

APPENDIX E

Computer History – East Asian Perspective

2025.3.20

Kilnam Chon

Table of Contents

1. Introduction
 2. Beginning of Computers
 3. Mainframe Computers, Mini Computers, and Microprocessor-based Computers
 4. OS and Browsers
 5. Latest Computer Development in the 21st Century
 6. Remarks
- References
- Appendix 1: Timeline of Computer History in China
- Appendix 2: Timeline of Computer History in Japan
- Appendix 3: Timeline of Computer History in South Korea

1. Introduction

We describe “Computer History – East Asian Perspective” in this volume (2020s) as the complimentary coverage to Asia Internet History. We cover primarily the East Asia with additional coverage on the rest of Asia as well as other regions.

The Computer History Museum (CHM) in Mountain View, California has the largest collection of historical computers in the world along The National Museum of Computing in Bletchley Park in UK [CHM 2024; TNMoC 2011]. Z3, one of the oldest computers could be found at the Deutsche Museum in Munich [Z3 2024]. Wikipedia covers the most comprehensive timeline on computer history [ComputerHistory 2024]. IEEE has List of IEEE Milestones which can be added by open submission [IEEE Milestone 2024] The Charles Babbage Institute of the University of Minnesota has extensive collections on the computer history as well as the internet history [Babbage 2024]. McElroy of the Computer History Museum posted his talk on “History of Computer Hardware” in 2021 [McElroy 2021]. Many others also gave talks on the historical computers in UK and USA. One of the notable examples is the International Research Conference on Computer History, 1976 in Los Alamos. Many of the talks are archived by the Computer History Museum and available through YouTube [CHM 2022].

The digital computer developments started in the 1940s in Germany with Z3, UK with Colossus, and USA with ENIAC. These computer developments were followed by Russia (USSR, 1940s), and China and Japan in the 1950s. South Korea started its digital computer development in the 1970s.

1.1 China

China started computer development along Russia (USSR), and Japan in the mid-20th century after the head starts of Germany, UK and USA in the 1940s. There are two major initial efforts to develop electronic computers in China. One is the effort by Xia Peisu who studied the computer science in UK in the 1940s, and influenced many areas on computers in China upon her return to China [BBC 2020; Xia 2024; Tech Teller 2023]. Then, the 12-year Science and Technology Development Plan by the central government of China which included the computer development with Russia in 1950s [Chen 2006; Xu 2015]. There have been various articles and books on some of the notable computer developments in China [Xia 2024; BBC 2020; Sun 2024; IEEE 2007; Mullaney 2024; Xu 2015; Chen 2006]. There is an official account of the computer development at the China Computer Federation (CCF) in Weixin, “Sixty Years of Computer” [CCF 2024]. Mr. Xu Zuzhe authored the book, “Tracing the origin of Chinese computers” in Chinese [Xu 2015]. The book covers from 1950s to 1980s. The Table of Contents of the book was translated in English [Xu 2015b]. Tao JianHua is the first author of the article, “A brief history of computers in China,” in Chinese with English Abstract [Tao 2016]. There is an article with pictures, “A brief history of China’s independent computers” [Qiangluzhi 2010]. “The history of computer development in China” was published in 2024 by Taoer_dlwangtao with many pictures [Taoer 2024]. The IEEE article described the computer development in China [IEEE 2007].

The Institute of Computer Technology was established under the Chinese Academy of Sciences in 1956 [IEEE 2007]. The China Computer Federation (CCF) was established in 1962 [CCF 2024b].

1.2 Japan

Japan also had the early start on the computer development along Russia, and China in the mid-20th century after the head starts of Germany, UK and USA in the 1940s.

Japan Information Processing Society (IPSJ) has the IPSJ Computer Museum (online) with the following sections in its website which covers up to the year 2000 [IPSJ 2024];

Historical Computers in Japan

- Early Computers
- Mainframes
- Supercomputers
- UNIX Servers
- PC Servers
- Office Computers
- Minicomputers
- Workstations
- Personal Computers
- Japanese Word Processors
- Other Computers
- (Peripherals)
- Mainframe OS

Office Computer OS
Japanese Computer Pioneers
Artifacts of IP Heritage
Satellite Museum
Model Name List

1.3 South Korea

South Korea had the rather late start on the computer development in the 20th century. Korea Computer History website, <http://ComputerHistory.kr>, covers the computer development in South Korea with the following sections [ComputerHistory.kr 2024];

Workshop list with video and presentation materials in 2015~2023

Year Table (Timeline) of computer histories of South Korea and the World, 1941~2024.

The website, ComputerHistory.kr is managed by Korean Computer History Project from 2015 to 2024, and the management was transferred to The Korean Institute of Information Scientists and Engineers (KIISE) in 2024.

