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akida

IP Platform Brief

BrainChip's Akida™ is the First, Silicon-Proven, Fully-Digital, Neuromorphic Processor IP
Akida is a neural processor platform inspired by the cognitive ability and efficiency of the human brain. Akida processes data with unparalleled energy efficiency and compelling performance close to the sensor. The second-generation platform can independently operate complex inferencing and learning on extremely low-power AI devices, thus delivering highly accurate, intelligent, responsive, real-time applications with greater reliability and security—all while untethered from the cloud.

From Perception to Cognition: Solutions for Today—Future-Proofed for Tomorrow

Akida's advanced acceleration performance, efficiency, and reduced model footprint goes well beyond classification. It has unprecedented support for complex algorithms and models, including high-resolution video object detection, semantic segmentation, and advanced time-series data applications and sequence prediction in low-power Edge devices. This NPU platform supports convolutional, deep learning and vision transformer networks in hardware. There's also native support for spiking neural nets (SNN) for even greater efficiency and performance as the native neuromorphic ecosystem grows.

Adds support for **8 bit** weights and activations and new algorithms to deliver accuracy with a smaller model footprint.

Elevate Your Edge AI Experience

Compelling Performance | **Very Accurate** | **Mostly Autonomous** | **Extremely Efficient** | **Easily Deployed**

Tech Foundations

Accelerates today's networks: CNNs, DNNs, RNNs, Vision Transformers (ViT), and more, directly in hardware with minimal CPU intervention

On-chip learning: Unique ability to learn and extend classes on the device; secure and untethered from the cloud

Event-based processing: Computes only when necessary; substantially reduces number of operations executed and energy consumed

At-memory compute: Significantly reduces memory movement; uses cost-effective, scalable, standard RAMs

Independent neural processor operation: Intelligent DMA minimizes or eliminates need for CPU in AI acceleration; minimizes system load

Exceptional spatio-temporal capability: Patent-pending Temporal Event-based Neural Nets (TENNs) revolutionize time-series data applications

Efficient Vision Transformer acceleration: Vision Transformer encoder acceleration to provide radically better vision solutions

Event-based communication: Sends data between NPUs through integrated mesh without any CPU intervention; offloads system

Improved security and privacy: Compute done on device, protects sensitive data; learning saved only as weights

Intelligent runtime: Runtime manages all operation of neural processor, transparent to the user, accessible through a simple API

Markets

Industrial
Predictive Maintenance
Manufacturing Management

Automotive
In-Cabin Experience
Real-Time Sensing

Health & Wellness
Vital signs Prediction
Sensory Augmentation

Home & Consumer
Security & Surveillance
Intelligent Home Automation

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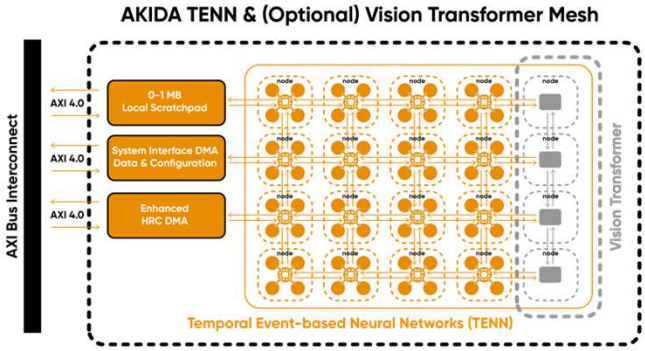
Platform

Self-contained neural processor

- Manages all memory and model operations with enhanced DMA
- Interfaces to the rest of the system through AXI bus

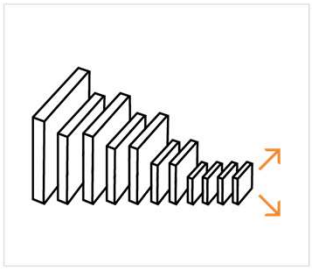
Efficient algorithmic hybrid mesh

- Integrates ENNs, TENNs and (optional) Vision Transformers
- Configurable local scratchpad reduces system bus load



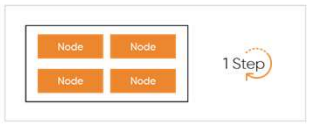
Differentiated Capabilities

Multi-Pass Processing Delivers Scalability, Future-Proofing



Multi-pass Sequential Compute

Parallel Compute in One-step



Extremely scalable

- Runs larger networks on given set of nodes
- Reduces Silicon footprint and Power in SoC

Transparent to application developer and users

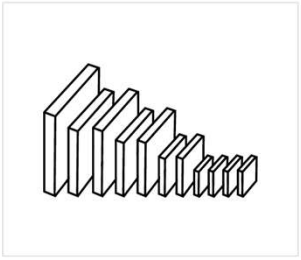
- Handled by runtime software
- Segments and processes network sequentially

Minimizes incremental latency

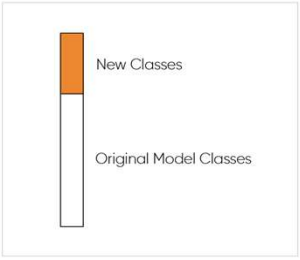
- Handles multiple layers concurrently
- Minimizes CPU intervention

Continuous, On-Chip Learning Delivers Efficiency

Original model's features



On-chip learning through new final layer



Efficient in use of existing training

- Leverages features extracted during training
- Adds classes to last fully connected layer

Customization and learning is untethered from the cloud

- Models can adapt to changes in field
- AI Application can implement incremental learning

Secure and Private

- Input data is not saved; only stored as weights

Akida efficiently accelerates…

- Image and audio classification
- Object detection
- Scene segmentation
- Gesture and face recognition
- State-of-the-art algorithms in sequence prediction
  - Video object detection
  - Human action recognition
  - Raw-audio classification
  - Vital signs prediction

Notable features:

- Supports **8-**,4-,2-, and1-bit weights and activations
- Supports multiple layers simultaneously
- Supports long-range skip connections in hardware

Software development and deployment:

- **Akida** leverages standard frameworks and development platforms such as TensorFlow/Keras, and Edge Impulse
- **Akida** is model-, network-, and OS-agnostic
- **BrainChip MetaTF ™** supports model development and optimization for Akida hardware
- **Akida models zoo** offers a set of pre-built Akida-compatible models, pre-trained weights and training scripts

metaTF