

brainchipTM Akida LiDAR Point Cloud Model Brochure

Efficient Real-Time **LiDAR Point Cloud Classification** at the Edge



BrainChip PointNet Model

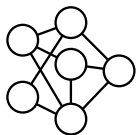
The **Akida PointNet++ model** is BrainChip's advanced solution for **real-time classification of LiDAR point clouds at the edge**. Building upon the original PointNet++ architecture, Akida PointNet++ model captures both local geometric details and global context.

Key Advantages Include

- ✳ Improved accuracy across complex, unstructured 3D data.
- ✳ Better handling of sparse and large-scale point clouds.
- ✳ Consistent efficiency, making it deployable on resource-constrained edge devices.

How It Works

PointNet++ Classification Workflow



1.

Input Point Cloud

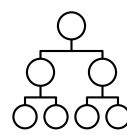
The process begins with raw 3D data from a source such as LiDAR or 3D CAD models. (Our model was trained on the ModelNet40 dataset, but it can be applied to diverse point cloud datasets.)



2.

Preprocessing Point Cloud Data

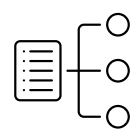
On the host processor, representative points and groups are selected by region, keeping critical details while reducing unnecessary data.



3.

Hierarchical PointNet++ Backbone

Learns from both fine-grained local structures and the overall shape, building a deeper understanding of complex 3D data.



4.

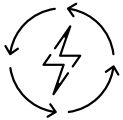
Classification

Instantly assigns the object to the correct category — enabling fast, accurate recognition at the edge.

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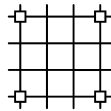
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Performance at a Glance



Low Power

Operates on milliwatts (~50 mW)—ideal for battery and always-on scenarios.



Compact Design

Fits within ~1 MB total memory and 114 KB on-chip SRAM per NP, perfect for constrained edge devices.



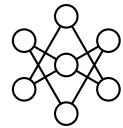
Real-Time

Processes point clouds at 183 FPS, enabling instant responses for streaming and automation.



Efficient Sparsity

Analyzes only key LiDAR points, minimizing computation and boosting precision.



Always-On

Efficient enough for continuous edge deployment in smart environments.

Model	PointNet++ Model
Dataset	ModelNet40 3D Point Cloud
Model Context	PointNet++ Model on Akida 2 for Point Cloud Classification
Main Goal	Low-power, real-time edge inference
Results	80.88% * 8-bit 81.56% 4-bit
# of Parameters	605K
FPS *	183.7 FPS
Power **	50.83 mW
Energy Per Inference **	276.7 μ J
Total Memory	1072 KB
On-Chip SRAM per NP	114 KB
Akida Configuration	8 NPs, 2 Nodes

* **Notes on Accuracy:** PTQ accuracy boosted with 5 epochs QAT.

* **Note on FPS:** Reported FPS reflects the Akida chip's core running at 400MHz, under continuous data supply, with host processor overhead being minimal on sufficiently powerful systems. Actual system FPS in real-world applications may vary depending on data buffering and host processing overhead.

** **Silicon Reference:** Area and power estimations are based on a GF 22nm baseline.

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Applications



Autonomous Vehicles & Drones

Obstacle detection, precision navigation, and environmental mapping.



Robotics & Warehousing

Pick-and-place, navigation, and inventory intelligence.



Smart Cities & Infrastructure

Traffic analysis, infrastructure inspection, and urban planning.



Industrial Automation

Real-time asset tracking, process control, and safety monitoring.

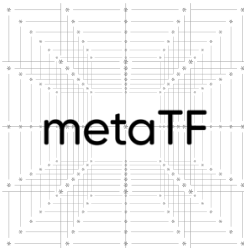


Security & Surveillance

Advanced 3D scene understanding for anomaly and intrusion detection.

How To Get Started

To begin using the **LiDAR Point Cloud model** on the Akida platform, you'll need the following tools and packages:



MetaTF Software Development Tool

Converts your model into a format compatible with Akida for deployment.



Akida Cloud

A cloud-based platform for testing, validating, and benchmarking your model.



Akida Enablement Package

Grants access to the hardware environment needed for running and evaluating your model on Akida.

Ready to Integrate PointNet++ for Lidar Point Cloud Classification?

Register for the [BrainChip Developer Hub](#) to learn more.