2. Beginning of Computers, 1800s - 1900s

2.1 Mechanical Computers

Charles Babbage developed one of the first mechanical computer, Difference Engine in 1822 [Timeline 2024]. This is one of the first decimal mechanical computers developed in the world. Konrad Zuse developed Z3, the electromechanical computer in 1938-1941 [Z3 2024]. This is the world's first programmable digital computer.

2.2 Analog Computers

Analog computers have their history as old as the mechanical computers [Analog 2024]. We even have the hybrid computers of the mechanical computers and the analog computers. The analog computers are well explained by Walter Karplus in his book, Analog Simulation [Karplus 1958]. But the analog computers were obsoleted in the 1950s-1970s due to the development of digital computers in the 20th century. But the analog computers are undergoing a resurgence lately [Analog 2024; Aspinity 2024].

China developed the first analog electronic computer at Harbin Institute of Technology in the 1957 [Qian 2010]. Japan developed many analog computers in the 20th century including one of the earliest analog computers in Japan, the Mechanical Differential Analyzer [TimelineJP, 2024]. South Korea had its first analog computer developed at Hanyang University in the 1962 [TimelineKR, 2024].

2.3 Vacuum Tube Computers

The digital computer based on vacuum tubes is the first digital and electrical computers. Colossus, one of the first vacuum tube computers was developed at Bletchley Park in UK in the 1943 [Colossus 2024]. This was followed by ENIAC, one of the first digital computers which was developed at University of Pennsylvania by John Mauchly and J. Presper Eckert in the 1945

[ENIAC 2024]. UK and USA developed the stored program computers in the 1949 and the 1950, respectively [TimelineTemplate 2024].

Japan developed its first vacuum tube computer, FUJIC in the 1956 [IPSJ 2024], and China developed its first vacuum tube computers, 103 in the 1958. The 103 is based on Russian-made computer, M-3 as the first cooperative effort between China and Russia (USSR) [TemplateCN 2024]. South Korea did not develop any vacuum tube computer.

2.4 Solid-State Computers

Solid state computers including transistors (and parametron in the case of Japan) eventually took over the vacuum tube computers due to their higher reliability, much less electricity consumption, and less space needed for computers. Almost all commercial computers are the first ones to use the solid-state devices. USA and UK started to develop the solid-state computers from the 1950s including the computers from UNIVAC and IBM [Timeline 2024].

ETL in Japan developed Mark III computer in 1956 which is the first solid-state computer in Japan [TenplateJP 2024]. China developed the transistor-based computers including 109 in the 1965 and 104 Model III in the 1967 [TenplateCN 2024].

2.5 Integrated Circuit (IC)-Based Computers

The solid-state computers evolved to the integrated circuit-based computers as soon as the integrated circuit (IC) became available in the 1960s [IntegratedCircuit 2024]. The integrated circuit reduce complexity of the processor boards used in computers including space and electricity among others. They are more important among minicomputers and microcomputers than mainframe computers due to their costs and spaces. The DEC PDP-1 minicomputer in the 1960 is the notable example.

The first integrated circuit-based computers in Japan and China may be developed in the 1960s, but they are not well documented. In South Korea, the first minicomputer, Sejong I was developed in the 1973. This is Nova-compatible computer, and the micro programming on the central processor unit (CPU) was used to enhance the instruction set of the computer [ComputerHistory 1973].

2.6 Microprocessor-Based Computers

The first microprocessor, Intel 4004 was invented in 1971 with collaboration of Busicom in Japan and Intel in USA. The first application was The Busicom 141-PF calculator in 1971. Intel developed more advanced microprocessors including 8-bit microprocessors, 16-bit microprocessors, and 32-bit microprocessors among others in the 20th century [Intel 2024]. Other companies followed to compete against Intel including Zilog, AMD, Motorola, and National Semiconductor among others in the 20th century.

The microprocessor eventually took over all computer market starting from microcomputers and calculators in 1970s, then minicomputers and eventually mainframe computers and

supercomputers. The microprocessor's lack of processing power could be made up with multiple processors. In some cases, tens of thousands and more microprocessors were used, especially for supercomputers, cloud computing, and AI computers and data centers. They will be described more in detail in the following sections.

Microprocessors were also developed in China, Japan and South Korea. They are either compatible to popular microprocessors in USA, in particular Intel microprocessors, or they have their own microprocessor instruction sets. They are used for various purposes; calculators, computers, and smartphones among others.

3. Mainframe Computers, Mini Computers, and Micro Computers

3.1 Introduction

After various “one of the kinds” computers were developed in the 1940s in Germany, UK and USA, commercial digital computers were developed in USA and UK based on the solid-state devices in the 1950s. Remington Land and IBM in USA led the commercial computer market with UNIVAC 1 and IBM 701 in the early 1950s, respectively. They are called the mainframe computers. Ferranti also offered Mark 1, the mainframe computer in UK in the 1951 [Timetable 2024]. IBM later developed two lines of the mainframe computers; IBM 7090 for scientific computation, and IBM 1401 for data processing. Minicomputers were developed from the 1960s to serve departmental computing. Once 8-bit microprocessors were developed in the 1970s, microcomputers became available to individual users as personal computers.

