Always-On Artificial Intelligence for Battery-Powered Devices | Neural Decision Processors™ NDP100, NDP101

About: Founded in 2017 and headquartered in Irvine, Calif., Syntiant Corp®. is moving artificial intelligence and machine learning from the cloud to edge devices. Syntiant's advanced chip solutions merge deep learning with semiconductor design to produce ultra-low-power, high performance, Neural Decision Processors™ (NDPs) for always-on applications in battery-powered devices. The Syntiant® NDPs seamlessly integrate with inertial, magnetic, image, chemical, and audio (microphone) sensor types to support most commercial applications. Syntiant is backed by some of the world's strongest strategic investors, including Intel Capital, Microsoft M12, Bosch Ventures and the Amazon Alexa Fund.

Problem to be solved, technical approach and its a novelty: Various sensors, eg. inertial sensors (3 axis accelerometer, 3 axis gyro) are readily available and are used in our daily life. In some use cases, the signals produced by these sensors are very complex and require processing in the cloud which adds latency and power dissipation to transmit the data to the cloud.

Built from the ground up to run deep learning algorithms, Syntiant's architecture enables processing complex signal signatures right at the edge with battery power. The power dissipation in processing the data is significantly lower than transmitting the data to cloud. While achieving power saving, the latency is eliminated which is very important in many applications.

Within the confines of TinyML, in one novel asset safety use case, NDPs provided complex signature detection using multiple sensors (sensor fusion technology) which made secure areas tamper-resistant while increasing the battery life 6 folds.

Product Specifications:

◈ **Power consumption**: Less than 140µW

◈ **Package size**: 1.4mm X 1.8mm

◈ **Neural Processing**: Neural network with over 500k parameters for sensor-based applications

◈ **Ease of Use**: Multiple, flexible methods to access neural processing engine where the user has full customization of application and post-processing.

◈ **Key Applications:**

	⇨Prediction of machine failure	⇨ Presence detection using PIR
⇨Asset Protection	⇨Senior citizen safety	⇨ Tamper resistance using multiple sensors
⇨Event detection	⇨Audio keyword detection	⇨ Image based object detection
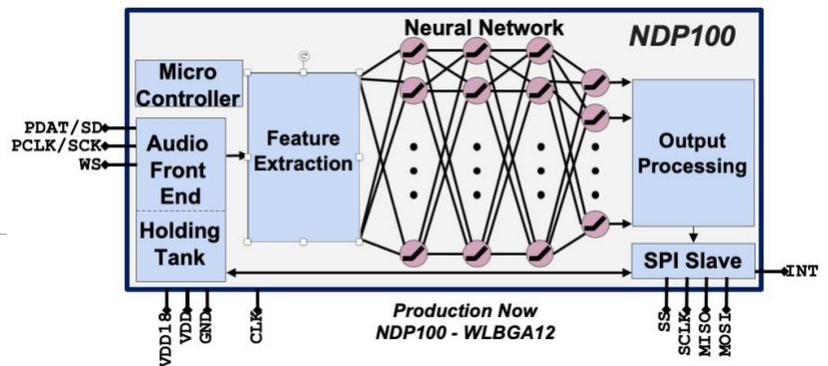
Comparing Key Measurements

Processor	NN Topology	OPS	Params	G10 Accuracy	Energy/ Frame	Inf. Time	Frames/ sec
*NDP10x	SYN FC	1.1M	557K	94%	3.4uJ	10 ms	100
Ambiq Apollo 3 Blue	TinyConv	756k	18k	66%	91uJ	268 ms	3.7
STM32L476	Small FC	159 k	80k	85%	139uJ	41.5 ms	24
STM32F476	Small FC	159 k	80k	85%	414uJ	11.8 ms	85