

The first compiler related tool, the A-0 System, was developed in 1952 by Grace Hopper, who also coined the term 'compiler'. In 1206, the Arab engineer Al-Jazari invented a programmable drum machine where a musical mechanical automaton could be made to play different rhythms and drum patterns, via pegs and cams. He gave the first description of cryptanalysis by frequency analysis, the earliest code-breaking algorithm. The academic field and the engineering practice of computer programming are both largely concerned with discovering and implementing the most efficient algorithms for a given class of problems. For example, COBOL is still strong in corporate data centers often on large mainframe computers, Fortran in engineering applications, scripting languages in Web development, and C in embedded software. In the 1880s, Herman Hollerith invented the concept of storing data in machine-readable form. For this purpose, algorithms are classified into orders using so-called Big O notation, which expresses resource use, such as execution time or memory consumption, in terms of the size of an input. It is usually easier to code in "high-level" languages than in "low-level" ones. Many programmers use forms of Agile software development where the various stages of formal software development are more integrated together into short cycles that take a few weeks rather than years. While these are sometimes considered programming, often the term software development is used for this larger overall process – with the terms programming, implementation, and coding reserved for the writing and editing of code per se. For example, when a bug in a compiler can make it crash when parsing some large source file, a simplification of the test case that results in only few lines from the original source file can be sufficient to reproduce the same crash. However, with the concept of the stored-program computer introduced in 1949, both programs and data were stored and manipulated in the same way in computer memory. Programming languages are essential for software development. Use of a static code analysis tool can help detect some possible problems. It affects the aspects of quality above, including portability, usability and most importantly maintainability. Computer programmers are those who write computer software. Programs were mostly entered using punched cards or paper tape. Normally the first step in debugging is to attempt to reproduce the problem. These compiled languages allow the programmer to write programs in terms that are syntactically richer, and more capable of abstracting the code, making it easy to target varying machine instruction sets via compilation declarations and heuristics. It is usually easier to code in "high-level" languages than in "low-level" ones. It involves designing and implementing algorithms, step-by-step specifications of procedures, by writing code in one or more programming languages. Many factors, having little or nothing to do with the ability of the computer to efficiently compile and execute the code, contribute to readability. After the bug is reproduced, the input of the program may need to be simplified to make it easier to debug. Integrated development environments (IDEs) aim to integrate all such help.