Japan and China followed similar paths to USA. South Korea did not develop any mainframe computers or supercomputers, but developed only smaller computers such as minicomputers and microprocessor-based computers. China, Japan and South Korea also imported these mainframe computers from USA and UK.

3.2 Mainframe Computer and Supercomputer

Mainframe computers as commercial products started in USA and UK in 1950. They are typically based on the solid-state devices such as transistor (or parametron in some cases in Japan). The mainframe computers cover both scientific computations as originally developed and data processing. IBM eventually dominated the mainframe computer market in USA and globally with IBM 360s which cover both scientific computation and data processing. Supercomputer market was dominated by CDC in the 1960s, especially with CDC 6600s [CDC 2024]. Cray Research took over the supercomputer market in the 1970s [Cray 2024]. Massively parallel supercomputers starting from ILLIAC IV with many microprocessors eventually took over the supercomputer market from the proprietary processor-based computers including Cray Supercomputers. This trend follows on cloud computing and AI computers in the late 1990s and the 2000s. Please refer further information on the massively parallel supercomputers and AI computers in the next section.

China developed the mainframe computers with 109 in 1965, and 104 Model III in 1967. The latter has similar performance to IBM 704. China also developed series of supercomputers from

1993, and eventually developed the world fastest supercomputer in 2024. Japan also developed the mainframe computer from the 1950s with several mainframe computer companies including Fujitsu, Hitachi and NEC. Japan also worked on the supercomputers, and developed the world fastest supercomputers including NEC SX-3/44r in the 1989, and K Computer in 2011. South Korea purchased several mainframe computers from CDC, Fujitsu and IBM in the 1967, but did not develop its own mainframe computers nor supercomputers.

3.3 Minicomputer

Digital Equipment Corporation (DEC) is one of the first companies which developed minicomputers in the 1960s. They are much smaller and cheaper than the mainframe computers. The minicomputers are used as departmental computer with or without computer centers whereas the mainframe computers are housed in the computer center with appropriate air conditioning. DEC dominated the minicomputer market with PDP and VAX series like IBM dominated with IBM 360s.

China developed minicomputers from the 1960s. China also imported various minicomputers from USA and other countries in the 20th and 21st centuries.

Japan developed various kinds of minicomputer including “office computers” and “word processors” from 1960s.

South Korea developed the Nova-compatible minicomputer with microprogramming to extend the Nova instruction set in the 1973.

3.4 Microcomputer (desktop, laptop, smartphone, and hand-hold)

Microprocessor-based computers including desktop computers, laptop computers, smartphones, and hand-hold devices including calculators started to appear from the 1971 with the first microprocessor, Intel 4004 with collaboration of Intel in USA and Busicom in Japan. It was used for the Busicom 141-PF calculator in 1971. Once the 8-bit microprocessor, Intel 8008 was developed in the 1972, the microprocessors were used for various computing devices including microcomputers, laptop computers, hand-hold devices and smartphones among others from the 20th centuries. Altair 8800 in USA and Sord SMP in Japan were developed with Intel 8080 microprocessor in the 1974. The portable microcomputers appeared in 1982 with Compaq MB 16001 in USA. Apple iPhone was developed in the 2007 followed by Android-based smartphones in the following years.

China developed Loongson microprocessor (or Xia-50 to commemorate Xia Peisu, “Mother of Chinese Computing”). It is compatible to the MIPS architecture. China developed various microprocessor-based devices. China eventually produced the most microcomputers in the world with 339 million microcomputers including 200 million laptop computers [TimetableCN 2024]. China also produces the most smartphones in the world now.

Japan started with Busicom calculator with Intel 4004 microprocessor as described earlier. Japan also developed one of the first 8-bit microcomputers, Sord SMP along Altair 8800 in USA in the 1974. NEC dominated the microcomputer market with its own operating system in the 1980s.

South Korea has been developing microprocessor-based devices from the 1970s very actively. South Korea started with GSCO-80A microcomputers in the 1976 [TimelineKR 2024]. It also developed the 4-bit microprocessor in the 1976. This followed by the 16-bit microcomputer, Han-16 microcomputer with Seattle DOS in 1981, and SSM-16 Unix computer in 1983. South Korea also developed K8048 8-bit microprocessor in 1984 which is compatible to 8-bit Intel microprocessor. In the 2010s, South Korea with Samsung and LG produced the most smartphones in the world. But China eventually produced more smartphones in the world in the 2020s.

4. OS and Browsers

“An operating system is system software that manages computer hardware and software resources, and provides the common services for computer programs” [OS 2024]. IBM announced IBM 360/OS in 1964. It is one of the first companies to use the term, operating system. Later, IBM made the 360/OS as the separate commercial product so that other companies could make the IBM 360-compatible mainframe computers.

