Always-on Artificial Intelligence for Battery Powered Devices
Syntiant Summary

Number of Employees: 48

Median Experience: 20 yrs

Funds Raised: $30M

Focus: Always-on machine learning semiconductors for battery powered devices

First Product Samples: July 2018

First Product Production: July 2019

Location: Irvine, CA

Strategic Investors

- Intel Capital
- M12 (Microsoft's Venture Fund)
- The Alexa Fund
- Bosch
- Applied Materials
- Motorola Solutions
NDP10x Application Examples

**Strong Devices**
- AP provides NDP & mic clock
- NDP awakens AP with INT
- AP collects match on SPI
- AP optionally collects matched audio on SPI

**Active Audio Devices**
- AP streams audio over SPI
- AP collects match on SPI

**Light Devices**
- SPI and GPIOs connect rest of system
**NDP100 Audio Neural Decision Processor**

### Features
- 2 PDM microphones, I2S or PCM-over-SPI input
- Frequency, time-domain & batch input models
- 3sec 16-bit input audio holding tank
- encoded ‘winner’, 1-bit & 8-bit outputs

### Specifications

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<tbody>
<tr>
<td><strong>Classes</strong></td>
<td>64</td>
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<tr>
<td><strong>Parameters</strong></td>
<td>560K</td>
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<td><strong>Max Frame Rate</strong></td>
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<tr>
<td><strong>Always-on Power</strong></td>
<td>140µW</td>
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### Applications
- Keyword speech interface
- Wake word detection
- Speaker identification
- Event detection
- Other ‘low-speed’ tasks
Syntiant NDP10x Platform Demo

NDP100
1.4mm X 1.8mm

NDP101 QFN32 (5X5)

Alexa wake word with Music
Syntiant NDP10x Platforms

USB and M.2 Card

Mobile Phone

iRobot® Create 2 with voice
Syntiant Alexa Wake Word Package

< 3 False accepts in 24 hours

FRR 0.00 at high SNR

FRR < 0.04 over range of 2 - 20 dB

SNR

Tested under six noise conditions

Chips + wakeword package ready for Alexa integration

Syntiant’s close-talk audio lab
Syntiant Speech Service

- Develop algorithms and training exactly as for idealized deployment
- NDP parallelism ensures no performance artifacts of hardware mapping
- Syntiant TDK packager collects neural network parameters for chip update
Syntiant Training Overview

Syntiant Keyword Speech Training Pipeline
- applies best-known production deep neural network training practices
- applies industrial-strength validation aligned with Amazon AVS chip qualification criteria
- employs multiple layers of iteration

Deep Learning Shifts Solution Development From Algorithms to Analysis, Validation and Iteration
Conclusion

- We have production silicon ready to deploy ML at the edge with a solid training pipeline
- Extremely powerful Neural Classifier ideal for Amazon AVS certification
- Optimized for voice, but ready for any sensors
- Programming model is straight from TensorFlow
- We are hiring!