Deep Learning Chipsets 2020 Report

Part of the AI & Intelligent Automation Service Area Package

Anand Joshi, Principal Analyst
Published On July 1, 2020

CPUs, GPUs, FPGAs, ASICs, SoC Accelerators, and Other Chipsets for AI Training and Inference Applications: Global Market Analysis and Forecasts

The need for artificial intelligence (AI) acceleration is widely recognized as of 2020. AI acceleration chipsets have become a standard feature requirement for device manufacturers within the enterprise (data center) and edge markets. As a result, the volume and revenue of AI chipsets have increased drastically in the last two years. NVIDIA’s latest A100 offers petaOPS of compute performance under certain compute conditions, marking a tremendous jump from the petaOPS server DGX-1 introduced just two short years ago.

Deep learning (DL) is slowly moving past its hype cycle as proof-of-concept (PoC) AI applications developed in the past two years go into production. AI chipset customers have become more sophisticated in terms of chipset needs for AI application acceleration and are asking for specific benchmarks when talking to vendors. Customers’ needs for chipsets are coming to the forefront, forcing chipset companies to rethink the applicability of their technology. All prominent chip companies, such as Intel, NVIDIA, and Qualcomm, have invested heavily in AI. Cloud companies have started rolling out graphics processing units (GPUs), field programmable gate arrays (FPGAs), and application-specific integrated circuits (ASICs), giving developers a choice for AI acceleration. Omdia forecasts that global revenue for DL chipsets will increase from $11.4bn in 2019 to $71.2bn by 2025.
Report Coverage

KEY ISSUES ADDRESSED

- What chipset types are being used for deep learning (DL) today, and how will they change through 2025 and beyond?
- What are the power consumption and compute capacity profiles of chipsets used for DL applications?
- What is the market opportunity for DL chipsets in enterprise environments versus edge devices?
- Which market sectors and industries will drive demand for DL chipsets?
- What is the state of technology development for DL chipsets, and which companies are driving innovation?
- What are some of the emerging architectures for DL chipsets?
- What are the key performance matrices for DL chipsets?
- What are some of the use cases for DL chipsets in different application markets?
- What has changed in the DL chipset market in the last two years?
- How are startups faring in the DL chipset market?

KEY MARKET FORECASTS

- Deep learning chipset revenue, world markets: 2019–25
- Deep learning chipset year-on-year revenue growth rates, world markets: 2020–25
- Deep learning chipset revenue by chipset type, world markets: 2019–25
- Deep learning chipset revenue, inference vs. training, world markets: 2019–25
- Deep learning chipset revenue by compute capacity, world markets: 2019–25
- Deep learning chipset revenue by power consumption, world markets: 2019–25
- Deep learning chipset revenue by market sector, world markets: 2019–25

COVERAGE

- Chipset Types
  - Central processing unit (CPU)
  - Graphics processing unit (GPU)
  - Field-programmable gate array (FPGA)
  - Application-specific integrated circuit (ASIC)
  - System-on-chip (SoC) accelerator

- Chipset Market Sectors
  - Enterprise
  - Edge

- Segments
  - Training
  - Inference

- Power Consumption
  - High (>100 W)
  - Medium (5–100 W)
  - Low (<5 W)

- Compute Capacity
  - High (>50 TOPS)
  - Medium (5–50 TOPS)
  - Low (<5 TOPS)

- Regions
  - North America
  - Europe
  - Asia Pacific
  - Latin America
  - Middle East & Africa

APPLICABLE TO

- Semiconductor and component manufacturers
- OEM companies building devices using AI chipsets
- Cloud companies using AI chipsets
- Service providers and systems integrators
- End-user organizations deploying deep learning systems
- Industry associations
- Government agencies
- Investor community


Omdia is a global technology research powerhouse, established following the merger of the research division of Informa Tech (Ovum, Heavy Reading, and Tractica) and the acquired Omdia technology research portfolio.* We combine the expertise of more than 400 analysts across the entire technology spectrum, covering 150 markets. We publish over 3,000 research reports annually, reaching more than 14,000 subscribers, and cover thousands of technology, media, and telecommunications companies. Our exhaustible intelligence and deep technology expertise enable us to uncover actionable insights that help our customers connect the dots in today’s constantly evolving technology environment and empower them to improve their businesses—today and tomorrow.

*The majority of Omdia technology research products and solutions were acquired by Informa in August 2019 and are now part of Omdia.
Executive summary

Introduction

2020 report update

Key findings

Market forecasts

Market issues

Use of AI in the market

• AI acceleration within enterprises

• AI acceleration at the edge

Market segmentation

• Segmentation by architecture (chipset type)

• Segmentation based on training vs. inference

• Segmentation based on compute capacity

Segmentation based on market sector: Enterprise and edge market

Market drivers

• Popularity of AI and increasing complexity

• Multiple AI pipelines

• Complexity of training

• Growth in enterprise applications

Technology issues

Evolution of neural networks since 2012 and the need for hardware acceleration

• Computational needs per forward pass (inference)

