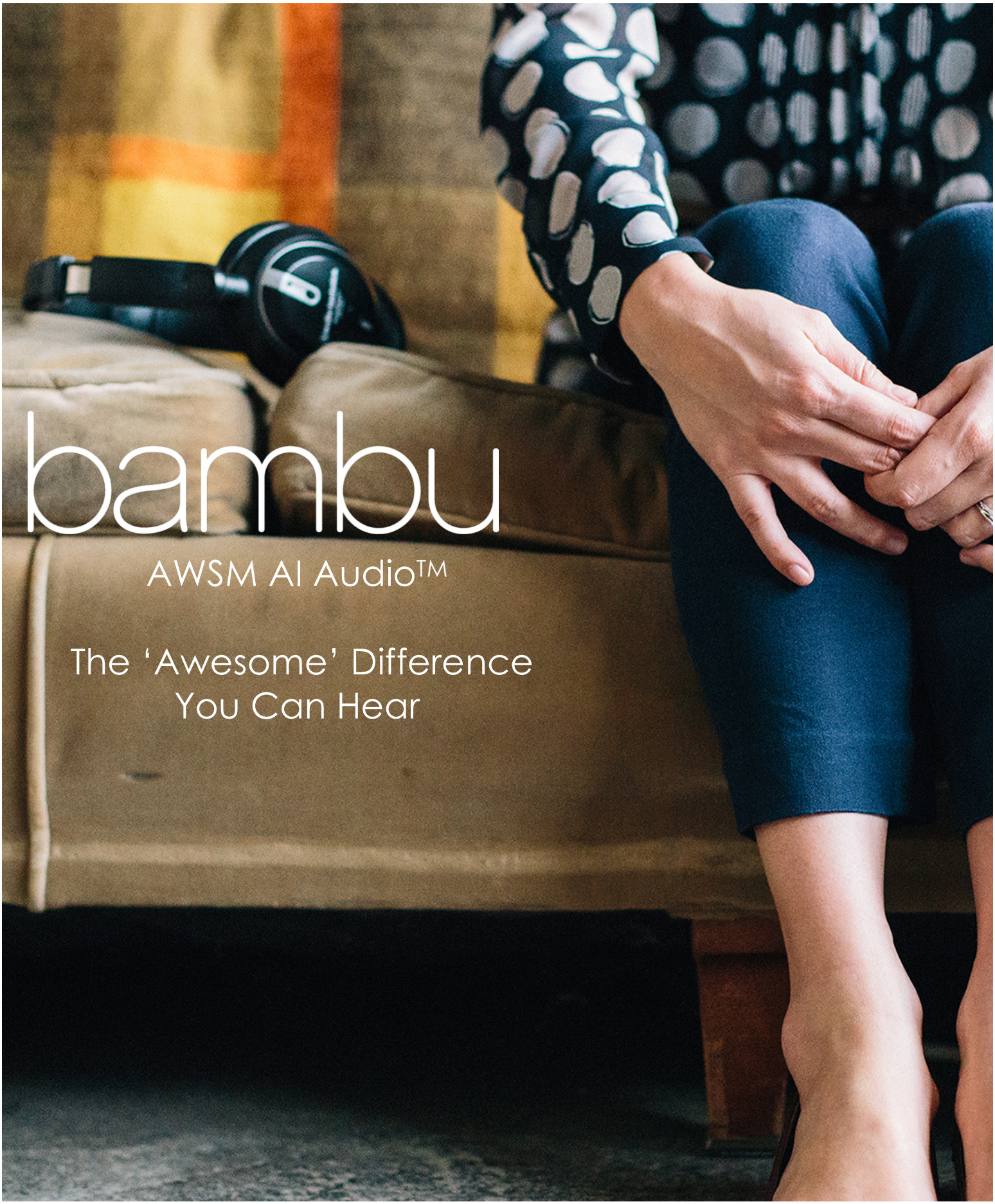

bambu
AWSM AI Audio™
The ‘Awesome’ Difference
You Can Hear

Bambu's AWSM AI Audio Software: A Breakthrough in Sound Quality

AWSM AI AUDIO

Bambu's proprietary Advanced Wave Sound Method with Adaptive Intelligence Audio™ enables a superior end-user experience and substantially cuts manufacturing and distribution costs.

Digital technology has revolutionized audio, allowing us to download, store, and stream voice communication, songs, soundtracks, you name it — and across a variety of devices. But technology has also done something else: It's taken a gruesome toll on audio quality.

The big culprit is audio format compression (MP3, AAC, etc.). By most accounts, it strips of audio file or stream of 90 percent of their detail and intricacy — at the same time it introduces artifacts, anomalies, and distortion. It imposes similarly degrading effects on downloaded or streamed video, movies, online radio, podcasts, live events, Web conferences, and voice traffic, too.