UNIX is a notable case of the operating system which can be ported to many computers from microcomputers to mainframe computers [UNIX 2024]. UNIX is an open-source OS written in C, the high-level language licensed from ATT. The UNIX development started in 1969. We have license-free UNIX such as LINUX and BSD now.

Microcomputers are some of the first cases where the OS is developed separately from the hardware. CP/M is the OS for many microcomputers based on Intel 8-bit microprocessor from the 1973. The OS for IBM and other microcomputers based on Intel 16-bit microcomputer are provided by Seattle DOS in the 1980, later as MSDOS from Microsoft. It eventually evolved to Microsoft Windows in the 1980s. Chrome was provided by Google from 2011 [Chrome 2024]. It was the dominant OS with browser for microcomputers now.

Smartphones had two major OSs; iOS for iPhone from Apple, and Android for many other smartphones from Google. Both OSs were released in 2007.

China developed several operating systems for the computers and smartphones developed in China. One of the notable examples is the Harmony OS from Huawei which was developed in 2019 [HarmonyOS 2024]. It is used in many products of Huawei; Smartphones, tablets, smart TVs, smart watches, personal computers and other smart devices.

Ken Sakamura in Japan developed TRON, the real-time OS in 1984 [TRON 2023]. TRON Forum was organized in the 1980s to promote TRON.

South Korea developed the Area-A Hangul word processor in the 1995 [Hangul (word processor) 2024]. It was commonly used along the Microsoft Words in South Korea. South

Korea also developed many other software products especially social media [ComputerHistory 2024]. But South Korea did not develop the commercial-grade OS.

5. Latest Computer Developments in the 21st Century

5.1 Massively Parallel Supercomputers

Initial supercomputers in the 20th century were based on the single proprietary processor. Later, multiple processors were used in the 20th century including ILLIAC IV. Then, SPARC and other non-proprietary processors were used in large quantity. In the 21st century, it is common to use massively parallel processors to develop supercomputers such as HP Frontier supercomputer in USA over 1 exaflops in 2022. In the recent years, the world fastest supercomputers are competition on the massively parallel supercomputers among China, Japan and USA.

In Japan, NEC delivered SX-3/44R, the world fastest supercomputers in 1989, followed by K Computer in Japan with 8 petaflops, the world fastest in 2011. Fugaku supercomputer was the world fastest in 2020 until HP Frontier supercomputer took over the title of the world fastest supercomputer in 2022.

Tianhe-3, also known as “Xingyi” is the latest in a series of supercomputers built by China’s National University of Defense Technology, potentially surpassing the upcoming “El Capitan” supercomputer being developed by Hewlett Packard and AMD for the Lawrence Livermore National Laboratory [Techradar 2024]. Tianhe-3 could have the peak performance of 2.05 exaflops on LINPACK.

South Korea used the supercomputers from USA for many years, but South Korea has never developed its own supercomputers.

5.2 Quantum Computers

Quantum computers started with quantum algorithm such as Deutsch’s algorithm in the 1985 rather than the quantum computer hardware [Quantum 2024]. Quantum algorithm by Peter Shor broke RSA encryption algorithm in 1994. In 1988, Holton came up with the 2-qubit quantum computers. Google and NASA in USA came up with quantum computer with 54-qubit in the 2019. IBM is one of the first companies delivered the commercial quantum computers in the 2019 [IBM 2024]. Google announced Willow, a quantum chip with the error correction in 2024 [Google 2024]. Zuchongzhi 3.0 quantum chip with 105 q-bits developed by University of Science and Technology of China was announced in 2024 [Zuchongzhi 2024].

Baidu announced Qianshi, China’s first quantum computer with 10-qubit in the 2022 [Reuter 2022]. According to Charles Choi in 2021, two of the world’s biggest quantum computers are made in China; Zuchongzhi and Jiuzhang 2.0 [IEEE 2024]. Xiaohong Chip with 504-qubits were announced recently. Tianyan quantum computer was developed, and it is accessible through China Telecom’s Quantum Cloud [Unbox 2025].

Various institutions in Japan have been working on quantum computing. They include Riken, Tokyo University, Osaka University, and NTT. Tokyo University and the University of Chicago agreed to develop 100,000-qubit quantum computer recently. This is the first major collaboration between Japan and USA on the quantum computer development.

