ESTD - 1928

Presentation On

Artificial Intelligence In The Semiconductor Industry

Presented by

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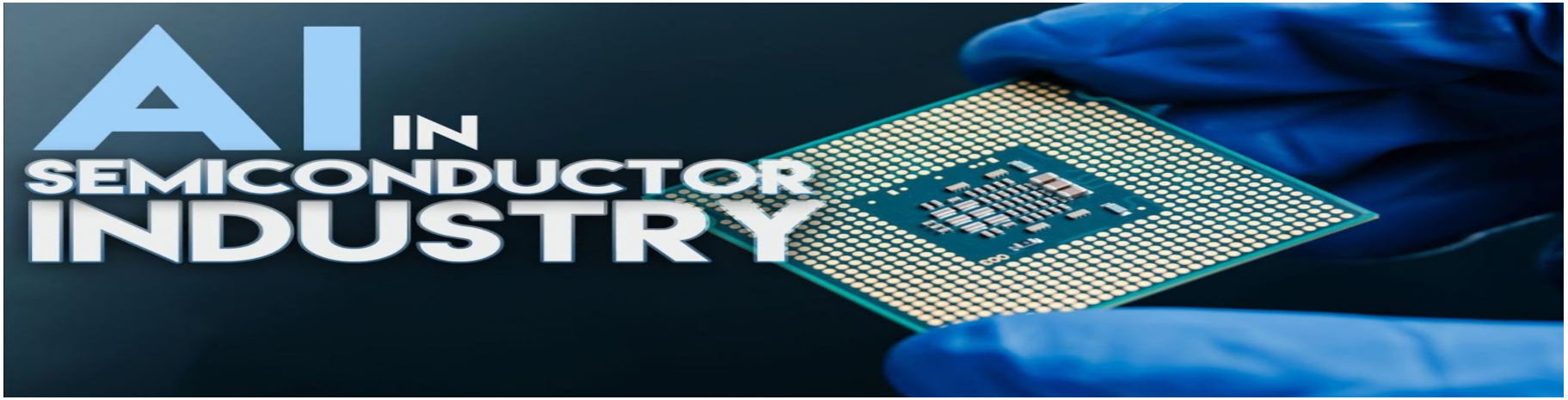
Topic-AI in Semiconductor Industry

Presentation Outline

1. Introduction
2. Artificial Intelligence Vs Human Intelligence
3. Different types of AI chips
4. Literature survey
5. AI in Semiconductor industry application
6. Future Scope

1.Introduction



This demand is changing the semiconductor supply chain by directly impacting design & manufacturing decisions.

Demand for Specialized Sensors, IC's, Improved Memory & Enhanced Processors is increasing.

Artificial Intelligence VS Human Brain

1.AI Chips —> Brain of human being

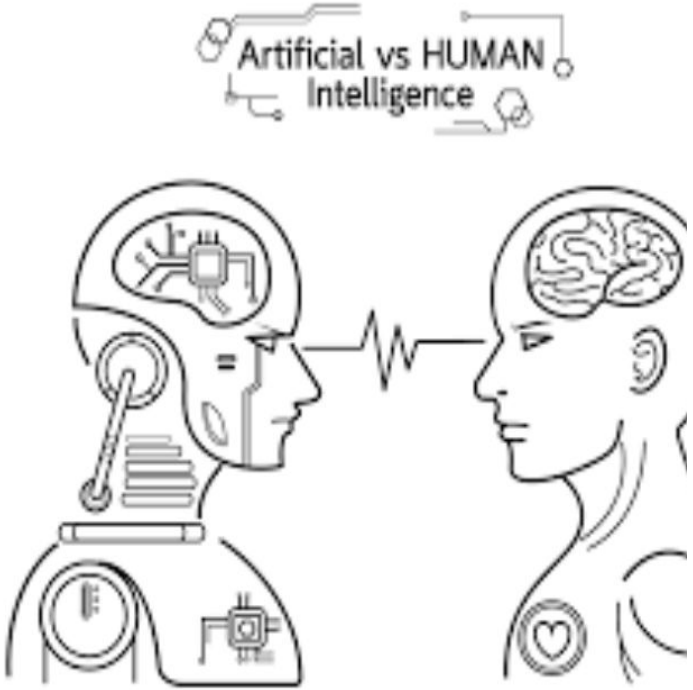
2.AI Chips is the hardware on which the AI Software and applications Run.

