

Wolfram Mathematica

Wolfram Mathematica is a software system with built-in libraries for several areas of technical computing that allow machine learning, statistics, symbolic computation, manipulating matrices, plotting functions and various types of data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other programming languages. It was conceived by Stephen Wolfram and is developed by Wolfram Research of Champaign, Illinois.^{[8][9]} The Wolfram Language is the programming language used in *Mathematica*.^[10]

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Notebook interface

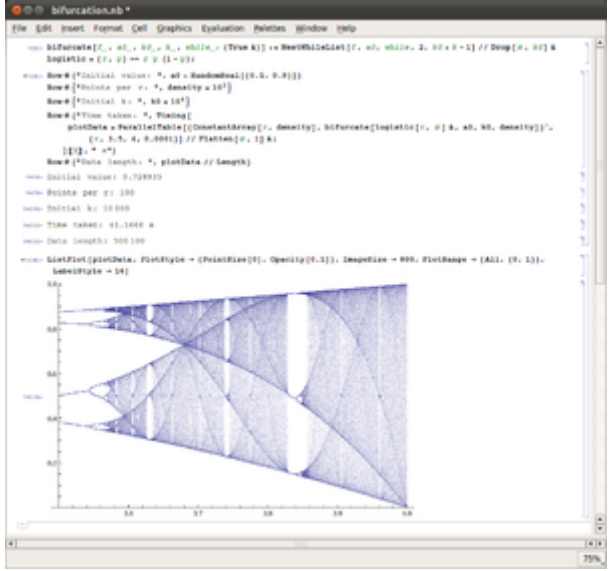
Wolfram Mathematica (called *Mathematica* by some of its users) is split into two parts: the kernel and the front end. The kernel interprets expressions (Wolfram Language code) and returns result expressions, which can then be displayed by the front end.

The original front end, designed by Theodore Gray^[11] in 1988, consists of a notebook interface and allows the creation and editing of notebook documents that can contain code, plaintext, images, and graphics.^[12]

Alternatives to the Mathematica front end include Wolfram Workbench—an Eclipse-based integrated development environment (IDE) that was introduced in

Wolfram Mathematica





Mathematica 8.0.0 Linux frontend

Developer(s)	<u>Wolfram Research</u>
Initial release	June 23, 1988 ^[1]
Stable release	12.3.1 (June 20, 2021) [±] (https://en.wikipedia.org/w/index.php?title=Template:Latest_stable_software_release/Wolfram_Mathematica&action=edit) ^[2]
Written in	<u>Wolfram Language</u> , ^[3] <u>C/C++</u> , <u>Java</u> ^[4]
Platform	<u>Windows</u> (10), ^[5] <u>macOS</u> , <u>Linux</u> , <u>Raspbian</u> , online service. ^[6] All platforms support 64-bit implementations. ^[7] (list) (http://www.wolfram.com/mathematica/system-requirements.html)
Available in	English, Chinese, Japanese
Type	<u>Computer algebra</u> , <u>numerical computations</u> , <u>information</u>

2006. It provides project-based code development tools for Mathematica, including revision management, debugging, profiling, and testing.^[13]

There is also a plugin for IntelliJ IDEA-based IDEs to work with Wolfram Language code that in addition to syntax highlighting can analyze and auto-complete local variables and defined functions.^[14] The Mathematica Kernel also includes a command line front end.^[15]

	<u>visualization</u> , <u>statistics</u> , <u>user interface creation</u>
License	Proprietary
Website	<u>www.wolfram.com</u> <u>/mathematica/</u> (<u>https://www.wolfram.com/mathematica/</u>)

Other interfaces include JMath,^[16] based on GNU Readline and WolframScript^[17] which runs self-contained Mathematica programs (with arguments) from the UNIX command line.

High-performance computing

Capabilities for high-performance computing were extended with the introduction of packed arrays in version 4 (1999)^[18] and sparse matrices (version 5, 2003),^[19] and by adopting the GNU Multi-Precision Library to evaluate high-precision arithmetic.

Version 5.2 (2005) added automatic multi-threading when computations are performed on multi-core computers.^[20] This release included CPU-specific optimized libraries.^[21] In addition Mathematica is supported by third party specialist acceleration hardware such as ClearSpeed.^[22]

In 2002, gridMathematica was introduced to allow user level parallel programming on heterogeneous clusters and multiprocessor systems^[23] and in 2008 parallel computing technology was included in all Mathematica licenses including support for grid technology such as Windows HPC Server 2008, Microsoft Compute Cluster Server and Sun Grid.

