



Co-Founder and CEO, AONDevices, Inc.

## **Mouna Elkhatib**

# AONdevices

## Harmonizing Customer Needs to Leverage Best-in-class Semiconductor Solutions

In recent years, the semiconductor industry has gained more prominence than ever before. Several powerful players have emerged in the sector after the need for advanced semiconductor solutions surged. One such company is AONDevices (AON) which is seamlessly catering to the needs of battery powered applications.

AONDevices (AON) is a fabless semiconductor company that was founded in 2018 by industry veterans with an average of more than 20 years of expertise in voice, audio processing, and AI. The company is headquartered in Irvine, CA.

AON specializes in developing ultra-low power, high accuracy AI processors that enable unprecedented sensing capabilities in battery-powered “always on” devices. Its processors enable a natural human-machine interface at the device level without compromising battery life or sending data to the cloud, thus improving user experience and assuring privacy.

AON's technology and expertise combine AI algorithms and architecture with a deep domain understanding of voice, audio, and other sensory algorithms. AON developed a proprietary neural network architecture that delivers unparalleled accuracy in processing sensory data at ultra-low power. This architecture underpins the cores which are uniquely optimized for specific domains such as audio and voice.

When featured in devices like phones, headsets,

wearables, game controllers, toys, vehicles, or smart home appliances, AON's technology enables constant sensing to detect multiple concurrent events. For example, AONVoice™ and AONSens™ cores can *simultaneously* recognize multiple voice commands and sound events such as a baby crying, siren, or glass breaking while detecting specific motion patterns including walking or falling.

### **Spearheading Human-Machine Interaction for a Better User Experience**

AONDevices has a vision of “always-on” everywhere to enable a natural human-machine interaction. This implies processing at the device level without sending anything to the cloud. Current solutions introduce trade-offs in performance, battery life, and privacy (sending data to the cloud). Moreover, system designers source the microcontroller from one vendor, the data from another vendor; which require coordinated updates.

AON's mission is to become a “one-stop-shop” that enables the always-on state for battery-operated devices without compromising performance, battery life, or privacy. AON's approach is to provide a complete solution - processor, AI models, software, and tools.

In 2020, AON began licensing the IP of its AONVoice core to tier-1 semiconductor companies. The AONVoice processor is optimized to detect microphone data, including voice commands and sound events.



AI enabled new paradigm in natural human-machine interfaces. Combined with the increasing awareness of privacy and energy efficiency, there is increasing demand for additional sensory triggers and multi-sensory capabilities. AONDevices is poised to become a recognized leader in its field as the industry continues to grow.

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In 2021, the company announced samples of its first chip, the AON1100, which combines AONVoice core with AONSense core for simultaneous voice, sound, and other sensory data processing. The AON1100 is actively evaluated by several tier-1 OEMs.

#### **A Strong Leader with Decades of Industry Experience**

Mouna Elkhatib is the Co-Founder and CEO of AONDevices and has over 19 years of experience in the semiconductor business with a successful track record in engineering, engineering management, and cross-functional team leadership. Before AON, she was the system lead and principal chip architect at Qualcomm. Prior to that, Mouna was the Director of VLSI at Conexant, where she led the audio system-on-chip (SOC) architecture and design domain. She is one of the key developers of Conexant's PC-HD audio codecs, USB audio codecs/DSP, and voice input processor SOCs for smart speakers.

Mouna also serves on the 'Global Semiconductor Alliance Womens Leadership Council and runs the WLI Entrepreneurial Committee. She holds an engineering degree from Ecole Nationale Supérieure d'Electricité et de Mécanique (ENSEM), eleven US patents, and eleven pending patents.

#### **AON is Transforming the Semiconductor Industry**

Since AON innovates, merging both AI and semiconductors, the company collaborates with different parties within the ecosystem including EDA vendors, fabs, and design houses, to name a few. The team feeds information into the semiconductor network regarding the AI challenges that occur in semiconductor design.

AON is an active member of several industry organizations such as GSA and TinyML, and contributes massively to the advancement of Edge AI. AON's principles revolve around constantly participating in industry committees and panels.