The Korea Institute of Science and Technology (KIST) is one of the leading institutions in quantum computer research and development in South Korea [Quantum 2023]. Several universities including Yonsei University with the 12-qubit computer from IBM are also working on quantum computing now [Quantum 2024]

5.3 AI Computers, AI Data Centers, and AI Personal Computers

AI computers and AI data centers may be the special cases of the cloud computing. NVIDIA is dominant with its graphical processor units (GPUs) such as H100 and B100 with CUDA platform now [NVIDIA 2024]. Other semiconductor makers in USA including AMD, and China are also working on the processors for AI. Two South Korean semiconductor companies; Samsung and SK are dominant on the high bandwidth memory chips for NVIDIA's AI processors. Open AI will have its own multi-billion dollar AI Data Center in Texas soon [Crusoe 2024]. Microsoft with Open AI announced to deliver Stargate, the multi-billion dollar AI data center by 2028. xAI developed Colossus with 100,000 NVIDIA H-100 in 2024 with expansion to 1 million processors in this decade. Meta is planning Meta Data Center in Richland Parish, Louisiana with 2 gigawatts of capacity.

There are many GPU as well as CPU for AI computers and data centers offered by NVIDIA, AMD and other companies now [Wired 2025c; NVIDIA 2025b].

AI computers and data centers consume much electricity. In order to solve the electric power requirement, some AI companies including Amazon, Google, Meta and Microsoft are investing on the nuclear plants to provide the electricity required for the AI data centers [NYT 2024].

The top seven companies to spend on NVIDIA GPU in 2024 are Microsoft, Google, Meta, and Amazon in USA, and ByteDance and Tencent [Omdia 2024; JPMorgan 2024].

The first AI Personal computer (PC) was developed by Microsoft with Intel in 2024 [Tom's 2024]. NVIDIA also came up with Digits, "Personal AI Supercomputer" with its own GPU in 2024, too [CES 2025; Wired 2025]. It also came up with the personal AI cloud, too.

6. Remarks

Conferences

There have been several global conferences on computer research and development since the 20th century including IFIP, ACM and IEEE;

IFIP (International Federation for Information Processing)

There was annual global conference in the 20th century, but it was closed down in the last century. IFIP has many working groups on the computer research and development now.

ACM (Association of Computing Machinery)

ACM had the annual ACM Conference in the 20th century, but it was also closed down in the last century. ACM has many special interest groups related to computer research and development which organize various conferences.

IEEE

Institute of Electrical and Electronics Engineers (IEEE) in USA has many conferences related to computer research and development including many from IEEE Computer Society.

International Research Conference on Computer History, Los Alamos in 1976 had many important presentations on the early computer development in the 1940s to the 1960s. The presentations are archived at the Computer History Museum and are available through YouTube [CHM 2022].

There are no regional conferences in Asia on computer research and development unlike the Internet which has numerous conferences in Asia.

Interaction among Countries

Interaction on the computer research and development among Asian countries is rare. But, the interaction with USA, Russia in the case of China, or the world-wide are common.

Cloud Computer

Amazon is one of the first companies in the world which started the cloud service for web in 2002. It is called Amazon Web Service (AWS). There are many other companies and organizations in the world including China, Japan and South Korea which offer cloud computing service now. Many of the cloud services include AI computing services. Notable examples are Microsoft, Google, Meta and Amazon.

Computer Museums

Many countries in the world including ones in USA and UK have computer (history) museums. The Computer History Museum (CHM) in USA may be the largest computer museum [CHM 2024]. The National Museum of Computing at Bletchley Park in UK has historic computers from 1940s [TNMoC 2011].

China, Japan and South Korea have the following computer museums;

Japan:

The National Science Museum

IPSJ Computer Museum – online museum by Information Processing Society of Japan

South Korea:

The Nexon Computer Museum

China:

The Electronic Science and Technology Museum, University of Electronic Science and Technology, Chengdu (since 2016)

CCF China Computer Museum is under construction in Hengdial, Zhejiang Province (expected in 2025)

Video Game Museum of China, Audio-Video Digital Publishing Association

Additionally, Israel, Australia and New Zealand have the computer museums according to Wikipedia [ComputerMuseum 2024; CCF.org.cn 2024b]. Please refer Chapter 8 Internet Museum in this volume for additional information.