3AI Cips like CPU, GPU, FPGA & ASIC are developed by companies like Intel, AMD, NVIDIA etc

4.CPU: Intel, AMD

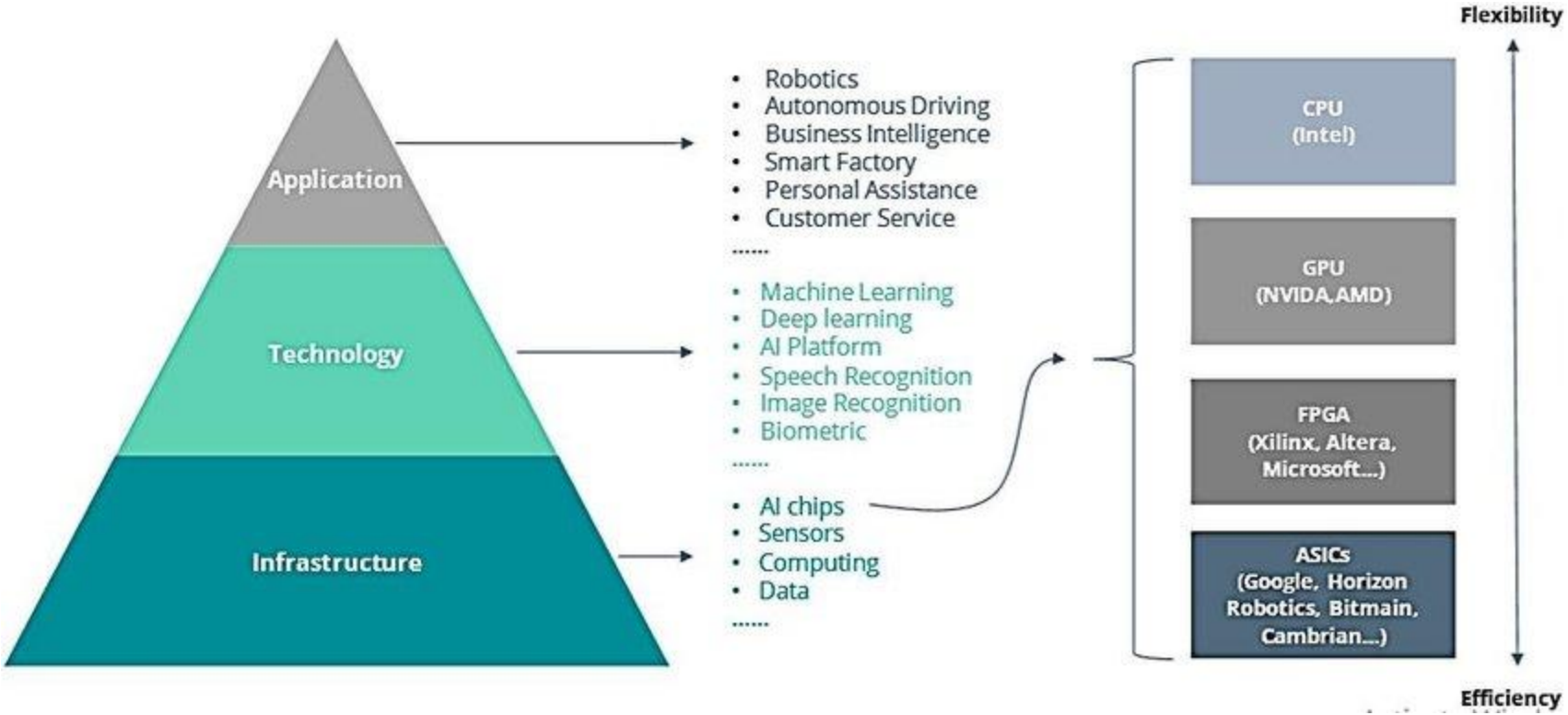
5.GPU: NVIDIA, Intel, AMD

6.FPGA: Xilinx, Intel (formerly Altera)



Artificial Intelligence VS Human Brain

Framework of Artificial Intelligence



Layers of Artificial Intelligence

A. The Infrastructure Layer

This layer consists of the AI Chips and sensors required to support the technology layer's decision-making, reasoning, and learning abilities.