#### **Innovating with the 'Next Wave of Disruptive Technologies'**

Just like the emergence of personal computing and the internet, fuelled major waves of innovation by respectively redefining what was possible up to that point in data processing and collaborative instant access to information, quite similarly, the new wave of disruptive technologies redefines the scope of possibilities and marks the next level in innovation.

IoT enables AONDevices to instrument, measure, and eventually impact every aspect of our lives from personal health to transportation, resource management, and so on. Huge amounts of data are being generated in these processes. Furthermore, AI algorithms enable us to analyze large amounts of data like never before and to draw conclusions based on the emergence of underlying features and patterns. And lastly, cloud computing and 5G enable ubiquitous access to the data, the information available, and the resources necessary to process it. With the unfiltered amount of information that tech businesses are constantly absorbing, change is inevitable. The future that we saw in movies decades ago such as self-driving vehicles, robotic customer delivery, personal and robotic medicine, and commercial space travel is almost here. Our lives will never be the same.

#### **Treating In-Hand Problems to Provide Optimized Solutions**

AON's approach to developing AI-based speech/sound/sensor or detection systems is fundamentally different than most. Rather than using established AI architectures and applying them to large datasets, the team started with analyzing the specific problem at hand and creating a complete solution that combines AON's tailored neural network architecture with AI algorithms as well as datasets and tools.

This results in a significantly more power-efficient solution that delivers extremely high accuracy using a

small dataset (even in noisy conditions and using a single mic in the case of voice/audio).

Unlike most solutions that support a singular function such as wake-word only or sound only, the company's solutions are capable of simultaneous detection of a large number of triggers such as keywords and sound events to combine data from multiple sources like mic(s) and other sensors.

#### **Envisioning a Successful Path to Tackle Major Complexities**

Mouna recalls that the first and foremost challenge the team faced was to prove to themselves and others that what they envisioned is feasible. Specifically, AON's technology was designed from the ground up to achieve high non-compromising accuracy at an ultra-low unprecedented power consumption that would enable battery-powered devices to stay "always-on". When the company was founded, it was not clear whether this goal was achievable or not. After the team achieved this goal, it was still challenging to prove to the customers that the technology is considerably above and beyond anything else that is available today.

Also, the timing of the market launch coincided with the pandemic. Like many others, customers were greatly impacted by the pandemic and the aftermath of supply chain challenges. This delayed customer projects and new product designs, which greatly impacted the business and delayed time to revenue.

Thankfully, the company proved the efficacy of its technology and matured it to a point where the team witnesses great traction in customer interest, evaluation, and design-in for these products. While the revenue ramp is somewhat delayed, Mouna is very confident in the near and long-term future of the company.

#### **Laurels and Recognitions that Hallmarks Success**

AONDevices was named one of the top 10 female-

founded startups by both Amazon Alexa Fund and Qualcomm Ventures. The company has also been shortlisted to participate at leading events and councils including EvoNexus, GSA Women's Leadership Initiative, and TinyML. Moreover, the company also received laurels at the Five Finalists from the "Women Founders Present" Pitch Competition by the Alexa Fund. Also, AON has been certified with OBCJ innovation award nominee, 2 years in a row.

In 2021 AON partnered with Dialog Semiconductor (a Renesas Company), a leading provider of standard and custom integrated circuits that power the Internet of Things (IoT) and industrial IoT applications, to provide the best-in-class edge AI solutions for integrating super low power wearables and consumer devices. AON has advanced as the top-tier edge AI processor technology provider. Its solutions have also demonstrated top-tier performance results in both ASIC and FPGA.

#### **The Future Ahead: Playing a Win-Win Game**

According to Mouna, AI enabled a new paradigm in natural human-machine interfaces through sensory data such as voice, sound, vision, motion, and others. "Smart interactive" devices will become the norm in nearly every industry, including personal electronics, smart home appliances, healthcare, banking, medicine, automotive, and industrial. Those markets will continue to grow aggressively. Sensory data has the advantage of enabling intuitive interaction while allowing focus on other tasks. Combined with the increasing awareness of privacy and energy efficiency, there is increasing demand for additional sensory triggers and multi-sensory capabilities. AONDevices is engaged with a number of customers and partners that are at the forefront of driving innovation in these markets. She says that the company is poised to become a recognized leader in its field as the industry continues to grow.