Support for CUDA and OpenCL GPU hardware was added in 2010.^[24]

In 2019, support was added for compiling Wolfram Language code to LLVM.^[25]

Connections to other applications, programming languages, and services

Communication with other applications occurs through a protocol called Wolfram Symbolic Transfer Protocol (WSTP). It allows communication between the Wolfram Mathematica kernel and front end and provides a general interface between the kernel and other applications.^[26]

Wolfram Research freely distributes a developer kit for linking applications written in the programming language C to the Mathematica kernel through WSTP using J/Link,^[27] a Java program that can ask Mathematica to perform computations. Similar functionality is achieved with .NET /Link,^[28] but with .NET programs instead of Java programs.

Other languages that connect to Mathematica include Haskell,^[29] AppleScript,^[30] Racket,^[31] Visual Basic,^[32] Python,^{[33][34]} and Clojure.^[35]

Mathematica supports the generation and execution of Modelica models for systems modeling and connects with Wolfram System Modeler.

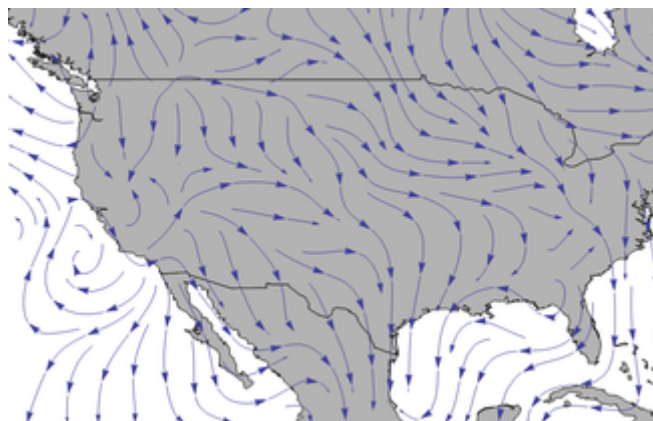
Links are also available to many third-party software packages and APIs.^[36]

Mathematica can also capture real-time data from a variety of sources^[37] and can read and write to public blockchains ([Bitcoin](#), [Ethereum](#), and [ARK](#)).^[38]

It supports import and export of over 220 data, image, video, sound, [computer-aided design](#) (CAD), [geographic information systems](#) (GIS),^[39] document, and biomedical formats

Computable data

Mathematica is also integrated with [Wolfram Alpha](#), an online computational knowledge [answer engine](#) that provides additional data, some of which is kept updated in real time, for users who use Mathematica with an internet connection. Some of the data sets include astronomical, chemical, geopolitical, language, biomedical, and weather data, in addition to mathematical data (such as knots and polyhedra).^[40]



A stream plot of live weather data

Reception

BYTE in 1989 listed Mathematica as among the "Distinction" winners of the BYTE Awards, stating that it "is another breakthrough Macintosh application ... it could enable you to absorb the algebra and calculus that seemed impossible to comprehend from a textbook".^[41] Mathematica has been criticized for being closed source.^[42] Wolfram Research claims keeping Mathematica closed source is central to its business model and the continuity of the software.^[43]

See also

- [Comparison of multi-paradigm programming languages](#)
- [Comparison of numerical analysis software](#)
- [Comparison of programming languages](#)
- [Comparison of regular expression engines](#)
- [Computational X](#)
- [Dynamic programming language](#)
- [Fourth-generation programming language](#)
- [Functional programming](#)
- [List of computer algebra systems](#)
- [List of computer simulation software](#)
- [List of graphing software](#)
- [Literate programming](#)
- [Mathematical markup language](#)
- [Mathematical software](#)
- [Wolfram Alpha](#), a web answer engine
- [Wolfram Language](#)
- [Wolfram SystemModeler](#), a physical modeling and simulation tool which integrates with Mathematica

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External links

- [Official website \(https://www.wolfram.com/mathematica/\)](https://www.wolfram.com/mathematica/)
- [Mathematica Documentation Center \(https://reference.wolfram.com/language/\)](https://reference.wolfram.com/language/)
- [A little bit of Mathematica history \(https://www.12000.org/my_notes/compare_mathematica/index.htm\)](https://www.12000.org/my_notes/compare_mathematica/index.htm) documenting the growth of code base and number of functions over time

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