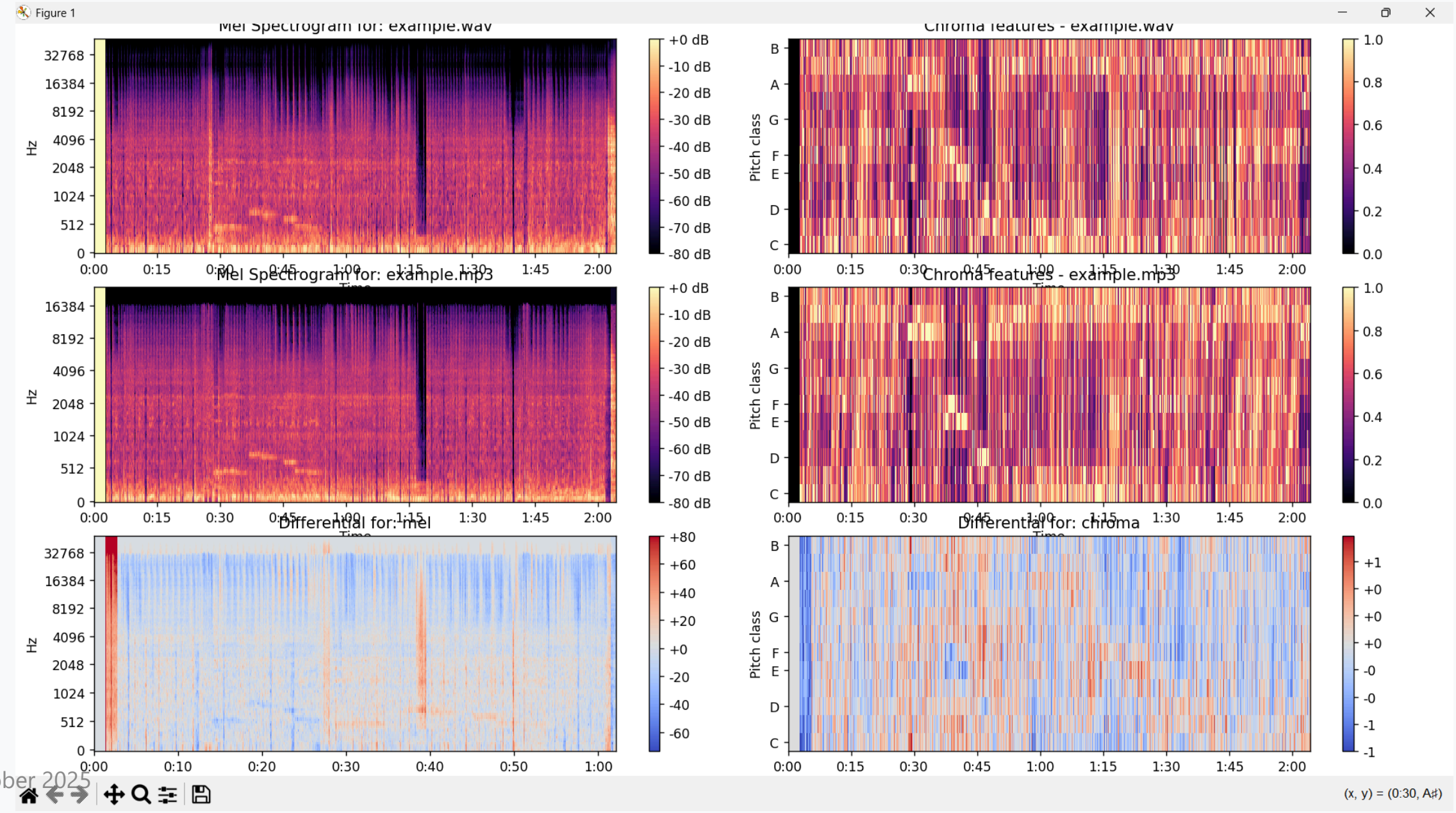
Figure 1
Mel Spectrogram for: example.wav
Chroma features - example.wav
Mel Spectrogram for: example.mp3
Chroma features - example.mp3
Differential for: mel
Differential for: chroma
Hz
Pitch class
Time
(x, y) = (0:30, A♯)

Technical Implementation Overview

🔧 Backend Architecture

- **VISQoL Integration** for objective audio quality assessment
- Python-based processing pipeline
- Modular design for scalability

📊 Analysis Components

- Audio preprocessing and normalization
- Spectrogram generation and analysis
- Quality metrics calculation and comparison

🎨 Frontend Visualization

- Interactive audio quality dashboards

Key Learnings & Technical Insights

🎓 Digital Audio Processing Mastery

- Comprehensive understanding of **audio compression algorithms**
- In-depth knowledge of **perceptual audio coding**
- Expertise in **quality assessment methodologies**

🔬 Research Methodology

- Systematic approach to AI model development
- Evidence-based evaluation of audio enhancement techniques
- Iterative improvement process for optimal results

Next Steps & Immediate Actions

Sprint 2

1. **Acquire additional datasets** from diverse sources
2. **Refine AI model architecture** based on current findings
3. **Implement Native pipline for AI** for mock streaming use