References

- [360doc 2024] Taoer dlwangtao, History of computer development in China, 360doc.com, 2024.8.10.
- [Analog 2024] Analog Computer, Wikipedia 2024.
- [Asia 2024] Asia Internet History, 1980s, 1990s, 2000s, 2010s, and 2020s.
- [Aspinity 2024] Aspinity, Analog computing, Free Think, 2023.
- [Audette 1966] Donald Audette, Computer technology in China, 1956-1965, CACM, 1966.
- [Babbage 2024] Charles Babbage Institute, the University of Minnesota, 2024.
- [Baidu 2024] History of Computer Science in China, Baidu (search), 2024.
- [Baidu 2024b] China's story on AI, Baidu, 2024.
- [BBC 2020] Leila McNeill, Computer pioneer who built modern China, BBC, 2020.2.19.
- [CES 2025] Jansen Huang, Keynote speech, CES, 2025.
- [Chen 2006] Huailin Chen, A brief story of computer development in China (1956-2006), math.ecnu.edu.cn/~jypan/Teaching/ParaComp/docs/HistoryChina2.html
- [CCF 2024] China Computer Federation (CCF), Forum: History of Computer Development in China and the Construction of the Museum, Weixin, 2024.
- [CCF 2024b] China Computer Federation, ccf.org.cn, 2024.
- [CDC 2024] Control Data Corporation (CDC), Wikipedia, 2024.
- [Chen 2024] Huailin Chen, A brief history of computer development in China (1956-2006), math.ecnu.edu.cn/~jypah/Teaching/ParaComp/docs/HistoryChina2.html.
- [CHM 2022] Int'l (Research)Conference on Computer History, Los Alamos, YouTube, 2022.
- [CHM 2009] Computer pioneers and pioneer computers, Parts 1 & 2, YouTube, CHM, 2009.
- [CHM 2024] Computer History Museum (CHM), Timeline of Computer History, 2024.
- [Chon 1983] Kilnam Chon and Kee-Wook Rim, Computer system development with standardization, Computers and Standards, 1983.
- [Colossus 2020] B. Randall, Uncovering Colossus, TNMoC, YouTube, 2013.
- [ComputerHistory 2024] Computer History, Wikipedia, 2024.

[ComputerHistory.kr 2024] ComputerHistory.kr, 2024.

[ComputerMuseum 2024] List of computer museums, Wikipedia, 2024.

[Cray 2024] Cray Research, Wikipedia, 2024]

[Z3 2024] Z3, Deutsche Museum, 2024.

[Electronic 2016] (A brief introduction to) History of China's Computer Development, Electronic Science and Technology Museum), 2016.6.27.

[ENIAC 2024] ENIAC, Wikipedia, 2024.

[Google 2024] Google, Meet Willow, our state-of-the art quantum chip, 2024.

[Hangul(word processor) 2024] Hangul (word processor), Wikipedia, 2024.

[Harmony OS 2024] Huawei, Harmony, Wikipedia, 2024.

[History 2024] History of Computing, Wikipedia, 2024.

[Hu 2024] Hu Qiheng, Personal communications, 2024.8.8-10.

[Hu 2024b] Hu Qiheng, Personal communications, 2024.9.5.

[HuMin 2024] Hu Min, Dilemma of intelligent computer center, ChinAI 281, 2024.9.11.

[IBM 2024] IBM Q System One, Wikipedia. 2024.

[IEEE 2007] Zhang Jiuchun & Zhang Baichun, Founding of Chinese Academy of Sciences Institute of Computing Technology, IEEE Annals of History of Computing, 2007.

[IEEE 2021] Charles Choi, Two of the world's biggest quantum computers made in China; Zhongzi and Jiuzhang 2.0, 2021.11.6, revised 2024.3.29.

[IEEE 2024] List of IEEE Milestones, IEEE, 2024.

[IntegratedCircuit 2024] Integrated Circuit, Wikipedia, 2024.

[Intel 2024] Intel, Wikipedia, 2024.

[IPJS 2024] Japan Information Processing Society (IPJS), Timeline on Computer Development.

[JPMorgan 2024] JP Morgan and New Street, AI Data Centers, 2024.

[Karplus 1958] Walter Karplus, Analog Simulation, McGraw-Hill, 1958.

[Liu 2000] Liu Ruiting, Computer Masters' Style Records, 2000.

[Liu 2000b] Liu Ruiting, Computer School Style Records, 2000.

[Liu 2000c] Liu Ruiting, Famous Computer Companies, 2000.

[McElroy 2021] Dan McElroy, History of Computer Hardware, Computer History Museum.

[Microsoft 2023] Microsoft, Announcement of \$100 billion AI data center with Open AI, 2023.

[Mullaney 2024] T. Mullaney, The Chinese Computer, MIT Press, 2024. (also in IEEE Xplore)

[NVIDIA 2025b] Jansen Huang, AI advancing at incredible pace, CES 2025 [NVIDIAAb].

[NYT 2024] NYT, Amazon, Google and Microsoft are inventing in nuclear power, 2024.

[Omdia 2024] Omdia Tech Trends to watch 2024.

[OpenAI 2024] Crusoe confirms \$3.4 Billion Data Center Financial Deal (with OpenAI), 2024.

[Qian 2010] Qianqizhi, A brief history of China's independent computer, 2010.3.13.

[Quantum 2023] Quantum Insider, Overview of quantum computing in South Korea, 2023.

[Quantum 2024] Quantum Insider, Yonsei University establishes South-Korea's first 127-qubit Quantum Computer Center, 2024.11.5.

[Reuter 2022] China's Baidu reveals its first quantum computer called Qianshi, 2022.8.25.

[Sakamura 2024] Ken Sakamura, TRON OS Project, Wikipedia, 2024.

[Sino-Unger 2024] Marshall Unger, Sino-Platonic Papers, Handling Chinese Characters, 2024.8.

