An Introduction and Overview of Acoustic Profiling

Dr. Jason Nordhaus

Chief Scientist, Soleo Communications, Inc.

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What is Acoustic Profiling?

- ✓ A method to identify an individual machine-generated audio stream based on its unique acoustic profile
- ✓ Acoustic profiling is designed to identify audio streams from machines, not humans
- ✓ Much like a fingerprint, a machine-generated audio stream can be instantly and positively matched to previous versions of the same audio stream
- ✓ Over 98% of robocalls can be identified in less than a second using acoustic profiling
- ✓ Acoustic profiling is language independent
- ✓ Acoustic profiling can be conducted to support STIR/SHAKEN or used as an independent resource

Acoustic profiling works much like fingerprint identification

Fingerprints capture data relative to the distance between unique markers

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Fingerprint identification

The technology works for partial prints as well

Acoustic profiling techniques

There are mathematical techniques that transform audio signals from time domain to frequency domain.

Example of frequency to time equation:

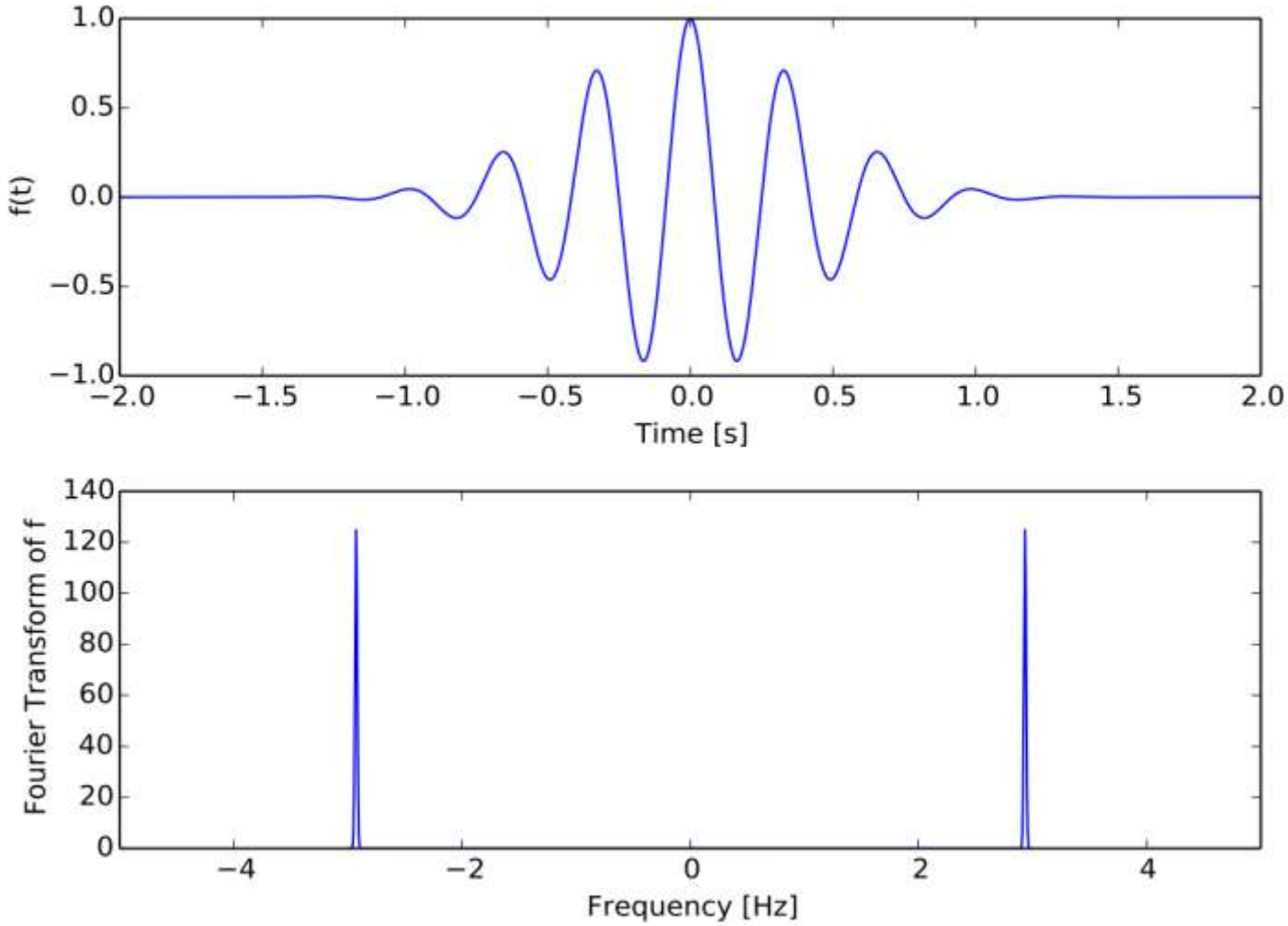
$$f(t) = \frac{1}{(2\pi)^{1/2}} \int_{-\infty}^{\infty} f(\omega) e^{-i\omega t} d\omega$$

