

Microcomputers Basic References Fall 2022

Contents

Timeline of Computer History To 2015 - Relay Adder To Apple Watch	2
Other News 2015 and On	2
Microcontroller Market 2021	2
Semiconductor industry	3
Milestones in embedded systems design Jack Ganssle and Embedded Systems Design February 23, 2008	3
Embedded Technology Trends for 2021	3
932 degrees F - WOW, WOW	4
Whoops - Be Careful with Advertising in what you read:	4
https://www.adlinktech.com/en/News/ADLINK-launches-deep-Learning-acceleration-DLAP-x86-series-smarter-edge-AI-inferencing	4
Microcontrollers II	4
ARM Wiki/	4
ARCHITECTURE	5
C2000™ 32-bit microcontrollers	5
C2000™ 32-bit microcontrollers	5
CLA real-time control accelerator	6
Arduino	6
How about Pi	7
Tom's Hardware Verdict (Not Me!)	7
https://www.tomshardware.com/reviews/raspberry-pi-4	7
Languages	7
Top Programming Languages 2020	7
Python rules the roost, but Cobol gets a pandemic bump	7
SPECIAL CHIPS	8
AI Chips	8
Cerebras debuts new 2.6 trillion transistor wafer scale chip for AI	8
Quantum Anyone 2016-2021	9
• First Reprogrammable Quantum Computer	9
IBM's "Eagle" Quantum Computer Chip	9

Timeline of Computer History To 2015 - Relay Adder To Apple Watch

<https://www.computerhistory.org/timeline/computers/>

Other News 2015 and On

Microsoft released Windows 10 on July 29, 2015.

Google split into two companies on August 10, 2015. The new company known as Alphabet is now responsible for Google, Nest, Google Capital, Google Fiber, Calico, Google X, Sidewalk Labs, and Google Ventures.

RadioShack filed for bankruptcy on February 6, 2015.

(Our competitor bit the dust – The TRS80 folks.)

On December 07, 2015, NXP announced it had completed the merger of Freescale.

Spin-off from Motorola in 2004, Freescale Semiconductor is a provider of mixed-signal integrated circuit design.

NXP Semiconductor
3501 Ed Bluestein Blvd
Austin, TX 78721

<https://www.computerhope.com/history/2015.htm>

Founded in [1972](#) by [Seymour Cray](#), Cray Inc. is a manufacturer of supercomputers. Cray was acquired by Hewlett Packard Enterprise on September 25, [2019](#).

<https://www.computerhope.com/history/2019.htm>

Microcontroller Market 2021

Microcontroller (MCU) sales boomeranged back with strong growth in the economic recovery of 2021, when the MCU market climbed 23% to a record-high **\$19.6 billion** after falling 2% in the 2020 outbreak year of the Covid-19 virus crisis, according to IC Insights' 1Q Update to its 2022 McClean Report. IC Insights is forecasting worldwide

microcontroller sales to increase 10% in 2022 to reach an all-time high of \$21.5 billion (Figure 1), with automotive MCU growth outpacing most other end-use categories this year.

About **46%** of microcontroller sales are generated by MCUs in “general” embedded applications(including smartphones, computers and peripherals, industrial uses, and consumer products) while a little over **40% come from automotive systems**, and **14%** from the smartcard market for banking, credit and debit purchases, transit fares, identification cards, and other uses.

<https://hardwarebee.com/microcontroller-market-history-and-forecast/>

Semiconductor industry

In 2021, the sales of semiconductors reached a record \$555.9 billion, up 26.2 percent with sales in China reaching \$192.5 billion, according to the [Semiconductor Industry Association](#). A record 1.15 trillion semiconductor units were shipped in the calendar year.^[8] The semiconductors is projected to reach \$ 726.73 billion by 2027.

