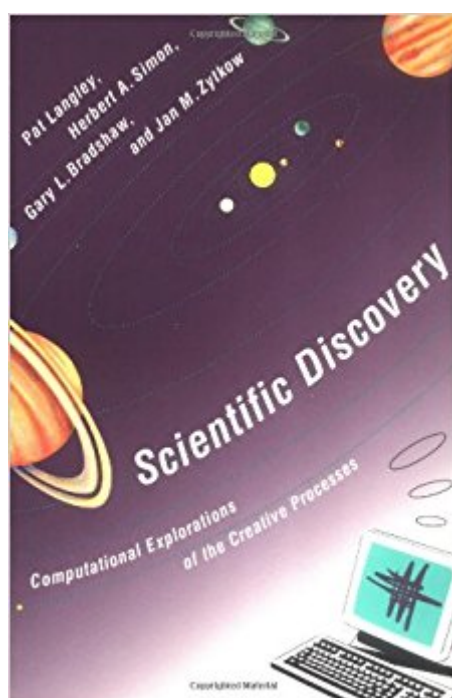The book was found

Scientific Discovery: Computational Explorations Of The Creative Processes

Synopsis

Scientific discovery is often regarded as romantic and creative -- and hence unanalyzable -- whereas the everyday process of verifying discoveries is sober and more suited to analysis. Yet this fascinating exploration of how scientific work proceeds argues that however sudden the moment of discovery may seem, the discovery process can be described and modeled.Using the methods and concepts of contemporary information-processing psychology (or cognitive science) the authors develop a series of artificial-intelligence programs that can simulate the human thought processes used to discover scientific laws. The programs -- BACON, DALTON, GLAUBER, and STAHL -- are all largely data-driven, that is, when presented with series of chemical or physical measurements they search for uniformities and linking elements, generating and checking hypotheses and creating new concepts as they go along. Scientific Discovery examines the nature of scientific research and reviews the arguments for and against a normative theory of discovery; describes the evolution of the BACON programs, which discover quantitative empirical laws and invent new concepts; presents programs that discover laws in qualitative and quantitative data; and ties the results together, suggesting how a combined and extended program might find research problems, invent new instruments, and invent appropriate problem representations. Numerous prominent historical examples of discoveries from physics and chemistry are used as tests for the programs and anchor the discussion concretely in the history of science.

Book Information

Series: MIT Press

Paperback: 344 pages

Publisher: The MIT Press (February 24, 1987)

Language: English

ISBN-10: 0262620529

ISBN-13: 978-0262620529

Product Dimensions: 6 x 0.8 x 9 inches

Shipping Weight: 1.1 pounds (View shipping rates and policies)

Average Customer Review: 5.0 out of 5 stars   2 customer reviews

Best Sellers Rank: #668,206 in Books (See Top 100 in Books)   #39 inÃ Â Books > Science & Math > Experiments, Instruments & Measurement > Microscopes & Microsocopy   #1796 inÃ Â Books > Medical Books > Psychology > Cognitive   #2685 inÃ Â Books > Science & Math > Behavioral Sciences > Cognitive Psychology

Customer Reviews

Scientific Discovery examines the nature of scientific research; reviews the arguments for and against a normative theory of discovery; describes the evolution of the BACON programs, which discover quantitative empirical laws and invent new concepts; presents programs that discover laws in qualitative and quantitative data; and ties the results together, suggesting how a combined and extended program might find research problems, devise new instruments, and invent appropriate problem representations.

Pat Langley is Associate Professor, Department of Information and Computer Science, University of California, Irvine.Herbert Simon is Professor of Psychology at Carnegie-Mellon University. He was awarded the Nobel Prize in economics in 1978.