Example of time to frequency equation:

$$f(\omega) = \frac{1}{(2\pi)^{1/2}} \int_{-\infty}^{\infty} f(t) e^{i\omega t} dt$$

Fourier Transforms

An example of a Fourier Transform from time to frequency



Acoustic Profiling creates an "audio print"

Power spectrums are created for each individual audio stream

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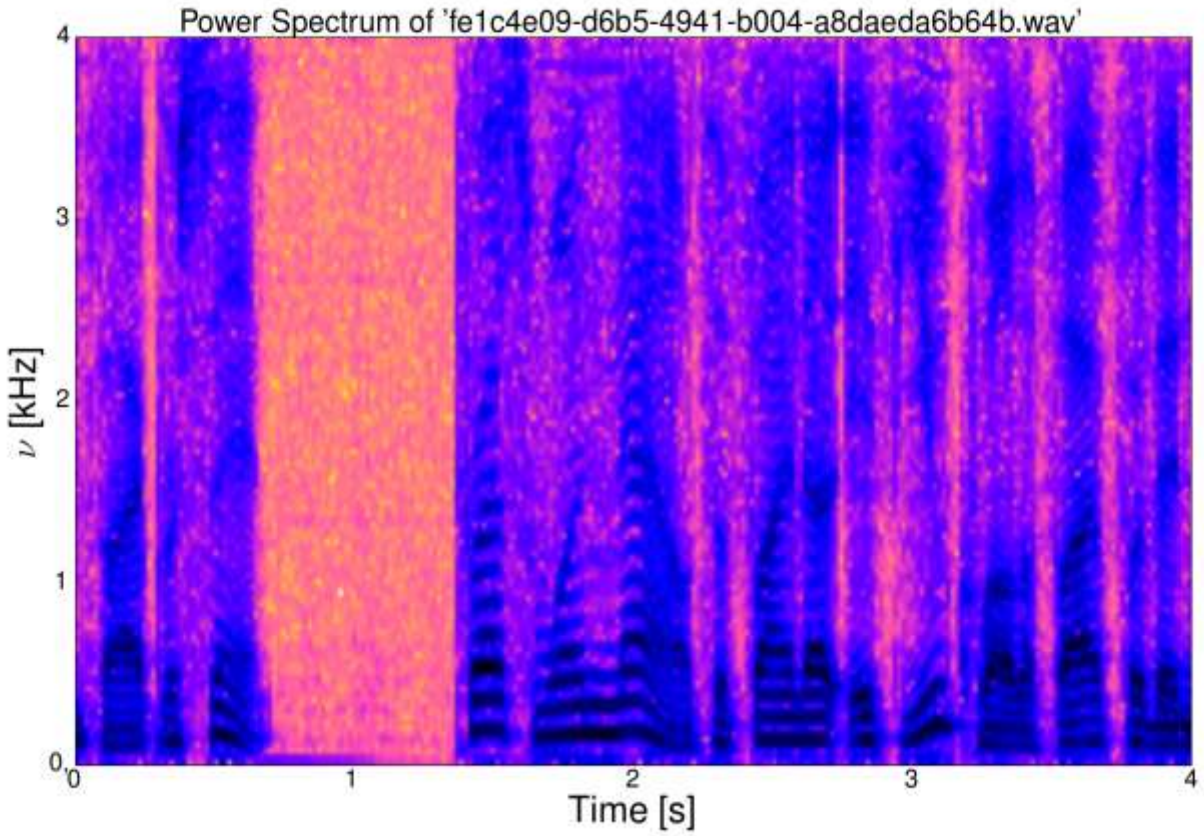
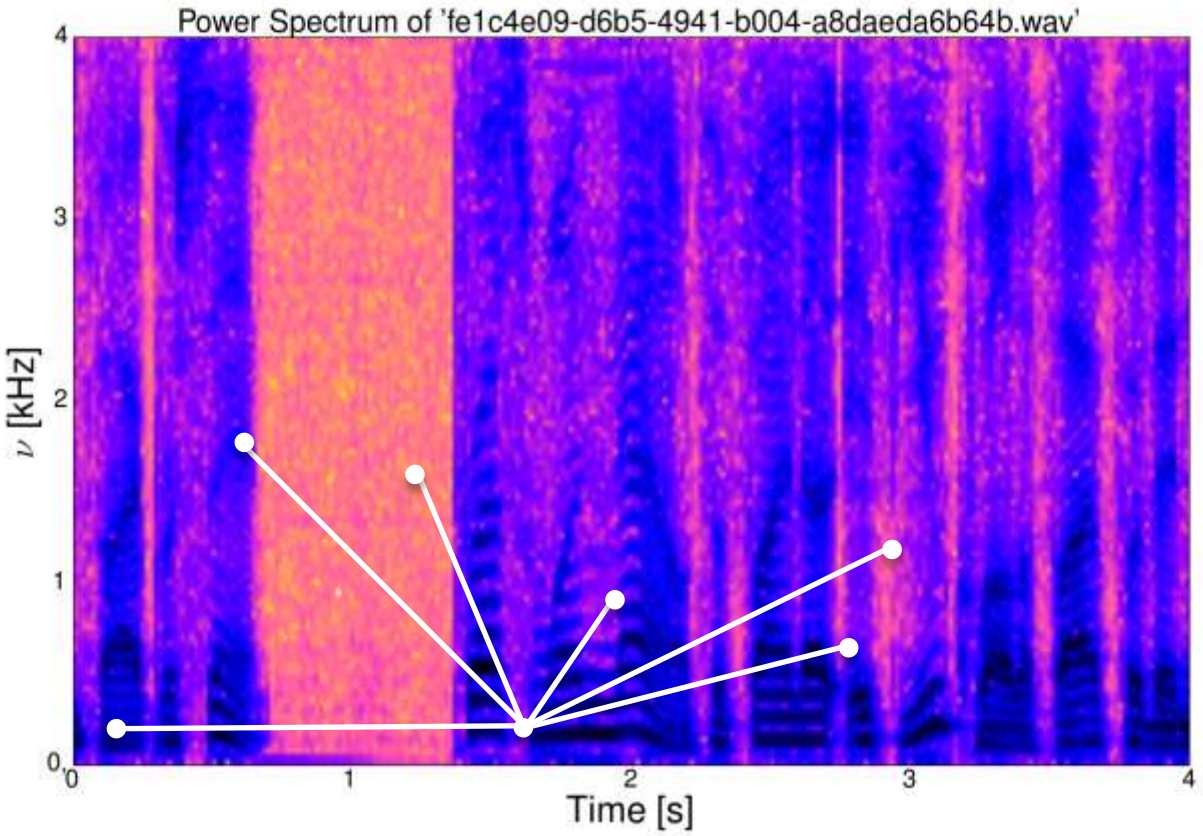