B. The Technology Layer

This layer employs various technologies such as deep learning, machine learning and speech and image recognition and hence is responsible for driving this layer and is fundamental in AI algorithms processing.

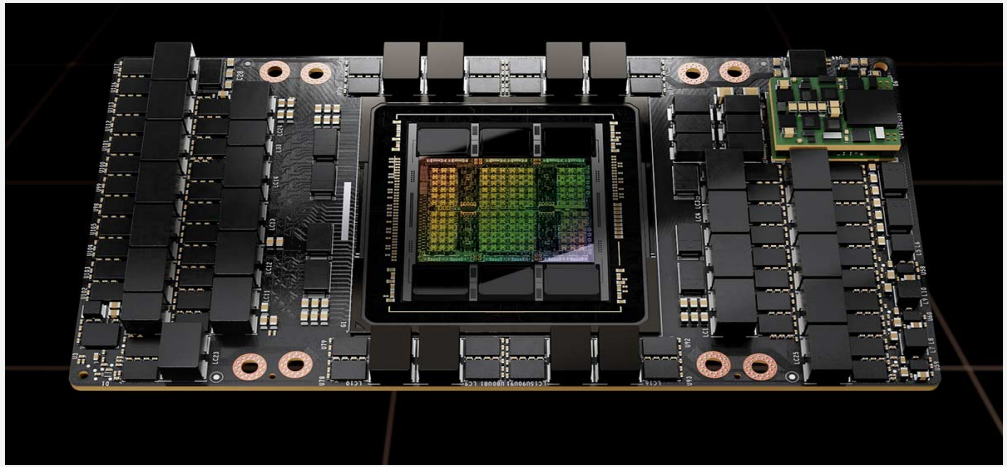
C. The Application Layer

This layer offers different domains where AI Chips can be utilized such as business intelligence, automotive industry, customer services, and individual assistance

Different types of AI Chips

1.Graphics Processing Unit

A GPU AI chip, also known as a **Graphics Processing Unit** Artificial Intelligence chip, is a specialized hardware component designed to **accelerate** artificial intelligence (AI) and machine learning (ML) workloads.



Characteristics & Advantages

1. Deep Learning
2. AI Accelerations
3. Specialized AI Hardware

Different types of AI Chips

2.Field Programmable Gate Array

An FPGA : **Field-Programmable Gate Array** consist of an **array** of **logic gates** and **programmable interconnects** that allow for the **creation** of custom digital circuits and systems.

Characteristics & advantages

1.Fixed in functionality

2.Programmability:Verilog,VHDL

Applications of FPGA

Different types of AI Chips

3.ASIC

ASIC:**Application Specific Integrated Circuits** execute a specific AI algorithm or function with high efficiency and performance