[Sugon 2024] Sugon, Wikipedia, 2024.

[Sun 2024] Sun Ninghui, Development of AI and Intelligent Computing, ESCN, 2024.5.20.

[Supercomputer 2024] Supercomputer in China, Wikipedia, 2024.

[Tao 2016] Tao Jianhua, A Brief History of Computers in China, Science & Technology Review,

2016. (in Chinese with Abstract in English)

[Techradar 2024] Wayne Williams, The most powerful machine yet assembled on Earth: China quietly launched record-breaking supercomputer, Techradar, 2024.2.17.

[TechTeller 2023] TechTeller927, Unknown woman (Xia Peisu) shocked USA. She is a great contributor to China's Computer, YouTube, 2023.

[Timeline 2024] Timeline of Computing, Wikipedia, 2024.

[TimelineCN 2024] Timeline of Computing in China, 2024.

[TimelineJP 2024] Timeline of Computing in Japan, 2024.

[TimelineKR 2024] Timeline of Computing in South Korea, 2024.

[TimelineTemplate 2024] TimelineTemplate, 2024.

[TNMoC 2011] The National Museum of Computing Tour, YouTube, 2011.

[Tom's 2025] What is an AI PC and do you actually need one [Tom's Hardware 2025]?

[TRON 2024] Ken Sakamura, TRON, Wikipedia, 2024.

[Unbox 2025] Xiaohong Chip with 504-qubits for Tianyan-504 quantum computer, Unbox Factory, Facebook, 2025.1.22.

[Wired 2025] Nvidia's Digits, \$3000 personal ai supercomputer will let you ditch data center.

[Wired 2025c] Essential CPU and GPU field guide for 2025, Wired [Wired 2025c].

[Xia 2024] Xia Peisu, Wikipedia, 2024.

[Xu 2015] Xu ZuZhe, "Tracing the origin of computer in China," 2015.(in Chinese)

[Xu 2015b] Xu ZuZhe, Table of Contents of "Tracing the origin of computer in China" (in English), 2015.

[Zhang 2007] Jiuchun Zhang, Founding of Chinese Academy of Sciences' Institute of Computing Technology, IEEE Annals of History of Computing.

[Zuchongzhi 2024] Quantum Chip: Zuchongzhi 3.0, Space Eye News, YouTube, 2024.

Appendix 1: Timeline of Computer History in China

Year	China	World
1941		Z3, Germany
1943		Colossus, UK
1945		ENIAC, MEMEX
1947		
1948		bit (by Shannon)
1949		EDSAC, EDVAC
1951		UNIVAC, Ferranti, FORTRAN, ACM
1952		IBM 701, IBM's first commercial computer
1956	Ins. of Computing Technology, CAS	
1958	Chinese Phonetic Alphabet	IBM 7090, IBM 1401
	103 (tube, ~M-3/Soviet)	
	107 (tube)	
	College Computer Science Dept.	
1959	104 (10KIPS, ~IBM 704)	
1960		DEC PDP-1, first minicomputer
1963		IEEE
1964	119 (tube)	IBM 360

1965	109 (transistor)	
1967	104 Model III (~IBM 704; transistor)	
1969		UNIX, ARPANET
1971		Intel 4004
1972		Intel 8008, Cray Supercomputer
1973		CP/M
1974		Altair 8800, Alto Workstation, Ethernet
1976		
1977		Apple II
1981		IBM PC
1982		Compaq MB 16001 portable PC
1983		MS Windows
1984		Apple Macintosh
1986		CISCO Router
1990		WWW
1993	Sugon Supercomputer Dawning #1	Mosaic browser, eBay
1994		Yahoo!, Amazon
		Quantum Algorithm broke RSA (by Shor)
1995		MS Windows 95 with Internet Explorer
1996		ILLIAC IV, massively parallel supercomputer
1997		Google, Napstar
1998		Quantum Computer (2-qubit by Holton)
1999		IoT
2001		Wikipedia
2002	DeepComputer 1800 ranking 43 rd Loongson (or Xia-50)-MIPS arch	
2004		Facebook
2006		Twitter (X), AWS
2007		Apple iPhone, Android
2010	Tianhe-1 Fastest with 2.5 petaflops	
2022	Qianshi (10 qbit), Baidu	HP Frontier Supercomputer with >1 exaflops
2023	339 million PC (200m laptop), Largest	
2024	Tianhe-3 (or Xingyi), World Fastest	

Remark: This timeline is mostly based on “A brief history of computer development in China (1956-2006)”, <http://math.ecnu.edu.cn/~jypan/Teaching>.