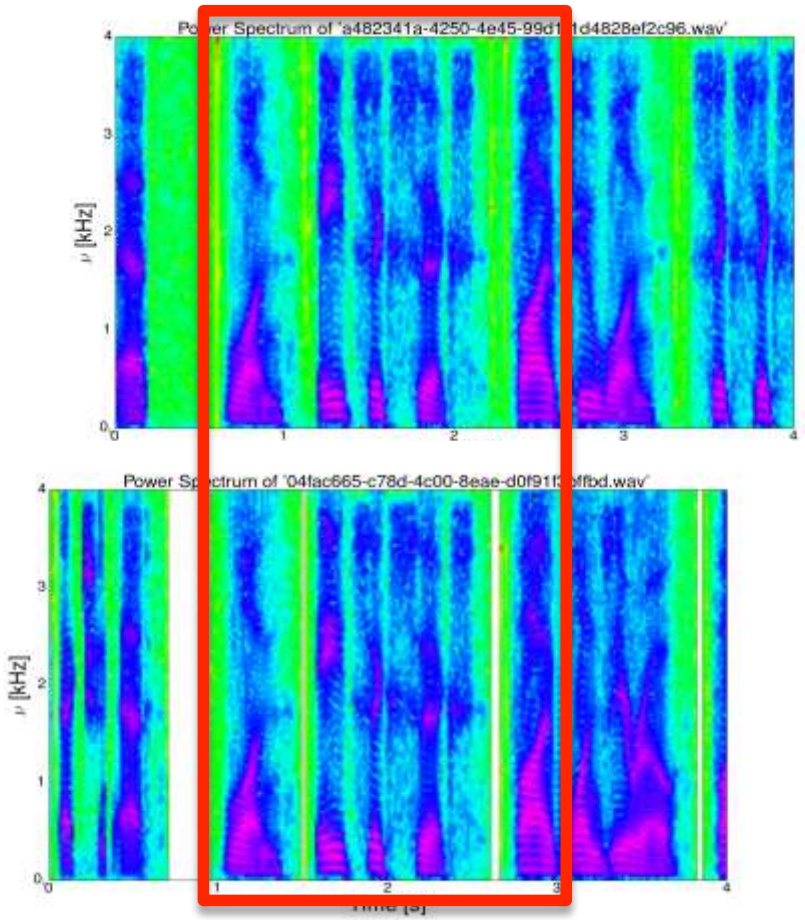
Unique markers are also created to positively identify individual audio prints