Applications

1.Consumer electronics: Smartphones, Cameras

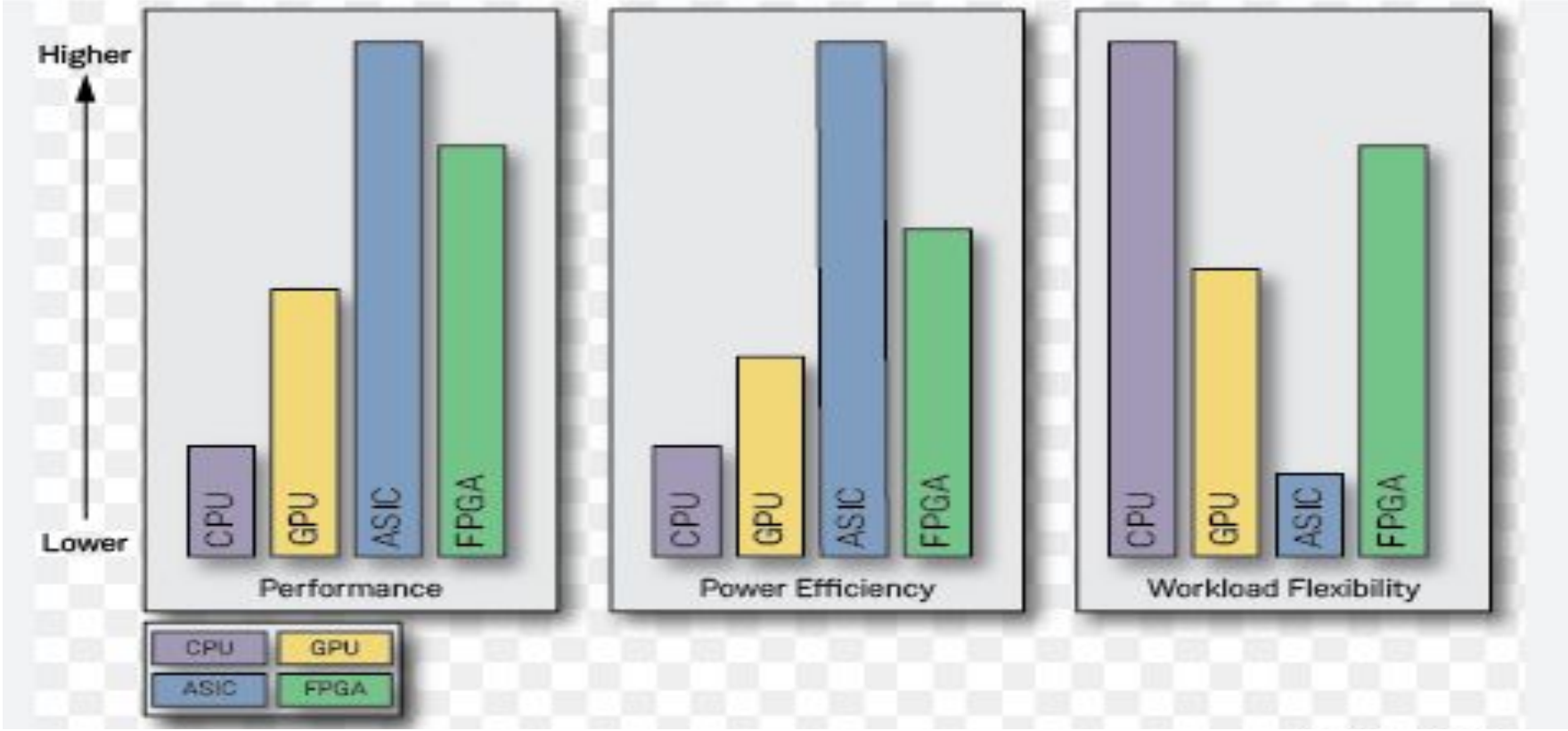
2.Telecommunications: Modems

3.Cryptography:security

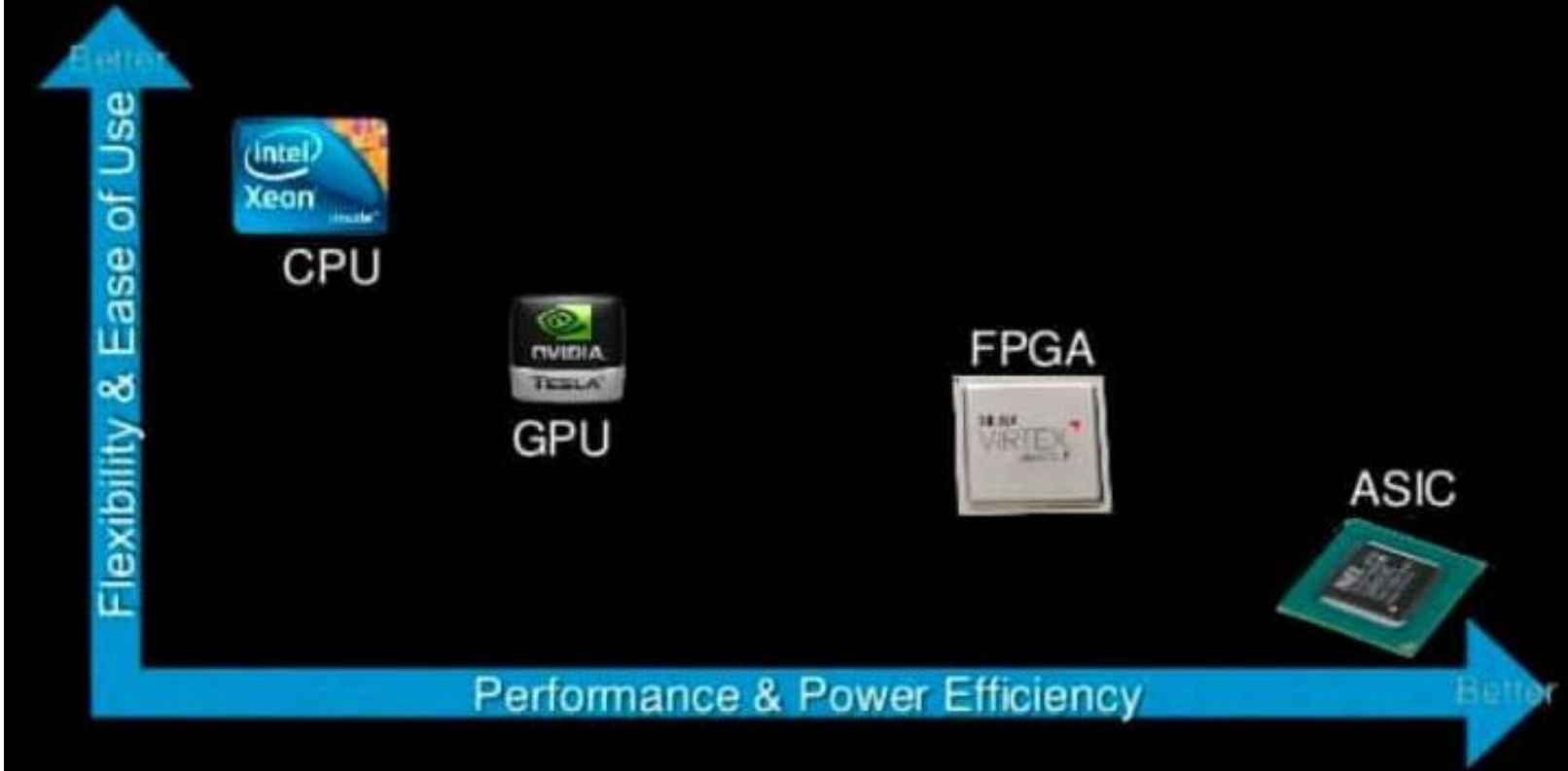
4.Industrial Automations:automate maufacturing

Core Type	Custom ASIC	Typical Power Consumption	Description	Strengths	Constraints
CPU		High	Flexible, general purpose processing units	• Complex instructions and tasks • System management	• Possible memory access bottlenecks • Few cores (4-16)
GPU		High	Parallel cores for high quality graphics rendering	• High performance AI processing • Highly parallel core with 100's or 1,000's of cores	• High power consumption • Large footprint
FPGA		Medium	Configurable logic gates	• Flexible • In-field reprogrammability	• High power consumption • Programming complexity
ASIC		Low	Custom logic designed with libraries	• Fast and low power consumption • Small footprint	• Fixed function • Expensive custom design

