

Task – 09

Batch – 04

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## Solutions available for FPGA Development Using AI

The intersection of FPGA development and AI has seen significant advancements, offering robust solutions for various applications, particularly in fields requiring high-speed processing and real-time data analysis. Here are some solutions available for FPGA development using AI:

**1. Xilinx Vitis AI:** Xilinx Vitis AI is a comprehensive AI development platform optimized for Xilinx hardware, including FPGAs and adaptive compute acceleration platforms (ACAPs). It enables developers to deploy machine learning models on Xilinx devices efficiently.

### Key Features:

- Provides a library of optimized and pre-trained AI models.
- Includes a deep learning processor unit (DPU) that accelerates inference.
- Compatible with TensorFlow, PyTorch, and Caffe.
- Supports deployment on both edge devices and cloud environments.

**2. Intel OpenVINO Toolkit:** The OpenVINO (Open Visual Inference and Neural Network Optimization) Toolkit is an Intel offering that enables developers to optimize and deploy AI inference across Intel hardware, including Intel FPGAs.

### Key Features:

- Converts and optimizes models from popular frameworks like TensorFlow, PyTorch, and ONNX.
- Provides a unified API for running inference on various Intel hardware.
- Offers a model zoo with a wide range of pre-trained models.
- Designed for edge AI applications, providing tools for low-latency inference.

## 3. Deep Learning Frameworks for FPGA (DNNWEAVER and FINN)

**DNNWEAVER:** DNNWEAVER is a framework developed by Microsoft Research that simplifies the mapping of deep neural networks (DNNs) to FPGAs.

#### Key Features:

- Automates the process from high-level model description to FPGA implementation.
- Focuses on resource utilization and performance optimization.
- Supports various DNN architectures.

**4. FINN:** FINN is a framework from Xilinx Research Labs that focuses on quantized neural network (QNN) inference on FPGAs.

#### Key Features:

- Allows customization of network architectures and quantization levels.
- Optimized for high-throughput, low-latency inference.
- Integrates with the Xilinx Vitis AI toolchain.

**5. Efinix Trion FPGA with Quantum Acceleration:** Efinix Trion FPGAs incorporate Quantum technology, providing an efficient platform for AI acceleration.

#### Key Features:

- Enhances the performance of AI and machine learning algorithms.
- Optimized for power and resource efficiency.
- Supports a wide range of AI applications, from edge to cloud.

### **6. Custom AI Solutions from Vendors (e.g., Gyrfalcon, BrainChip)**

**Gyrfalcon Technology:** Gyrfalcon Technology offers AI accelerators designed to work with FPGAs, providing efficient inference capabilities for edge AI applications.

#### Key Features:

- Optimized for low-power, high-performance AI inference at the edge.
- Scalable solutions suitable for various applications.

**7. BrainChip Akida:** BrainChip's Akida platform provides a neuromorphic processor that can be integrated with FPGAs to deliver efficient AI inference.

#### Key Features:

- Mimics brain processing for efficient AI computation.
- Designed for ultra-low-power AI applications.
- Suitable for real-time inference tasks.

### **References:**

1. <https://www.electronicdesign.com/technologies/embedded/article/21168273/electronic-design-using-ai-to-design-fpga-based-solutions>
2. <https://vlsifirst.com/blog/using-artificial-intelligence-and-machine-learning-in-fpga-design>