The distance between markers are stored in the acoustic profile database, allowing for real-time identification



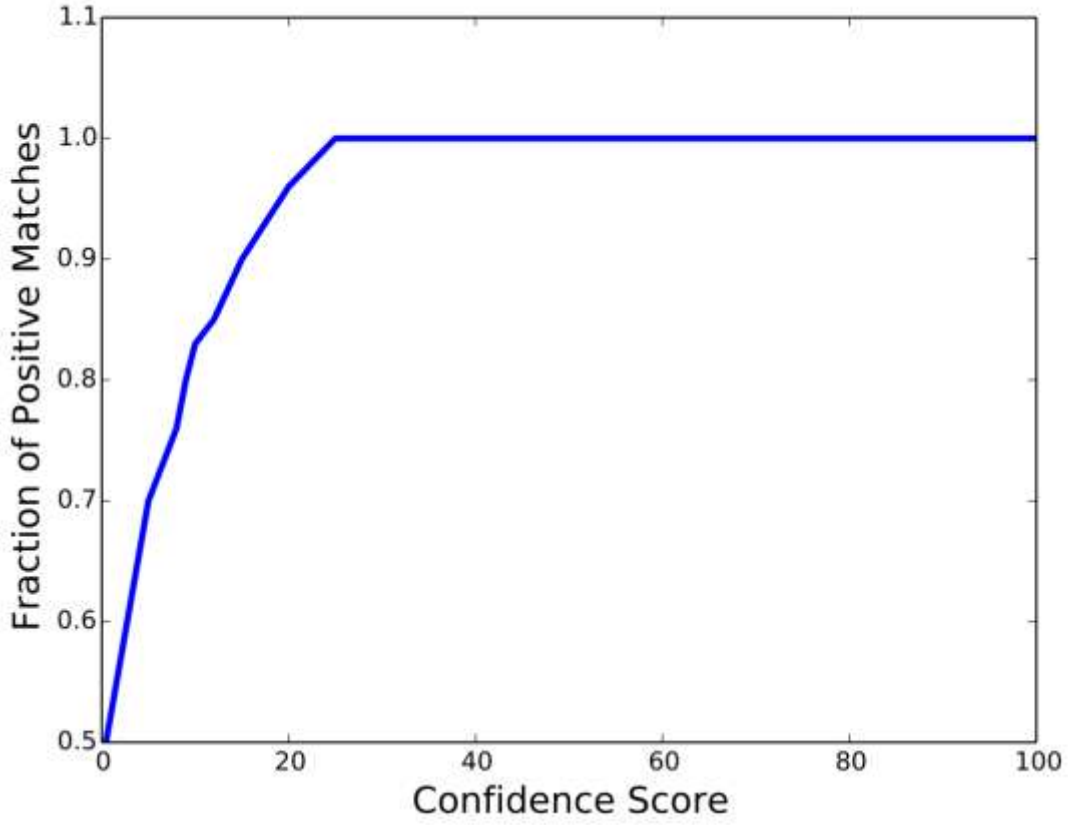
Variations of the same robocall can be identified

Even though the robocall wording may change, calls generated from the same source can be positively identified