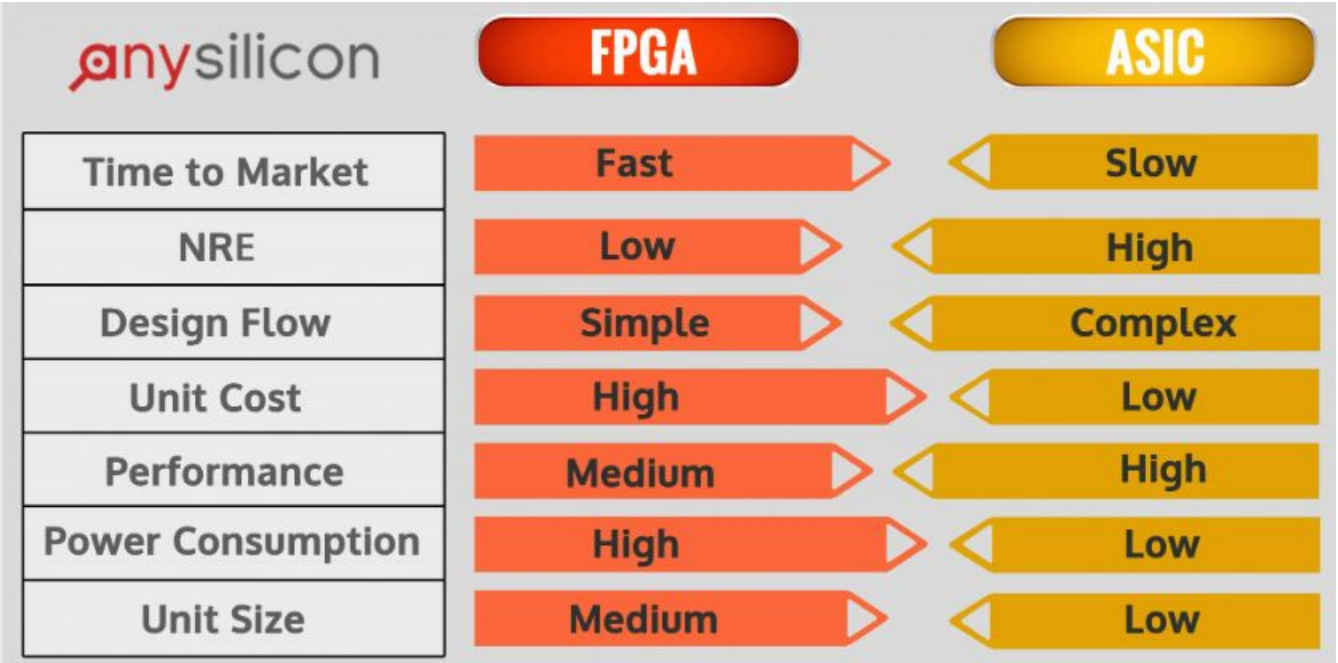
Literature Survey



New Type of Cloud Accelerator - FPGAs



FPGA Vs ASIC (CPU & GPU)



NRE: Development Cost

When a new product has to be launched Companies use FPGA. But once product is stable they develop an ASIC, Because ASIC per unit cost is low.

Comparison between AI Chips

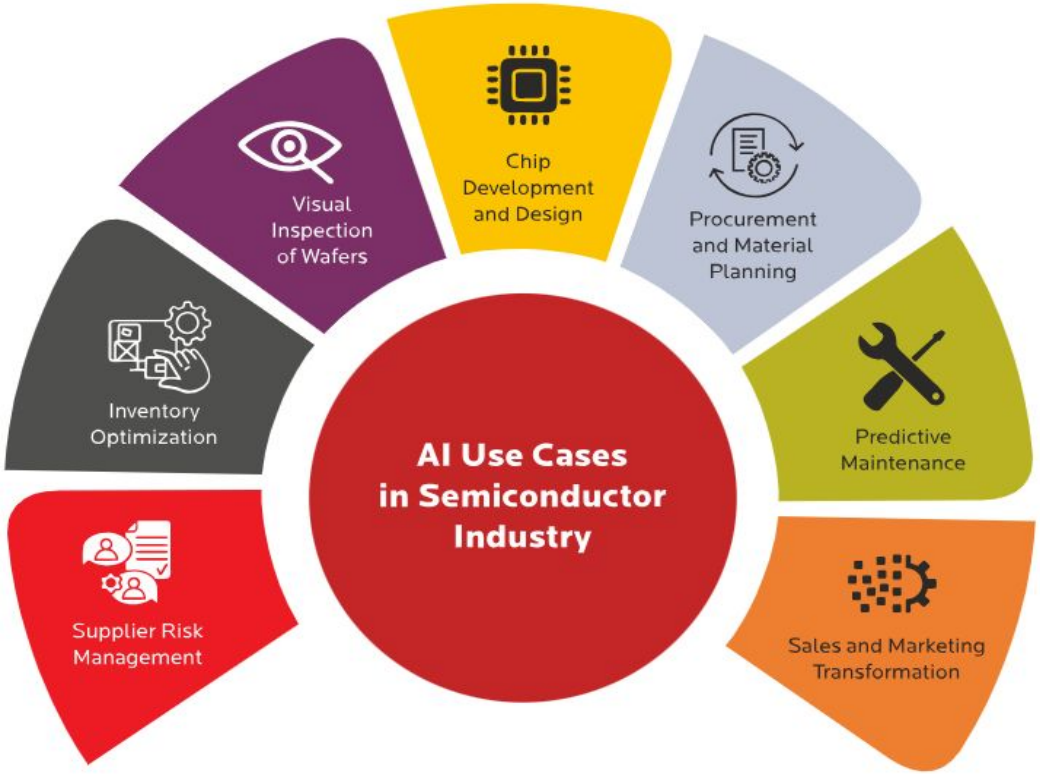
	Graphic Processing Units	Field Programmable Gate Arrays	Application Specific Integrated Circuits
Power consumption	High	Medium	Low
Latency	More	Less	Less
Flexibility	Medium	High	Low
Efficiency	Low	Medium	High