For the sake of cost and user convenience, device manufacturers, voice, VoIP, and multimedia service providers have been left with no choice but to live with these compromises. Or they have been forced to rely on more costly components and larger file sizes more expensive to distribute and store.

Until now!

Bambu's pioneering **A**dvanced **W**ave **S**ound **M**ethod (**AWSM**, pronounced "*awesome*") with Adaptive Intelligence Audio™ frees you from your quality-versus-cost dilemma.

AWSM AI Audio is the first solution of its kind to use adaptive intelligence, a computing concept closely related to artificial intelligence. Its smarts allow the the software to respond and to protect and restore digital audio in any format, on any device, with any operating system, saving it from the most muddying effects of audio format compression and the inefficiency of signal processing in devices. As it does, AWSM AI Audio delivers better quality in the same file formats and file sizes. In fact, AWSM AI Audio allows audio compression formats to make a file as much as 90 percent smaller *with no loss of fidelity.*

Compression: Playing to Lowest Common Denominator

Audio-Format compression works by removing "less critical" data from a file or stream. "Less critical" means data representing hard-to-hear sounds — high frequency waves or those that occur at the same time as louder sounds. It does so based on a generic set of ears, devices, and environments.

At the same time audio format compression removes data, it adds artifacts, distortions, and anomalies. The result: A symphony orchestra that would have sounded so blissfully beautiful live in a concert hall becomes tinny, cold, and muffled, depending on who's listening or on whether they're listening through a phone, tablet, PC, stereo system, TV, soundbar, or in a car.

Audio format compression's toll isn't limited to music. Most digital audio is compressed, even a voice call.

AWSM AI Audio: A Victory for Audio Quality

Over time, many technologies have emerged to improve audio quality by addressing compression's degrading effects. But they all suffer from the same shortcoming: They treat an audio file or stream as a "stationary" dataset, addressing every waveform the same. As a result, they are unable to sufficiently deal with the effects of compression as it removes data, limits dynamic range, and introduces artifacts, phase anomalies, and distortions.

By contrast, AWSM AI Audio is real science. It rests on a fundamental understanding of the physical nature of soundwaves.

Sound is dynamic. It moves through space over time. Soundwaves affect each other to create any audio's distinct harmonics. When compression eliminates or changes one waveform it launches a cascading effect across others.

Bambu's AWSM AI Audio, however, addresses and anticipates the *dynamic* millisecond-to-millisecond changes, details, and harmonics of sound — *processing waveforms as they affect each other.* It treats digital audio to in all its intricacies, complexities, and interdependencies. Yet it operates with nearly undetectable levels of latency — measured at ~2 milliseconds.

AWSM AI Audio was invented by two globally recognized guys who spent decades as musicians, sound designers, hardware developers, and technologists at the forefront of the digital revolution in audio.

Because they understand audio quality from an authentic and artistic perspective, they arrived at a recognition: Hardware alone can't come close to capturing and replaying audio *as it was intended to heard.*

Their revolutionary approach makes for stunning improvements in quality. They are so significant, in fact, that a file can be compressed as much as 90 percent more — *with no loss of fidelity.*

AWSM AI Audio technology addresses quality in these principal ways:

- **Detail.** One of the most basic and irrefutable standards of audio quality is detail, capturing and replaying the extraordinarily intricate harmonics that comprise most of the sound we hear, from an Adele song, a Star Wars soundtrack, a single human voice, a VoIP call, or a video conference. AWSM AI AUDIO extends the capacity of an audio file or stream to deliver the nuances of sounds that are responsible for such richness. When AWSM AI Audio processes a 16-bit file, it actually sees and delivers a 20-to-24 bits which translates into far more detail than simple math makes it seem. The reason: Because of the way binary code works, there's an exponential difference between a 16-bit and 24-bit file. A 16-bit file can capture sound at 65,536 different digital increments, while a 24-bit file can capture its details in 16.7 million increments.

- **Preservation.** AWSM AI Audio maintains detail, intricacy, and nuance. When used before encoding, it prevents compression from eliminating many critical details that codecs remove to reduce file sizes. At the same time, it helps to prevent imperfections from being added during the encoding process.

- **Restoration.** Even if AWSM AI Audio is absent from the pre-encoding phase, the software is smart enough to restore the quality of a sound or stream in real-time. If used only on playback, it can restore details and remove artifacts, anomalies, and distortions created by compression.

- **Configurability.** For as much as engineers and other experts know about audio physics and technology, these "golden ears" still rely on what they actually hear. While AWSM AI Audio is based on science, its inventors recognized that quality is highly subjective. So AWSM AI Audio is easy to tune. We don't sell a specific sound. We sell a technology that allows you to deliver the sound you want to your end users.

- **Adaptability.** Many other sound technologies came out of efforts to enhance movie soundtracks. Most were created for theater experiences. But the primary places and ways in which we experience sound now extend beyond that. Consumers are listening in cars, dorm rooms, or on mobile devices through Bluetooth connected devices. By using AWSM AI Audio you will be able to expand the Quality of Experience in ANY environment.