Robocall Capture Rate

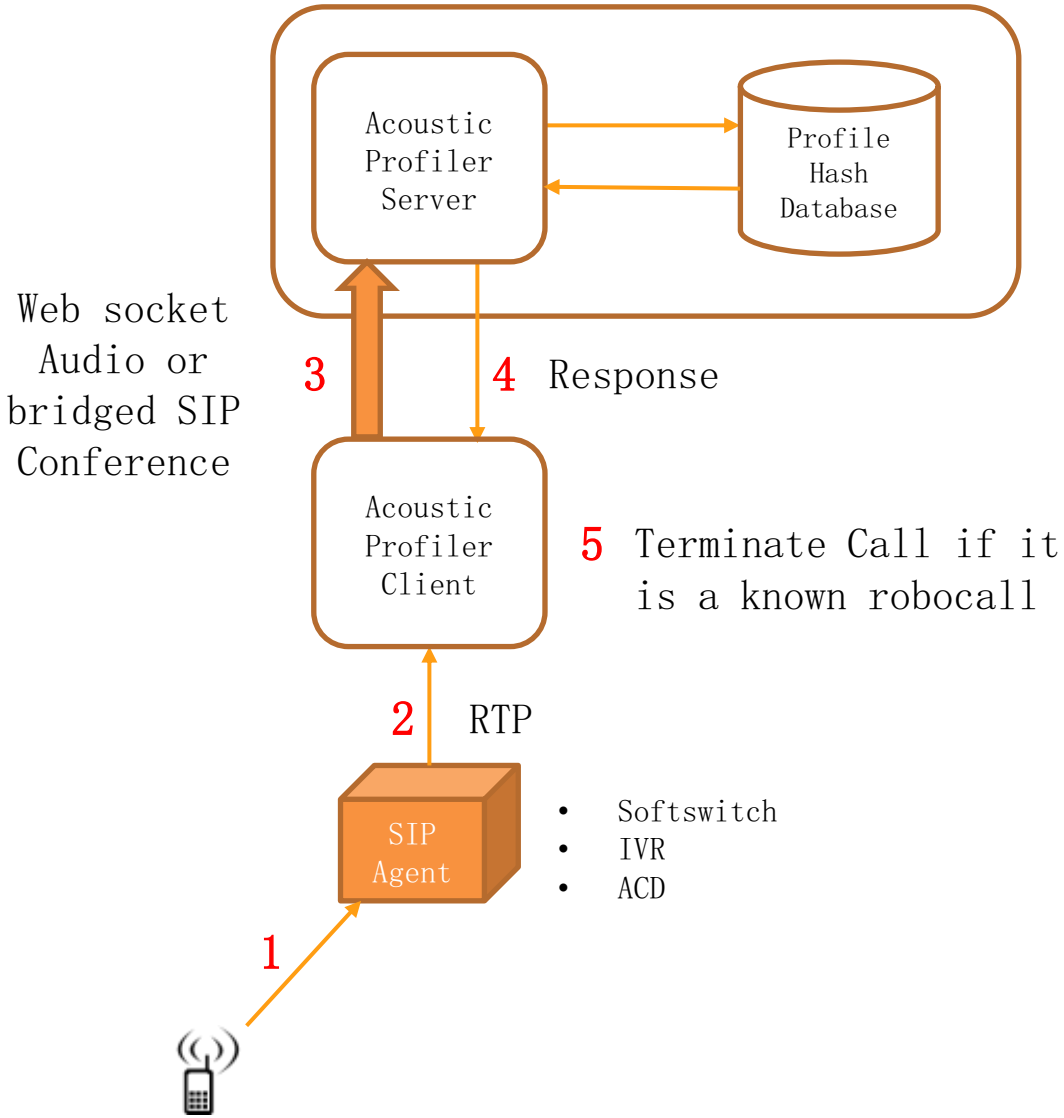
The accuracy of real-time robocall identification increases with the duration of the audio stream, but well within an acceptable delay



Soleo and Acoustic Profiling

- ✓ Soleo handles a large network of calls being placed to consumers and businesses
- ✓ Our acoustic profile database is constantly updated from calls that reach our voice platforms
- ✓ We allow authorized access to the acoustic profile database to service providers that need real-time access to known robocall acoustic profiles
- ✓ Acoustic profiling can be used to inform a Call Validation Treatment (CVT) engine, a function of STIR/SHAKEN
- ✓ Call centers can integrate both acoustic profiling and CVT to block robocalls

Use Case for Realtime Robocall Detection and Blocking



Acoustic Profiling Benefits

- ✓ Large database of known robocalls
- ✓ Real-time identification of known robocalls
- ✓ Real-time identification of known acceptable machine-generated calls
- ✓ Detailed analysis of robocall behavior and patterns
- ✓ Forensic evidence for enforcement

Like fingerprint technology, acoustic profiling is difficult to defeat.

Contacts:

Dr. Jason Nordhaus, Chief Scientist	jnordhaus@soleo.com
Dan Gallagher, Chief Executive Officer	dgallagher@soleo.com
Jim Sonnick, Vice President - Sales	jsonnick@soleo.com

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