

# Microprocessor Architectures

This presentation explores the world of microprocessor architectures, covering the core building blocks of computing, from CPUs to GPUs and NPU's. We will also delve into the key differences between x86 and ARM architectures, two dominant forces in modern computing.





# Central Processing Units (CPUs)

## 1 General-Purpose Processing

CPUs are designed to handle a wide range of tasks, from basic arithmetic operations to complex computations.

## 2 Sequential Execution

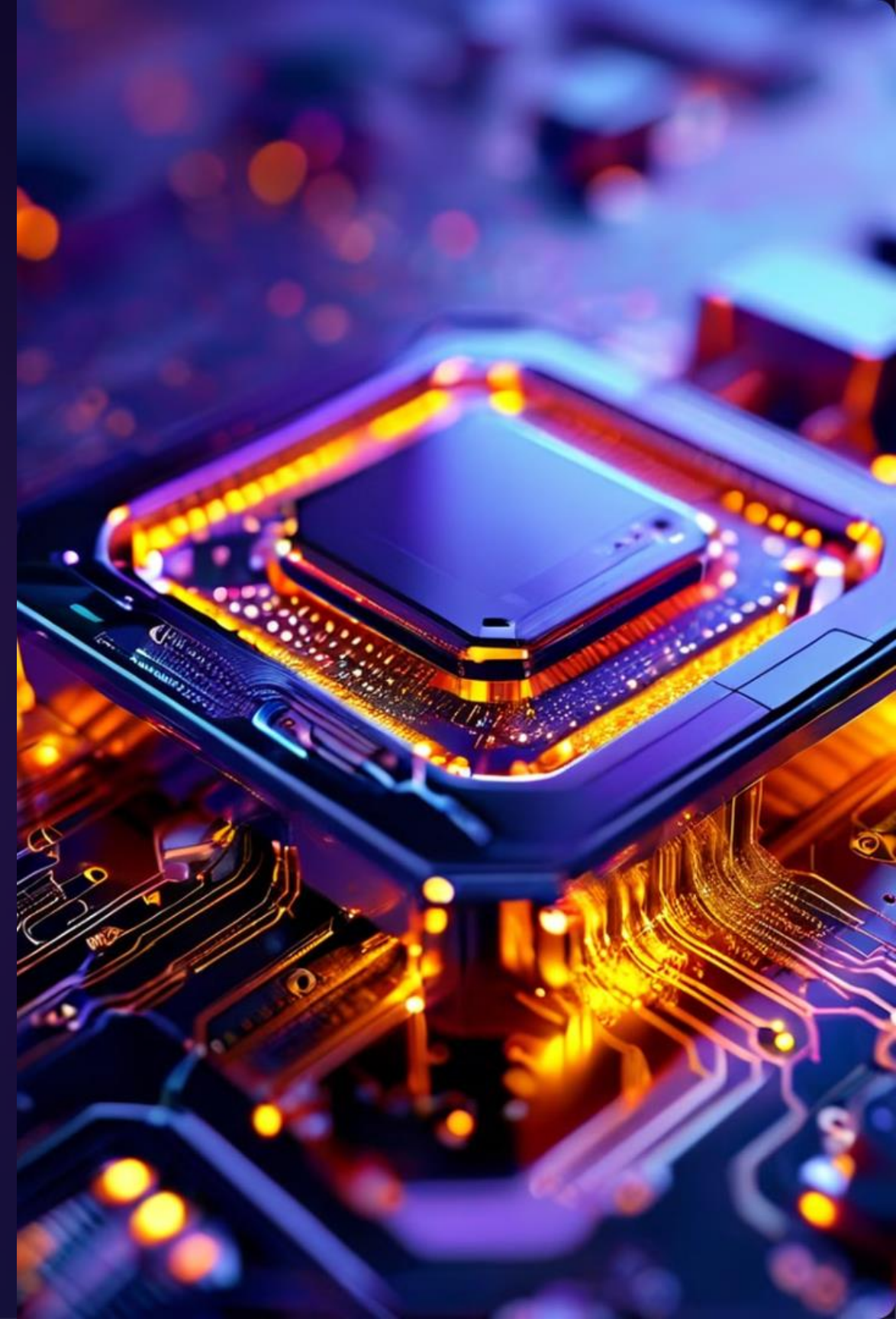
CPUs excel at executing instructions one after another, making them ideal for applications that require precise control over execution flow.

## 3 High Clock Speeds

CPUs achieve high performance by operating at high clock speeds, enabling them to process instructions quickly.

## 4 Versatile Applications

CPUs are the workhorses of modern computers, powering everything from operating systems to productivity software.



# Graphics Processing Units (GPUs)

## Parallel Processing

GPUs are designed for parallel processing, enabling them to perform many calculations simultaneously.

They are especially suited for tasks that involve processing large amounts of data, such as image rendering and video editing.

## Specialized Architecture

GPUs have a specialized architecture that prioritizes parallel processing over general-purpose computation.

They have thousands of smaller, more efficient cores, optimized for specific tasks.

## Emerging Applications

GPUs are increasingly used for tasks beyond graphics, including machine learning, scientific computing, and data analysis.

Their parallel processing capabilities make them valuable for these demanding tasks.





# Neural Processing Units (NPUs)

1

## **Specialized for AI**

NPUs are designed specifically for accelerating AI workloads.

