

A short introduction to Mathematica

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Outline

- 1 Introduction
- 2 A glimpse of Mathematica's power
- 3 More information

Some facts

- Technical computing software
- Originally conceived by Stephen Wolfram (1988)
- Developed by Wolfram Research, Champaign, Illinois, USA
- Current version: 10.0



Some facts

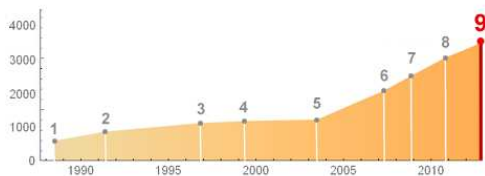
All-in-one platform: functionality outperforms classical 'mathematical' software

- Built-in data
- Built-in parallel computing
- Hybrid computations
- Interactivity
- Multiparadigm Language
- No toolboxes
- Visualization and graphics

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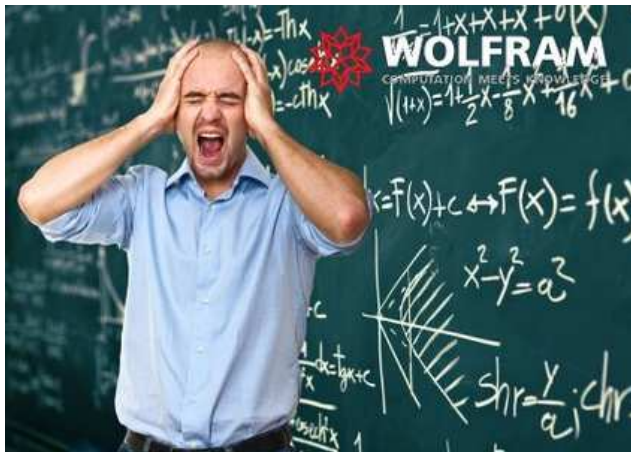
All-in-one platform: functionality outperforms classical 'mathematical' software

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- **No toolboxes**
- Visualization and graphics



Number of built-in functions vs. time

Mathematica system



Key features

- Linear algebra and calculus
 - Differentiation, integration, Fourier analysis, integral transforms, ...
 - Matrix decompositions, eigenvalues, matrix functions, ...
 - Sparse matrices
 - Both numeric and symbolic
- Numeric and symbolic equation solving capabilities
 - algebraic equations
 - differential equations (FDM, FEM)
 - inequalities
 - recurrence equations
 - systems of algebraic, differential and recurrence equations
- Optimization
 - Constrained and unconstrained local optimization
 - Constrained and unconstrained global optimization
 - Linear programming

Key features

- Probability and statistics
 - Numerous built-in discrete and continuous distribution distributions
 - Empirical distributions from data
 - Classical statistics
 - Large-scale data analysis
 - Statistical model analysis
- Graphs and network analysis
 - Directed, undirected, and weighted graphs
 - Hundreds of built-in Mathematica functions and standard graph algorithms
 - Metrics and centrality measures to characterize graphs and networks
 - Graph operations and modifications
- Data integration and computable data
 - Automatic handling of hundreds of data formats
 - Integrated access to curated static and dynamic data

Key features

- Fully customizable instant GUIs
- Built-in parallel computing
 - Multicore parallelism standard with zero configuration
 - Automatic parallel versions of iteration and functional operations
 - High-level mechanisms for distributing definitions to subkernels
 - Distribution and management of the tasks is entirely automatic
 - HPC!
- Multiparadigm programming language
 - procedural
 - functional
 - rule-based
 - pattern-based

Documentation

- 10,000 pages on Mathematica functions with 100,000 examples
- Numerous tutorials, downloadable free of charge
- On-line seminars and screencasts
- Wolfram Demonstrations Project

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The screenshot shows the Wolfram Demonstrations Project website. At the top, there is a search bar and navigation links: TOPICS, LATEST, ABOUT, PARTICIPATE, and AUTHORIZING AREA. The main content area features a large banner with the text "Bring ideas to life from recreation & education to research & industry Start exploring >". To the right of the banner is a video player showing a demonstration. Below the banner is a section titled "FEATURED DEMONSTRATIONS" with a "View latest >" link. This section displays a grid of 24 small thumbnail images representing various mathematical demonstrations, such as fractals, geometric patterns, and data visualizations.

Wolfram CDF Player

- CDF: Computable Document Format
 - allows to stuff documents with easy-to-author interactivity
 - readers can generate results live
 - means to communicate research results
 - easy enough for non-programmers to create interactive content
- CDF Player
 - interaction with applications from the Wolfram Demonstrations Project
 - explore interactive documents in a web browser
 - view Mathematica examples, reports, and files
 - no code editing
 - Available on Athena and Zephyr


Wolfram Demonstrations Project

- Initiated in 2007
- Dynamic computation
- Illuminate concepts in science, technology, mathematics, finance, . . .
- Free, open-code resource
- Developed in Mathematica
- For use in classrooms or at conferences
- Accessible with the Wolfram CDF Player
- Can be embedded in websites or blogs
- Used in the remainder of this session


Resources

- Learning center
- Knowledge base
- Training
- Mathematica community









Industry »
For professionals and researchers



Education »
For educators and students



Know What You're Looking For?

<p> Documentation and "How Tos" » Explore comprehensive materials covering every function and application</p> <p> Videos and Screencasts » Learn through introductions, tutorials, user stories, examples, and more</p> <p> Mathematica Demonstrations » Download interactive examples with full source code from science, engineering, and more</p> <p> The Mathematica Journal » Read the journal dedicated to Mathematica-related topics and solutions</p>	<p> Wolfram Training » Learn from our instructors and developers in on-demand and live courses</p> <p> Mathematica Books » Browse some of the latest Mathematica-related books</p> <p> Printed Tutorial Collection » Get the full set of Mathematica tutorials in convenient printed form</p> <p> Wolfram Library Archive » Browse thousands of downloadable resources and references for Mathematica</p>
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Looking for materials for your seminar, presentation, or lecture? [Contact us »](#)

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The screenshot shows the Wolfram Training website interface. At the top, the logo "Wolfram Training" is displayed in red and white, with the tagline "Your resource for learning Wolfram technologies" to its right. Below the logo is a navigation menu with tabs for "Overview", "Courses", "Calendar", "Special Events", "Onsite Training", and "Instructors". The "Calendar" tab is currently selected and highlighted in red. The main content area is titled "Course Catalog" in red. Below the title, there is a paragraph of text: "Learn about *Mathematica*, the Computable Document Format (CDF), and other Wolfram technologies. Wolfram Training courses include quick starts to cover the basics and in-depth looks at concepts and applications. Watch courses on demand according to your schedule or join live courses online, in a classroom, or at your organization." Below this text, there are two course cards. The first card is for "General Mathematics" and features a red icon with a white pi symbol (π). The text below the icon reads: "General Mathematics", "Overviews and detailed introductions to data processing, numerics, and other areas", and "Browse courses >". The second card is for "Image Processing" and features a red icon with a white camera symbol. The text below the icon reads: "Image Processing", "Real-world applications of a comprehensive image processing environment", and "Browse courses >".

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