Appendix 2: Timeline of Computer History in Japan

Year	Japan	World
1941		Z3, Germany
1942	Mechanical differential analyzer	
1943		Colossus, UK
1944		Mark I
1945		ENIAC, MEMEX

1947		
1948		bit (by Shannon)
1949		EDSAC, EDVAC
1951		UNIVAC, Ferranti, FORTRAN, ACM
1952		IBM 701, IBM's first commercial computer
1953	Book, Digital and Analog Computer	
1954	Fujitsu, FACOM 100	
1955	ETL, Mark II (relay computer)	
1956	FUJIC (tube)	
	ETL Mark III (transistor)	
1957	CASIO 14-A, desktop calculator	
1958		IBM 7090, IBM 1401
1959	ETL Yamato, machine translator	
1960		DEC PDP-1, first minicomputer
1962		CDC 6600, fastest computer
1963		IEEE
1964		IBM 360
1967		
1969		UNIX, ARPANET
1971	Busicom 141-PF calculator	Intel 4004
1972		Intel 8008, Cray Supercomputer
1973		CP/M
1974	Sord SMP microcomputer (8080s)	Altair 8800, Alto Workstation, Ethernet
1976		
1977		Apple II
1979	NEC PC-8001	
1980		Goodyear MPP massively parallel processing comp.
1981		IBM PC
1982	Fifth Generation Computer Systems	Compaq MB 16001 portable PC
1983		MS Windows
1984		Apple Macintosh
1986	NEC PC-98LT laptop computer	CISCO Router
1989	NEC SX-3/44R, fastest (>1gigaflop)	
1990		WWW
1993		Mosaic browser, eBay
1994		Yahoo!, Amazon
		Quantum algorithm broke RSA (by Shor)
1995		MS Windows 95 with Internet Explorer
1996		ILLIAC IV, massively parallel supercomputer
1997		Google, Napstar
1998		Quantum Computer (2-qubit by Holton)
1999	NTT Docomo i-mode	IoT
2001		Wikipedia
2004		Facebook
2006		Twitter (X), AWS
2007		Apple iPhone, Android

2011	K Computer, fastest with 8 petaflops	
2020	Fugaku, fastest supercomputer	
2022		HP Frontier supercomputer with 1.1 exaflops

Remark: Most data are from IPSJ Museum [IPSJ 2024].

Appendix 3: Timeline of Computer History in South Korea

Year	South Korea	World
1941		Z3, Germany
1943		Colossus, UK
1945		ENIAC, MEMEX
1947	CIEE	
1948		bit (by Shannon)
1949	CIEE renamed to KIEE	EDSAC, EDSAC
1951		UNIVAC, Ferranti, FORTRAN, ACM
1952		IBM 701, IBM's first commercial computer
1958		IBM 7090, IBM1401
1960		DEC PDP-1, first minicomputer
1962	Analog Computer (Hanyang Univ.)	CDC 6600, fastest computer
1963		IEEE
1964		IBM 360
1967	First Computers introduction to Korea (IBM 1401, FACOM 222, CDC 3300)	
1969	Hangul Line Printer	UNIX, ARPANET
1971		Intel 4004 (with Busicom)
1972	Pocket Calculation (KIST)	Intel 8008, Cray Supercomputer
1973	Sejong 1 minicomputer KISS	CP/M
1974		Altair 8800, Alto Workstation, Ethernet
1976	GSCOM-80A Microcomputer 4-bit microprocessor Hangul Printer	
1977	GSJET-1200, GSM2000 Printer	Apple II
1978	Hangul Computer Terminal, KIST	
1980	Han-8 microcomputer, Word 80	
1981	Han-16 microcomputer	IBM PC
1982	SDN (IPv4 Network)	Compaq MB 16001 portable PC
1983	SSM-16 Unix computer Myeongpil word processor	MS Windows
1984	K8048, 8-bit microprocessor	Apple Macintosh
1985	SSM-32 Unix computer Hangul laser beam printer (QNIX) ATLAS, Korea-Japan Translator	
1986		CISCO Router
1989	Han/Gul 1.0 word processor	

	DTP (Human Computer)	
1990	K-DOS	WWW
1991	Minicomputer for Gov Administration	
1993	Tmax, cair.kaist.ac.kr website	Mosaic browser, eBay
1994	Dangoon online game	Yahoo!, Amazon
		Quantum Algorithm broke RSA (by Shor)
1995	CoSeek search engine	MS Windows 95 with Internet Explorer
	Odyseus DBMS	
1996	Baram Nara online game	ILLIAC IV (massively parallel supercomputer)
1997	SPAX multiprocessor minicomputer	Google, Napstar
	Hanmail	
1998		Quantum Computer (2-qubit by Holton)
1999	Naver search engine	IoT
	Daum Café, SayClub	
2000	CyWorld	
2001		Wikipedia
2004		Facebook
2006	Prada mobile phone	Twitter (X), AWS
2007		Apple iPhone, Android
2022		HP Frontier supercomputer with >1 exaflops

Remark: Most data on South Korea are from the ComputerHistory.kr website.