2

## **Low-Precision Arithmetic**

NPUs utilize low-precision arithmetic, which is optimized for AI tasks and reduces power consumption.

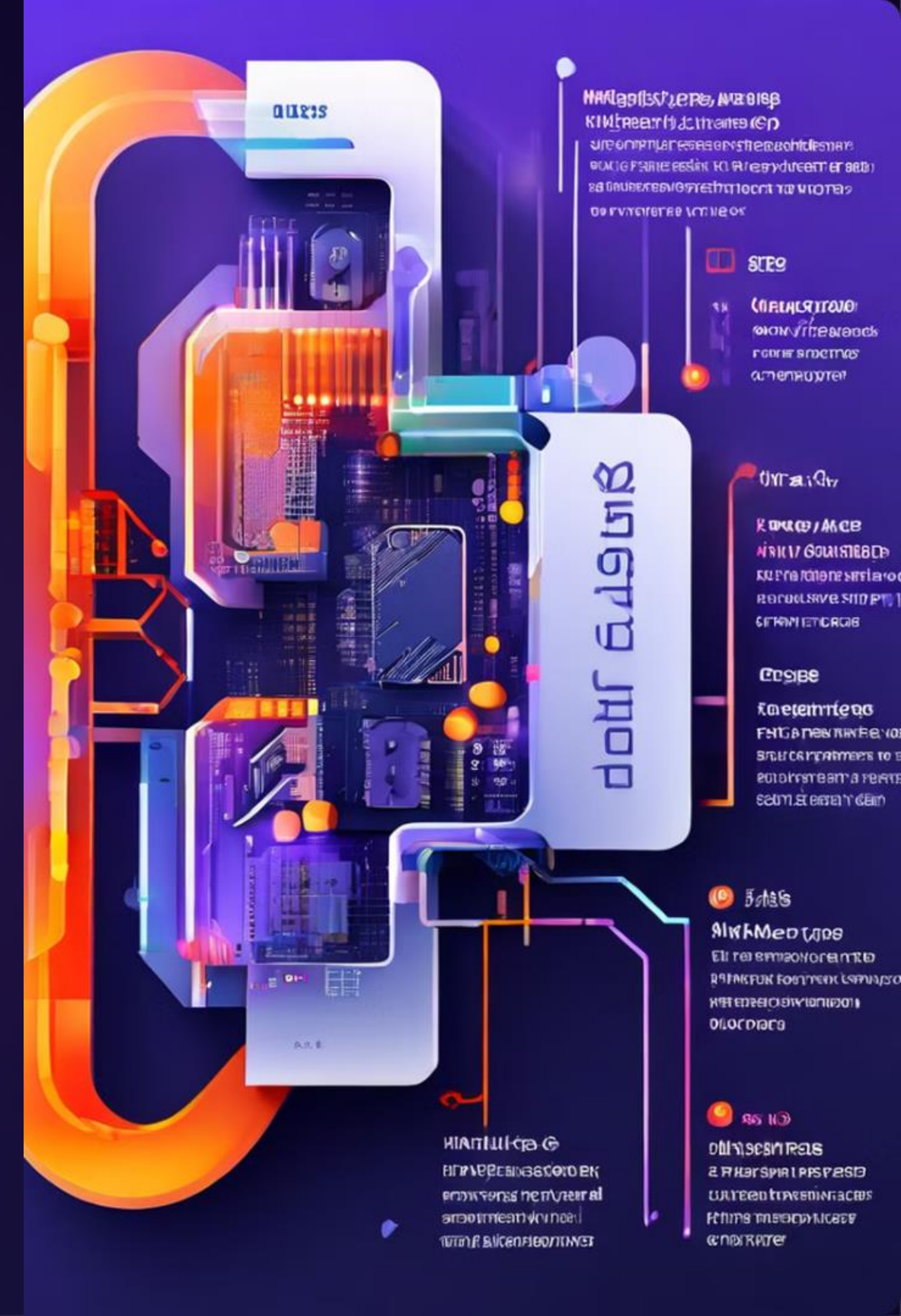
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## **Efficient for Neural Networks**

They are designed to efficiently process the complex calculations involved in training and running neural networks.

# Comparison of x86 and ARM Microprocessors

Architecture	x86	ARM
Complexity	More complex	Simpler
Performance	Higher clock speeds	More energy efficient
Applications	Desktops, servers	Mobile devices, embedded systems







# Key Differences in Instruction Set Architectures

## x86 Instructions

x86 instructions are complex, supporting a wide range of operations and addressing modes.

## ARM Instructions

ARM instructions are simpler and more streamlined, focusing on efficiency and energy savings.

## Compatibility

x86 has a long history and a vast ecosystem of software, while ARM is rapidly growing in popularity.

# Applications and Use Cases for Different Architectures



## Desktop and Server Computing

x86 CPUs are the dominant choice for desktops and servers, offering high performance and compatibility.



## Mobile Devices and Embedded Systems

ARM processors are widely used in mobile devices, embedded systems, and IoT devices, where energy efficiency is crucial.



## Gaming and Graphics

GPUs are essential for demanding applications like gaming and graphics, enabling realistic visuals and smooth performance.



## Artificial Intelligence and Machine Learning

NPU are accelerating the development of AI and machine learning, enabling faster and more efficient processing of large datasets.