AWSM AI Audio: A Difference You Can Hear — and See

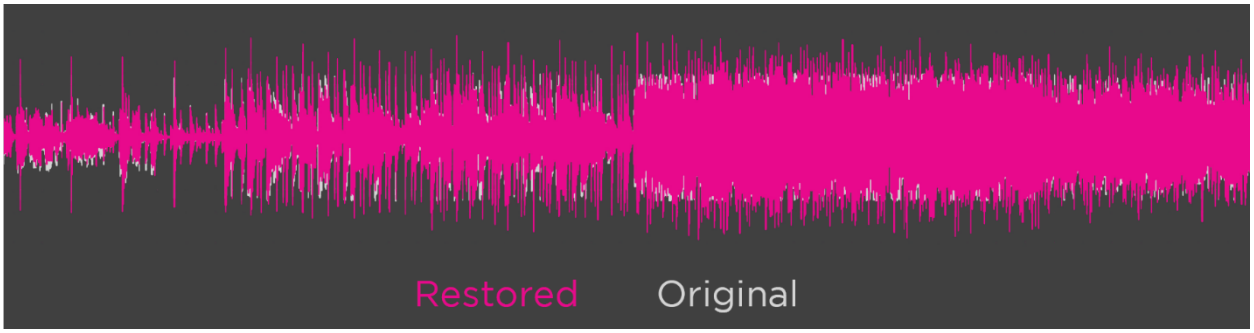
Sound is complex. As a testament to its detail, intricacy, and nuances even engineers and scientists will describe audio quality in subjective terms. They'll use words such as bloated, breathy, bright, crisp, dark, edgy, grainy, liquid, smeared, even wet and dry.

Nevertheless, we can be more scientific. We can use measuring tools to show the AWSM AI Audio difference.

The two images below illustrate the "before and after" of AWSM AI Audio processing, comparing the Original (a CD-quality 15.15MB 44.1 WAV) to an AWSM AI Audio-processed file (1.38MB MP3).

Even a CD is squeezed. In the first example, you can see the content AWSM AI Audio restored from the CD as illustrated by the additional fuchsia content extending past the white waveform of the Original. Even though MP3 files are compressed, AWSM AI Audio restored the harmonic content.

Note: If these were "EQ" changes, then the lower amplitude parts would also become louder.



In the example above, you can see the content removed or restored from the source. The white shows where AWSM AI Audio removed artifacts, phase distortions, and anomalies. The fuchsia that extends beyond the white waveform show were audio was restored.

Why Quality Matters More than Ever

Is the issue of audio quality falling on deaf ears, so to speak? Has quality become immaterial to a generation that doesn't know any better — those grown up on MP3s, iPods, earbuds, and smartphones?

It's true that quality has taken a backseat to convenience. Most consumers have happily traded fidelity for the access of entire libraries and streams accessible through personal devices.

But we're beginning to see a change in that consumer response. Vinyl records are enjoying a comeback because of they retain harmonics that audio format compression deletes or degrades. Music services that deliver bigger, higher quality streams and downloads are cropping up. Cars are becoming fully connected. A growing legion of cable-cutters are instead relying in streaming services to smart TVs that will only whet their appetite for broadcast-quality experiences. As proof, consider: Soundbar sales are expected to grow at a compounded annual growth rate of 11 percent between 2015 and 2021.

Surveys bear out the trend. A 2015 study by the Consumer Technology Association found that **82%** of consumers describe sound quality as critical when selecting a product. MusicWatch said in an early 2016 survey that an estimated 25 million U.S. consumers would pay for better quality music.

We Help You Differentiate

Audio is a critical to billions of consumers through the devices and services they are increasingly using. They have more choices than ever. In the intense, quickly shifting competition for their dollars it's essential to set your product or service apart.

We can help. Bambu's AWSM AI Audio makes audio better. It makes music files and streams fuller. It makes movie and video sound more detailed. It can make a voice call clearer. *Our technology enables you to deliver audio far closer to the way nature itself intended it to be heard.*

What's more, better QoE doesn't have to come at a cost. ***In fact, AWSM AI Audio can deliver better quality as the same time it can reduce costs.*** AWSM AI Audio allows a file to be compressed as much as 90 percent more — with no loss of quality. We've also shown device manufacturers how they can reduce component costs by using AWSM AI Audio to get their existing microphones, speakers, and processors to deliver better quality.

CONCLUSION

Sound is a profound part of the human experience. Nature itself has set the standard. Recording artists, producers, and directors have made it their life's work to deliver audio at extraordinary levels of richness and detail. Consumers may settle for less for now, but not forever.

Quality matters.

And those of us behind AWSM AI Audio are committed to making sure you meet the expectations of your customers as they demand better audio ahead.

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