As of 2021, only three firms are able to manufacture the most advanced semiconductors: [TSMC](#) of Taiwan, [Samsung](#) of South Korea, and [Intel](#) of the United States. Part of this is due to the high capital costs of building foundries. TSMC's latest factory, capable of fabricating [3 nm process](#) semiconductors and completed in 2020, cost \$19.5 billion.

https://en.wikipedia.org/wiki/Semiconductor_industry

Milestones in embedded systems design Jack Ganssle and Embedded Systems Design
February 23, 2008

<https://www.embedded.com/design/prototyping-and-development/4007514/Milestones-in-embedded-systems-design>

Embedded Technology Trends for 2021

Embedded system is typically a combination of electronic hardware elements such as silicon (**micro**), firmware, Field Programmable Gate Array (**FPGA**), and software components like Real-time Operating Systems (**RTOS**). Generally, embedded systems are powered by software integrated circuits that are designed to be programmed. More industries, products, and their associated services now rely on embedded systems than ever before.

The market size of embedded systems is predicted to hit US\$127.50 billion by 2027 with a 5.70% CAGR (Compound Annual Growth Rate), according to Data Bridge Market Research. The newest wave of embedded systems is bringing innovation to a wide range of applications, often using **Artificial Intelligence and machine learning, including IoT security, robotics, medical devices, autonomous vehicles, vision technologies, [System-on-Chip](#) solutions, and more.**

Example: New deep learning platform accelerates AI at the edge

[ADLINK](#) Technology's new DLAP x86 deep learning acceleration platforms are optimised to boost the performance of edge AI in industrial applications by speeding up memory-hungry, compute-intensive learning and inferencing tasks. They also take advantage of NVIDIA's Turing GPU architecture and are designed to withstand hard knocks, strong vibrations, and **temperatures up to 500C**, making them ideal for manufacturing, industrial and healthcare environments.

932 degrees F - WOW, WOW

<https://www.redlinegroup.com/news/embedded-technology-trends-for-2021-11951410947#:~:text=The%20newest%20wave%20of%20embedded,%2DChip%20solutions%2C%20and%20more.>

Woops - Be Careful with Advertising in what you read:

the DLAP x86 series can sustain temperatures up to **50 degrees Celsius**/240 watts of heat dissipation, strong vibration (up to 2 Grms) and shock protection (up to 30 Grms), for reliability in industrial, manufacturing and healthcare environments.

<https://www.adlinktech.com/en/News/ADLINK-launches-deep-Learning-acceleration-DLAP-x86-series-smarter-edge-AI-inferencing>

Microcontrollers II

PIC32MM Family of Low Power, Low Cost, 32-bit Microcontrollers

eXtreme Low power - Sleep Mode with RAM retention **500 nA**

<https://www.microchip.com/design-centers/32-bit/architecture/pic32mm-family>

ARM Wiki/

ARM, originally **Acorn RISC Machine**, later **Advanced RISC Machine**, is a family of [reduced instruction set computing](#) (RISC) [architectures](#) for [computer processors](#), configured for various environments.

British company [ARM Holdings](#) develops the architecture and licenses it to other companies, who design

their own products that implement one of those architectures—including [systems-on-chips](#) (SoC) and [systems-on-modules](#) (SoM) that incorporate memory, interfaces, radios, etc. It also designs [cores](#) that implement this [instruction set](#) and licenses these designs to a number of companies that incorporate those core designs into their own products.

https://en.wikipedia.org/wiki/ARM_architecture

ARCHITECTURE

https://www.arm.com/files/pdf/ARM_Arch_A8.pdf

ARM Cortex A family (v7-A):

Applications processors for full OS and 3rd party applications



ARM Cortex -R family (v7 -R):

Embedded processors for real -time signal processing, control applications



ARM Cortex -M family (v7 -M):

