

Advanced Forensic Audio Enhancement and Processing

Course Description: This course builds on knowledge and skills gained in the longstanding *Forensic Analysis and Enhancement of Digital Audio* course, by exploring deeply the processing of digital multimedia and advanced techniques for enhancing recorded audio through filtering, noise reduction, and cross-channel adaptive filtering. Additional time will be spent on working with audio files from video and batch processing with free command line utilities.

Previous completion of the *Forensic Analysis and Enhancement of Digital Audio* course is **required**.

*Please note that some of the methods and software discussed and presented may only be available for demonstration purposes and/or to law enforcement agencies.

Course Outcomes:

KNOWLEDGE

Students will:

- Gain new perspectives to understand:
 - The latest forensic audio recording/processing techniques.
 - Advanced principles of forensic audio enhancement.
 - Forensic techniques, emerging science, and limitations of the forensic expert.
 - Digital evidence seizure and acquisition.
- Acquire knowledge which either enhances or is not covered in scientific literature.

SKILLS

Students will:

- Apply audio processing for increased intelligibility using advanced filters.
- Use ffmpeg, SoX, and other free command line utilities for processing large amounts of audio in batch.
- Know how to apply advanced techniques for forensic audio enhancement.
- Understand the questions that they shall be able to answer as a forensic expert.
- Take entrance and exit exams to gauge course's effectiveness while informing student regarding the advancement of their knowledge.
- Demonstrate a familiarity with general topics related to forensic audio.

DISPOSITIONS

Students will:

- Gain an appreciation for advanced issues in forensic audio.
- Be able to critically evaluate different forensic audio equipment, software, and methods.
- Enhance awareness of needs and opportunities in the field of forensic audio.

Course Schedule:

1. Foundations for Forensic Audio Enhancement Review
 - 1.1. Digital Recording Techniques
 - 1.2. Noise Reduction
 - 1.3. Sources Separation
2. Demonstration and Practice
 - 2.1. Advanced Forensic Audio Enhancement
 - 2.1.1. Noise Reduction
 - 2.1.2. Sources Separation
 - 2.1.3. Machine Learning Techniques
3. Introduction to Command Line
 - 3.1. ffmpeg
 - 3.2. SoX
4. Batch processing
 - 4.1. Batch scripting
 - 4.2. Batch Processing with Audio Software
5. Hands-on Lab
 - 5.1. Recording
 - 5.2. Processing
 - 5.3. Production of Final Product