AI chips in use

The table given below provides information of the various AI chips in use and their details:

Type	AI Chip	Use
GPU	Radeon Instinct	Deep Learning Artificial Neural Network High Performance Computing GPGPU
	Tesla V100	High Performance Computing Data Science Graphics
FPGA	Agilex	Data Center 5G Network Smart NICs
	Virtex	10G to 100G Networking Portable Radar
ASIC	FSD Computer	Tesla Self Driving Cars
	TPU v3	Custom developed for Google's Machine Learning

AI in Semiconductor Industrial application



AI Applications in Semiconductor Industry

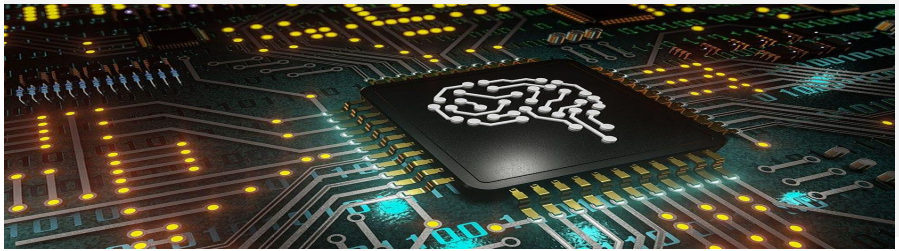
1.CHIP DEVELOPMENT & DESIGN

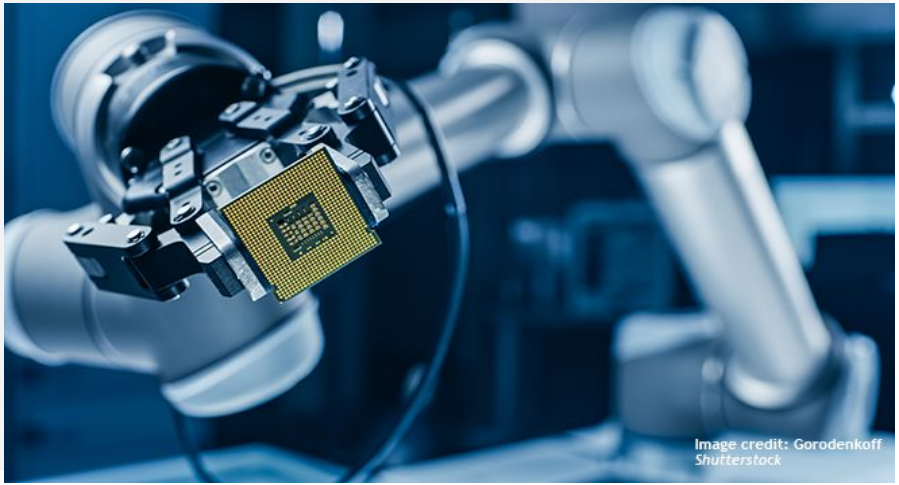
1. **ML** algorithms will predict **failure** of designs.
2. **Faster** process.
3. Improved **design quality**
4. 30% Production **cost** is **reduced**

2.VIRTUAL INSPECTION OF WAFERS

Thin **Silicon Wafers** Inspected.

