



Kairali AI Chip

For Prelims: **Artificial Intelligence (AI)**, Kairali AI Chip, **Machine Learning**, **Unmanned Aerial Vehicles (UAVs)**, **Active Neural Network (ANN)**, Edge AI

For Mains: Kairali AI Chip, Achievements of Indians in science & technology.

Source: TH

Why in News?

Recently, the Digital University Kerala has introduced State's maiden silicon-proven **Artificial Intelligence (AI) chip—Kairali AI Chip**, that offers **Speed, Power Efficiency and Scalability** for various applications.

What is a Kairali AI Chip?

▪ About:

- This chip leverages edge intelligence (or edge AI) to deliver **high performance and low power consumption** for a wide range of applications.
 - Edge artificial intelligence (AI), or AI at the edge, is the implementation of AI in an edge computing environment, which allows computations to be done close to where data is actually collected, **rather than at a centralized cloud computing facility** or an offsite data center.
 - It entails deploying **Machine Learning algorithms** on the edge device where the data is generated, rather than relying on cloud computing.
 - Edge intelligence can provide **faster and more efficient data processing** while also protecting the privacy and security of both data and users.

▪ Potential Applications:

- **Agriculture:** The chip can **enable precision farming techniques** by providing real-time monitoring of crop health, soil conditions and environmental factors. This can help in **optimizing the use of resources and enhancing** the crop yields.
- **Mobile Phone:** The chip can **improve the efficiency and performance** of smartphones by enabling advanced features such as real-time language translation, enhanced image processing and AI-powered personal assistants.
- **Aerospace:** The chip can augment the capabilities of **Unmanned Aerial Vehicles (UAVs)** and satellites by providing advanced processing power for navigation, data collection and real-time decision-making, all with minimal power consumption. The chip can also enhance the navigation and autonomous decision-making capabilities of drones, which are useful for applications such as delivery services and environmental monitoring.
- **Automobile:** The chip can be a game-changer for autonomous vehicles by providing the necessary computing power for real-time processing of sensory information, which is essential for safe and efficient autonomous driving.
- **Security and surveillance:** The chip can enable faster and efficient facial recognition algorithms, threat detection and real-time analytics by using its edge computing capability.

What are AI chips?

▪ About:

- AI chips are built with specific architecture and have integrated AI acceleration to support deep learning-based applications.
 - Deep learning, more commonly known as **Active Neural Network (ANN)** or Deep Neural Network (DNN), is a subset of **Machine Learning** and comes under the broader umbrella of AI.

▪ Functions:

- It combines a series of computer commands or algorithms that stimulate activity and brain structure.
- DNNs go through a training phase, learning new capabilities from existing data.
 - **DNNs can then inference**, by applying these capabilities learned during deep learning training to make predictions against previously unseen data.
 - Deep learning can make the process of collecting, analysing, and interpreting enormous amounts of data faster and easier.
- Chips like these, **with their hardware architectures, complementary packaging, memory, storage, and interconnect solutions**, make it possible for AI to be integrated into applications across a wide spectrum to turn data into information and then into knowledge.

▪ Types of AI Chips Designed for Diverse AI Applications:

- Application-Specific Integrated Circuits (ASICs), Field-Programmable Gate Arrays (FPGAs), Central Processing Units (CPUs) and GPUs.

▪ Applications:

- AI applications include Natural Language Processing (NLP), computer vision, robotics, and network security across a wide variety of sectors, including automotive, IT, healthcare, and retail.

What are the Benefits of AI Chips?

▪ Faster Computation:

- Artificial intelligence applications typically require parallel computational capabilities in order to run sophisticated training models and algorithms.
- AI hardware provides more parallel processing capability that is estimated to have up to 10 times more computing power in ANN applications compared to traditional semiconductor devices at similar price points.

▪ High Bandwidth Memory:

- Specialized AI hardware is estimated to allocate 4-5 times more bandwidth than traditional chips.
- This is necessary because due to the need for parallel processing, AI applications require significantly more bandwidth between processors for efficient performance.

What are the Differences between Cloud AI and Edge AI, and Traditional Chips and AI Chips?

Cloud AI vs Edge AI

Aspect	Cloud AI	Edge AI
Location of Processing	Remote servers in data centers	Locally on devices
Latency	May have higher latency	Typically lower latency
Bandwidth	Requires substantial bandwidth	Can operate with lower bandwidth
Privacy and Security	Raises concerns about data privacy and security	Enhanced privacy and security as data remains on the device
Use Cases	Suited for high computational requirements, large datasets, and less stringent real-time processing needs	Ideal for real-time or near-real-time processing, such as in IoT devices and wearables

Traditional Chips vs AI Chips

Aspect	Traditional Chips	AI Chips
Design and Architecture	General-purpose processors	Specialized processors optimized for AI workloads
Energy Efficiency	May not be as energy-efficient for AI tasks	Engineered to be more power-efficient for AI computations
Flexibility	Versatile for a broad range of applications	Specialized for AI tasks, potentially less versatile for general-purpose computing
Performance	Can handle a variety of tasks but may not achieve the same level of performance as AI chips for specific AI workloads	Specialized for higher performance in AI-specific tasks
Examples	The CPU in laptops or smartphones	GPUs powering AI-powered self-driving cars

UPSC Civil Services Examination, Previous Year Questions

Q. With the present state of development, Artificial Intelligence can effectively do which of the following? (2020)

1. Bring down electricity consumption in industrial units
2. Create meaningful short stories and songs
3. Disease diagnosis
4. Text-to-Speech Conversion
5. Wireless transmission of electrical energy

Select the correct answer using the code given below:

- (a) 1, 2, 3 and 5 only
(b) 1, 3 and 4 only
(c) 2, 4 and 5 only
(d) 1, 2, 3, 4 and 5

Ans: (b)

Exp:

- Google is using the Internet of Things (IoT) and Artificial Intelligence (AI) from its DeepMind acquisition to reduce energy consumption in its data centres by as much as 30%. Hence, 1 is correct.
- Using AI as a tool to make music or aid musicians has been in practice for quite some time. In the 1990s, David Bowie helped develop the Verbasizer, which took literary source material and randomly reordered the words to create new combinations that could be used as lyrics. However, as AI works in programmed ecosystem and does not have emotions so it would be hard for an AI to create meaningful short stories and songs. Hence, 2 is not correct.
- AI combined with robotics and the Internet of Medical Things (IoMT) could potentially be the new nervous system for healthcare, presenting solutions to address healthcare problems. Integration of AI technology in cancer care could improve the accuracy and speed of diagnosis, aid clinical decision-making, and lead to better health outcomes. Hence, 3 is correct.

- Speech synthesis is the artificial production of human speech. It is a way to convert language to human voice (or speech). For example, Google's Assistant, Amazon's Echo, Apple's Siri, etc. Hence, 4 is correct.
- Potential cases of AI's use in the energy sector include energy system modelling and forecasting to decrease unpredictability and increase efficiency in power balancing and usage. However, it cannot be used for transmission of electrical energy. Hence, 5 is not correct. Therefore, option (b) is the correct answer.

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