The Quest for Computable Knowledge — A Short Timeline

The concept of computable knowledge has a long history.
Here are a few of the highlights, viewed from a Wolfram|Alpha perspective.

Arithmetic (~20000 BC)
Counting abstract objects
The invention of arithmetic provided a way to compute abstractly about numbers of objects.

Written language (~4000 BC)
A systematic way to record knowledge
A central event in the emergence of civilization, written language provided a systematic way to record and transmit knowledge.

Babylonian census (3800 BC)
Taking stock of a kingdom
The Babylonian census began the practice of systematically counting and recording people and commodities, for taxation and other purposes.

Babylonian astronomy (~500 BC)
Using arithmetic to predict the heavens
The Babylonians introduced mathematical calculation as a way to find the behavior of planets and a few other systems in nature.

Pythagoras (~500 BC)
Numbers are the key to nature
The Pythagoreans promoted the idea that numbers could be used to systematically understand and compute aspects of nature, music, and the world.

Panini (~400 BC)
Finding the rules of human language
Panini created a grammar for Sanskrit, forming the basis for systematic linguistics.

Aristotle (~350 BC)
Classifying the world, and introducing logic
Aristotle tried to systematize knowledge, first by classifying objects in the world, and second, by inventing the idea of logic as a way to formalize human reasoning.

Library of Alexandria (~300 BC)
Collecting the world's knowledge
The Library of Alexandria collected perhaps half a million scrolls, with works covering all areas of knowledge.

Archimedes (~200 BC)
Computing as a basis for technology
Archimedes used mathematics to create and understand technological devices, and may have built gear-based mechanical astronomical calculators.

Ramon Lull (1300)
Creating knowledge by combinations
Ramon Lull promoted a scheme for systematically creating knowledge from formal combinations of ideas.

John Graunt etc. (1660)
Inventing the idea of statistics
Graunt and others started to systematically summarize demographic and economic data using statistical ideas based on mathematics.

Isaac Newton (1687)
Mathematics as a basis for natural science
Newton introduced the idea that mathematical rules could be used to systematically compute the behavior of systems in nature.

Gottfried Leibniz (1700)
Answering questions using computation
Leibniz promoted the idea of answering all human questions by converting them to a universal symbolic language, then applying logic using a machine. He also tried to organize the systematic collection of knowledge to use in such a system.

British Museum (1700)
Collecting everything in a museum
The British Museum was founded as a "universal museum" to collect every kind of object, natural and artificial.

Carl Linnaeus (1750)
Creating a taxonomy for life
Linneaus systematized the classification of living organisms, introducing ideas like binomial naming.

***Encyclopedia Britannica* etc. (1768)**
Printing collected knowledge
The *Encyclopedia Britannica*—and the *Encyclopédie* of Diderot and d'Alembert—attempted to summarize all current knowledge in book form.

Charles Babbage (1830)
Printing mathematical tables by machine
Babbage constructed a mechanical computer to automate the creation of mathematical knowledge.

Melvil Dewey (1876)
Classifying the world's knowledge
Dewey invented the Dewey Decimal scheme for classifying the world's knowledge, and specifying how to organize books in libraries.

Gottlob Frege (1879)
Axiomatizing knowledge through logic
Frege created a formal system and language in which mathematical and other knowledge could be represented in terms of an extended form of logic.

***Oxford English Dictionary* (*OED*) (1880s)**
Collecting every word in English
With extensive information supplied by a network of volunteers, the *OED* was a systematic project to get complete knowledge of the words in English.

Hermann Hollerith (1890)
Automating the census with punched cards
Hollerith took all the data from the U.S. Census, and put it onto punched cards, which could then automatically be tabulated. The company he started was an ancestor of IBM.

Mundaneum (1910)
Collecting the world's knowledge on index cards
Two Belgian lawyers collected 12 million index cards of information, planning to create a world center for answering factual questions.

Alan Turing (1936)
The concept of universal computation
Turing showed that any reasonable computation could be done by programming a fixed universal machine—and then speculated that such a machine could emulate the brain.

Vannevar Bush (1945)
The concept of a computerized encyclopedia
Bush speculated on the idea of a "memex" device that would provide computerized access to the world's knowledge.

Digital computers (1950s)
Automating the process of computation
The arrival of digital electronic computers provided the mechanism by which computations of all kinds could be automated with increasing efficiency.

Computational linguistics (1955 etc.)
Algorithms for human language
Computational linguistics put the concepts of grammar into an algorithmic form that promised to automate processes of language understanding.

Computer languages (1958)
Languages for programming tasks
Fortran, COBOL and other early computer languages defined the concept of a precise formal representation for tasks to be performed by computers.

Pop-culture computers (1950s–1960s)
Imagining intelligent machines
From the Tracy and Hepburn movie *Desk Set* to TV's *Batman* and *Star Trek* to HAL in *2001:A Space Odyssey* and the robots of Isaac Asimov, the public became used to the idea that computers would eventually have human-like knowledge and reasoning.

Artificial Intelligence (1950s–1960s)
Making computers intelligent
Artificial Intelligence (AI) defined a research program for developing computers that show general intelligence—and led to many spinoffs important for specific purposes.

Hypertext etc. (~1960)
Imagining connectivity in the world's knowledge
The concept of links between documents began to be discussed as a paradigm for organizing textual material and knowledge.

Relational databases (1970s)
Making relations between data computable
Relational databases and query languages allowed huge amounts of data to be stored in a way that made certain common kinds of queries efficient enough to be done as a routine part of business.

Interactive computing (1970s–1980s)
Getting immediate results from computers
With the emergence of progressively cheaper computers, it became possible to do computations immediately, integrating them as part of the everyday process of working with knowledge.

Expert systems (1970s–1980s)
Capturing expert knowledge as inference rules
Largely as an offshoot of AI, expert systems were an attempt to capture the knowledge of human experts in specialized domains, using logic-based inferential systems.

Neural networks (1980s)
Handling knowledge by emulating the brain
With precursors in the 1940s, neural networks emerged in the 1980s as a concept for storing and manipulating various types of knowledge using connections reminiscent of nerve cells.

Cyc (1984)
Creating a computable database of common sense
Cyc has been a long-running project to encode facts of common sense in a computable form.

***Mathematica* (1988)**
Language for algorithmic computation
Mathematica was created to provide a uniform system for all forms of algorithmic computation, by defining a symbolic language to represent arbitrary constructs, and then assembling a huge web of consistent algorithms to operate on them.

The Web (1989)
Collecting the world's information
The web has grown to provide billions of pages of freely available information from all corners of our civilization.

Google (1997)
An engine to search the web
Google and other search engines provide highly efficient capabilities to do textual searches across the whole content of the web.

Wikipedia (2001)
Self-organized encyclopedia
Volunteer contributors have assembled millions of pages of encyclopedia material, providing textual descriptions of practically all areas of human knowledge.

***A New Kind of Science* (2002)**
Exploring the computational universe
Stephen Wolfram explored the universe of possible simple programs, and showed that knowledge about many natural and artificial processes could be represented in terms of surprisingly simple programs.

Web 2.0 (early 2000s)
Societally organized information
Social networking and other collective websites defined a mechanism for collectively assembling information by and about people.