AI will accurately **detect** the defects





AI Applications

3.EDGE COMPUTING & IoT:

AI-enabled edge devices and **IoT (Internet of Things)** devices often require specialized processors. The semiconductor industry plays a crucial role in **developing** and **manufacturing** these specialized chips that power AI at the edge.

4.REQUIREMENT PLANNING

1.AI is expert in **Planning & Predictions**

2.With previous data , like market rates of raw materials

How product will **perform** in market

AI Applications

5.LOGISTICS AND SHIPMENT

1.**Shipped** to destination on time

2.**When** to ship? (for lower cost)

3.Track **location** of product

6.SUPPLY CHAIN OPTIMIZATION

AI algorithms can optimize the semiconductor supply chain by predicting demand, managing inventory, and improving logistics. This ensures that the right components are available at the right time and reduces excess inventory costs.

AI-THE FUTURE

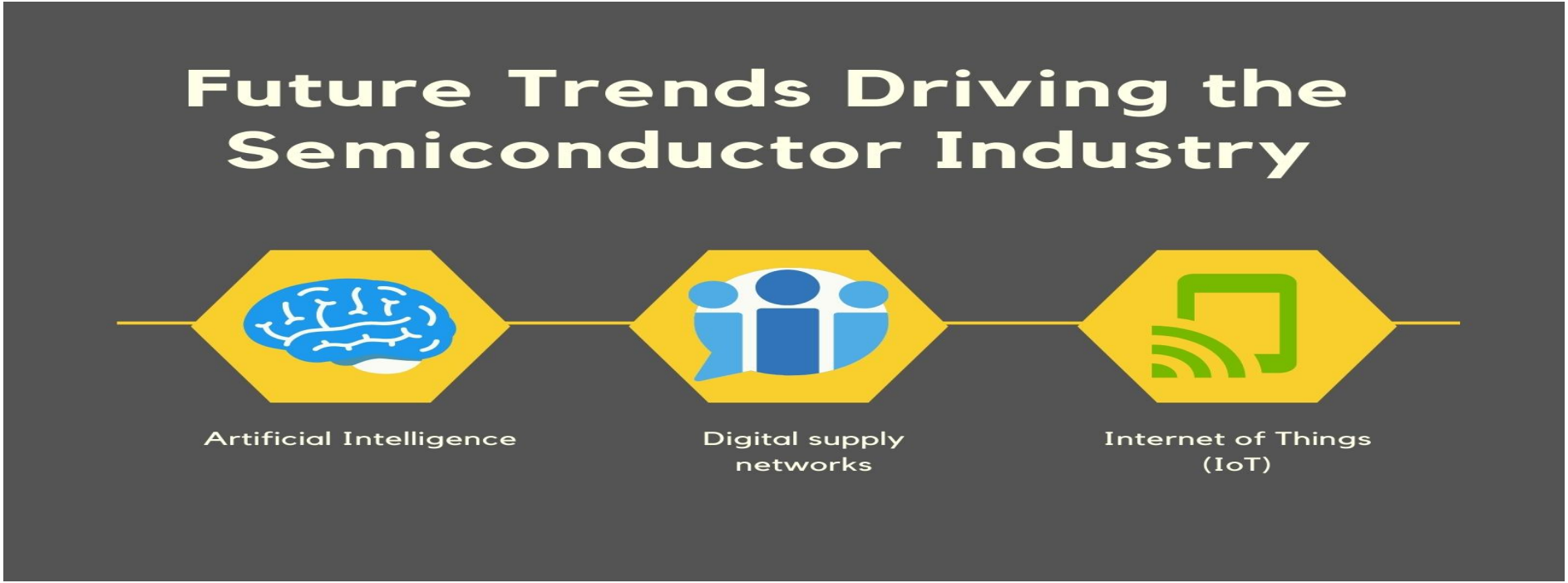
AI is revolutionizing the Semiconductor industry by enhancing

1.Efficiency 2.Quality 3.Innovation

in both Manufacturing and Design processes.

Continuously Evolving field.

AI-THE FUTURE



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2] Marco Chiappetta on “Chips designed by AI are the future of future of semiconductor evolution beyond Moore’s Law” March 2021

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Thank you