Microcontroller -oriented processors for MCU and SoC applications

C2000™ 32-bit microcontrollers

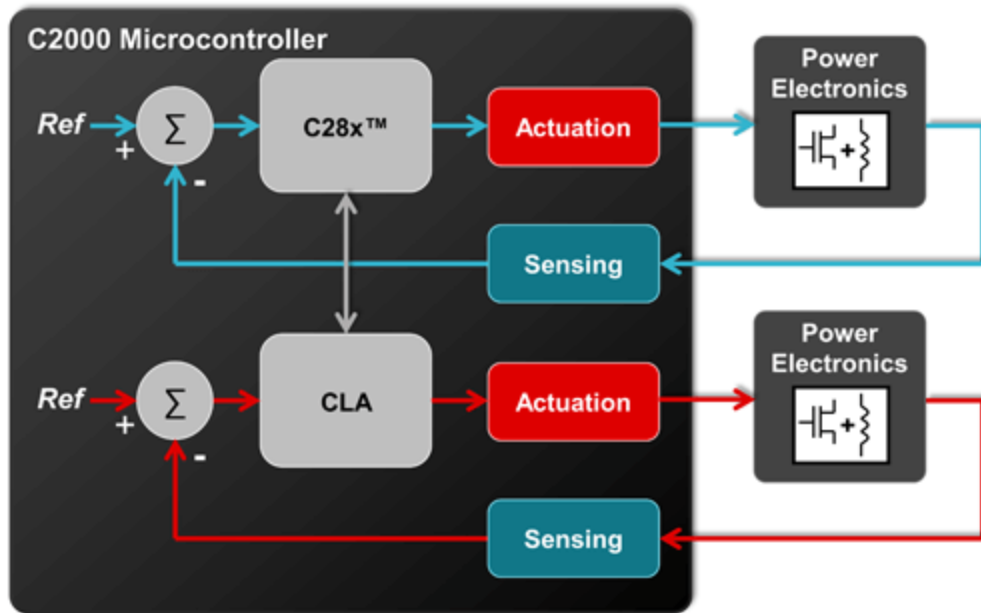
32-bit microcontrollers (MCUs) optimized for processing, sensing, and actuation to improve closed loop performance.

http://www.ti.com/lscs/ti/microcontrollers-16-bit-32-bit/c2000-performance/real-time-control/overview.page?DCMP=dsp_C2000&HQS=c2000

C2000™ 32-bit microcontrollers

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CLA real-time control accelerator

Software flexibility, Hardware deterministic timing!!

Arduino

<https://www.arduino.cc/en/Main/Products>

<https://www.arduino.cc/en/Main/ArduinoBoardUno>



\$24.95

prices are VAT excluded

How about Pi

Tom's Hardware Verdict (Not Me!)

Starting at just \$35 for the 2GB model, the Raspberry Pi 4 is the world's best single-board computer, a must-have for tech enthusiasts of all ages.

Pros

Much faster than prior Raspberry Pis, USB 3 Ports, Ability to output 4K video at 60 Hz, Dual-monitor support

Cons Runs warm, Good streaming video requires a hack



<https://www.tomshardware.com/reviews/raspberry-pi-4>

Languages

<http://spectrum.ieee.org/static/interactive-the-top-programming-languages-2016>

Language Rank

Top Programming Languages 2020

Python rules the roost, but Cobol gets a pandemic bump

<https://spectrum.ieee.org/top-programming-languages/>

Python Java C C++

SPECIAL CHIPS

AI Chips

<https://www.alliedmarketresearch.com/artificial-intelligence-chip-market>

Artificial Intelligence Chip Market by Chip Type (GPU, ASIC, FPGA, CPU, and others), Application (Natural Language Processing (NLP), Robotic, Computer Vision, Network Security, and Others), Technology (System-on-Chip, System-in-Package, Multi-chip Module, and Others), Processing Type (Edge and Cloud), and Industry Vertical (Media & Advertising, BFSI, IT & Telecom, Retail, Healthcare, Automotive & Transportation, and Others): Global Opportunity Analysis and Industry Forecast, 2019-2025