Computational philosophy of science will define twenty-first philosophy of science, and it has already started. This book by Herbert Simon, Nobel laureate and one of the founders of artificial intelligence, describes several computerized discovery systems created under Simon's direction at Carnegie-Melon University in the 1980's.In his book titled Novum Organon Francis Bacon had expressed the view that with a few easily learned rules or a method it may be possible for anyone undertaking scientific research to be successful. Today Bacon's agenda is called proceduralization for computerized mechanization, and it is appropriate therefore that one of the most extraordinary discovery systems - Pat Langley's - should be named BACON.The BACON discovery system is actually a set of successive and increasingly sophisticated discovery systems that make quantitative empirical laws and theories. Given sets of observation measurements for two or more variables, BACON searches for functional relations among the variables. The original version was designed and implemented by Pat Langley in 1979 as the thesis for his Ph.D. dissertation at Carnegie-Mellon department under Simon's direction.System BACON has rediscovered several historically significant empirical laws including Boyle's law of gases, Kepler's third planetary law, Galileo's law of motion of objects on inclined planes, Boyle's ideal gas law, Coulomb's law of electrical current, Ohm's law of electrical circuits, Archimedes law of displacement, Black's law of specific heat, Newton's law of gravitation, the law of conservation of momentum, and the laws describing chemical reactions formulated by Dalton, Gay-Lussac, and Comizzaro.Other discovery systems also described in this book are: System GLAUBER named after the eighteenth century chemist, Johann Rudolph Glauber, who contributed to the development of the acid-base theory. System STAHL named after the German chemist, Georg Ernst Stahl, who developed the phlogiston theory of combustion.

System DALTON named after John Dalton, who developed the atomic theory of matter. Readers interested in more commentary on Simon are referred to Twentieth-Century Philosophy of Science: A History and Philosophy of Science: An Introduction (Second Edition). Thomas J. Hickey

A book which opens a new direction in mankind's outlook towards itself. Talks about how the ultimate quality, namely the creativity, which distinguishes humans from all the animals, is not unique. Should be compulsory reading for all students of computers, if not everybody. Hundred years form now, scientists will call this the first book ever published.

Scientific Discovery: Computational Explorations of the Creative Processes Computational Fluid Mechanics and Heat Transfer, Third Edition (Series in Computational and Physical Processes in Mechanics and Thermal Sciences) Discovery Map 85: Cork Kerry (Discovery Maps): Cork Kerry (Discovery Maps) (Irish Discovery Series) The Great Age of Discovery, Volume 2: Captain Cook and the Scientific Explorations Explorations: Through the Wormhole (Explorations Volume One) Explorations: War (Explorations Volume Three) The Graphic Designer's Digital Toolkit: A Project-Based Introduction to Adobe Photoshop Creative Cloud, Illustrator Creative Cloud & InDesign Creative Cloud (Stay Current with Adobe Creative Cloud) The Computational Beauty of Nature: Computer Explorations of Fractals, Chaos, Complex Systems, and Adaptation The Computational Beauty of Nature: Computer Explorations of Fractals, Chaos, Complex Systems, and Adaptation (MIT Press) Computational Explorations in Magnetron Sputtering Current Topics in Computational Molecular Biology (Computational Molecular Biology) Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems (Computational Neuroscience Series) Simulating Enzyme Reactivity: Computational Methods in Enzyme Catalysis (Theoretical and Computational Chemistry Series) Computational Approaches to Protein Dynamics: From Quantum to Coarse-Grained Methods (Series in Computational Biophysics) The Power of Computational Thinking:Games, Magic and Puzzles to Help You Become a Computational Thinker Computational Fluid Mechanics and Heat Transfer, Second Edition (Series in Computional and Physical Processes in Mechanics and Thermal Sciences) Heat Conduction Using GreenÃ¢ ¬â„¢s Functions, 2nd Edition (Series in Computational Methods and Physical Processes in Mechanics and Thermal Sciences) Positive Psychology: The Scientific and Practical Explorations of Human Strengths Scientific Computing with MATLAB and Octave (Texts in Computational Science and Engineering) An Introduction to Scientific Computing: Twelve Computational Projects Solved with MATLAB (Texts

in Applied Mathematics)