• Compute needs for training

• A neural network zoo

• AI inference workloads

• Recommendation engine

• Image and video

• Audio and speech

• Text/natural language processing

• Search

Translating neural network needs to chipset requirements

• Processing elements and arithmetic logic units

• Memory

• On-chip connectivity

• Chip-to-chip connectivity

Chipset architectures for deep learning

• Central processing units

• Graphics processing units

• Field-programmable gate arrays

• Application-specific integrated circuits

• System-on-chip accelerators

Conclusions
# Tables

- Deep learning chipset revenue by chip type, world markets: 2019–25
- Deep learning enterprise-chipset revenue by chip type, world markets: 2019–25
- Deep learning enterprise-chipset shipments by chip type, world markets: 2019–25
- Deep learning chipset revenue by power consumption, world markets: 2019–25
- Deep learning chipset revenue, inference vs. training, world markets: 2019–25
- Deep learning edge-chipset revenue by chip type, world markets: 2019–25
- Deep learning edge-chipset shipments by chip type, world markets: 2019–25
- Deep learning edge-chipset revenue growth rates, world markets: 2020–25
- Deep learning enterprise-chipset revenue by power consumption, world markets: 2019–25
- Deep learning enterprise-chipset revenue for inference vs. training, world markets: 2019–25
- Deep learning edge-chipset ASPs by chip type, mobile, HMDS, drones, and machine vision (non-PC), world markets: 2019–25
- Deep learning edge-chipset ASPs by chip type, edge servers, world markets: 2019–25
- Deep learning edge-chipset ASPs by chip type, PCs/tablets, world markets: 2019–25
- Deep learning edge-chipset ASPs by chip type, cameras, world markets: 2019–25
- Deep learning edge-chipset ASPs by chip type, smart speakers, world markets: 2019–25
- Deep learning edge-chipset ASPs by chip type, automotive, world markets: 2019–25
- Deep learning edge-chipset ASPs by chip type, robots, world markets: 2019–25
- Deep learning enterprise-chipset revenue by compute capacity, world markets: 2019–25
- Deep learning CPU chipset revenue by compute capacity, world markets: 2019–25
- Deep learning GPU edge-chipset revenue by compute capacity, world markets: 2019–25
- Deep learning GPU edge-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning GPU enterprise-chipset revenue by compute capacity, world markets: 2019–25
- Deep learning GPU enterprise-chipset revenue by power consumption, world markets: 2019–25
- Deep learning GPU edge-chipset revenue, training vs. inference, world markets: 2019–25
- Deep learning FPGA edge-chipset revenue, training vs. inference, world markets: 2019–25
- Deep learning FPGA edge-chipset ASPs by chip type, cameras, world markets: 2019–25
- Deep learning FPGA edge-chipset ASPs by chip type, smart speakers, world markets: 2019–25
- Deep learning FPGA enterprise-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning FPGA enterprise-chipset revenue by compute capacity, world markets: 2019–25
- Deep learning FPGA enterprise-chipset revenue by power consumption, world markets: 2019–25
- Deep learning FPGA edge-chipset revenue, training vs. inference, world markets: 2019–25
- Deep learning FPGA edge-chipset revenue by compute capacity, world markets: 2019–25
- Deep learning FPGA edge-chipset revenue by power consumption, world markets: 2019–25
- Deep learning ASIC-chipset revenue by compute capacity, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, automotive, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, automotive, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, robots, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, robots, world markets: 2019–25
- Deep learning SoC accelerator-chipset revenue by compute capacity, world markets: 2019–25
- Deep learning SoC accelerator-chipset revenue by market sector, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, smart speakers, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, smart speakers, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, cameras, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, cameras, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning SoC accelerator-chipset revenue by compute capacity, world markets: 2019–25
- Deep learning SoC accelerator-chipset revenue by market sector, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25
- Deep learning ASIC-chipset ASPs by chip type, training vs. inference, world markets: 2019–25

*The majority of Omdia technology research products and solutions were acquired by Informa in August 2019 and are now part of Omdia.*
Deep learning SoC accelerator edge chipset revenue, training vs. inference, world markets: 2019–25
Deep learning CPU edge chipset revenue by power consumption, world markets: 2019–25
Deep learning SoC accelerator enterprise chipset revenue by power consumption, world markets: 2019–25
Deep learning SoC accelerator enterprise chipset revenue by compute capacity, world markets: 2019–25
Deep learning SoC accelerator edge chipset revenue by power consumption, world markets: 2019–25
Deep learning SoC accelerator edge chipset revenue by compute capacity, world markets: 2019–25
Types of devices with enterprises using AI accelerators
Edge devices shipping in high volume and chipset requirements
Key players in different deep learning chipsets
Key CPU products and vendors
Key players in GPU
Deep learning CPU enterprise chipset revenue by compute capacity, world markets: 2019–25
Deep learning CPU edge chipset revenue by power consumption, world markets: 2019–25

Deep learning FPGA chipset revenue, world markets: 2019–25
Deep learning SoC accelerator chipset revenue, world markets: 2019–25
Deep learning CPU edge chipset revenue by power consumption, world markets: 2019–25
Deep learning CPU edge chipset revenue by compute capacity, world markets: 2019–25
Deep learning CPU chipsets
Deep learning GPU chipsets
Deep learning ASIC chipsets

Estimated AI workloads on enterprise GPUs and CPUs
Deep learning chipset revenue, world markets: 2019–25
Deep learning chipset year-on-year revenue growth rates, world markets: 2020–25
Deep learning chipset revenue by chipset type, world markets: 2019–25
Deep learning chipset revenue, inference vs. training, world markets: 2019–25
Deep learning chipset revenue by compute capacity, world markets: 2019–25
Deep learning chipset revenue by power consumption, world markets: 2019–25
Deep learning chipset revenue by market sector, world markets: 2019–25
Deep learning CPU chipset revenue, world markets: 2019–25
Deep learning GPU chipset revenue, world markets: 2019–25
Deep learning ASIC chipset revenue, world markets: 2019–25

Key players in FPGA
Comparison of deep learning chipset parameters
Selected benchmarks for AI chipsets
Data formats used in AI chipsets
Popular deep learning frameworks
Deep learning chipset companies
IP companies

Deep Learning Chipsets Report – 2020 | REAI-102206