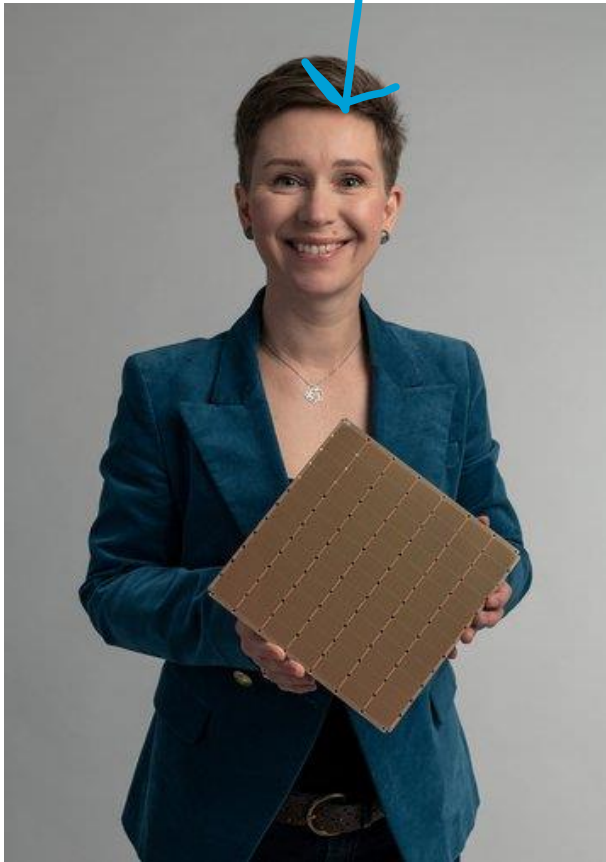
The artificial intelligence chip market was valued at \$6,638 million in 2018, and is projected to reach \$91,185 million by 2025, registering a CAGR of 45.2% from 2019 to 2025. North America was the highest contributor to the global artificial intelligence chip market, with \$2,437.0 million in 2018, and is estimated to reach 28,258.3 million by 2025, registering a CAGR of 41.7% during the forecast period.

Artificial intelligence (AI) chips are specialized silicon chips, which incorporate AI technology and are used for machine learning. AI helps to eliminate or minimize the risk to human life in many industry verticals. The need for more efficient systems to solve mathematical and computational problems is becoming crucial owing to the increase in volume of the data. Thus, the majority of the key players in the IT industry have focused on developing AI chips and applications. Furthermore, emergence of quantum computing and increase in implementation of AI chips in robotics drive the growth of the global artificial intelligence chip market. In addition, emergence of autonomous robotics—robots that develop and control themselves autonomously—is anticipated to provide potential growth opportunities for the market.

Cerebras debuts new 2.6 trillion transistor wafer scale chip for AI

<https://www.datacenterdynamics.com/en/news/cerebras-debuts-new-26-trillion-wafer-scale-chip-for-ai/>

TRY IT FOR SIZE



Quantum Anyone 2016-2021

- Scientists at [MIT](#) created the first five-atom [quantum computer](#) with the potential to crack the security of traditional encryption schemes
- Google claims to have achieved [quantum supremacy](#).
 - First Reprogrammable Quantum Computer
 - **2016:** Quantum Computers have made considerable progress and the [first reprogrammable quantum computer](#) is finally complete. It's made up of 5 singular atoms that act as switches. These switches are activated by a laser beam that controls the state of the qubit. This leap has brought us very close to quantum supremacy.

<https://compscicentral.com/history-of-computers/>

IBM's "Eagle" Quantum Computer Chip

2021: IBM continues to lead the charge in quantum computer development and in November, [they showcased their new "Eagle" chip](#). This is currently the most cutting-edge quantum chip in existence, packing 127 qubits, making it the first to reach over

100 qubits. IBM plans to create a new chip more than three times powerful than the “Eagle” by next year, 2022.