Judea Pearl Wins ACM Turing Award for Contributions to Artificial Intelligence

The A.M. Turing Award, sometimes referred to as the "Nobel Prize" of Computing, was named in honor of Alan Mathison Turing (1912–1954), a British mathematician and computer scientist. He made fundamental advances in computer architecture, algorithms, formalization of computing, and artificial intelligence. Turing was also instrumental in British code-breaking work during World War II.

CITATION

For fundamental contributions to artificial intelligence through the development of a calculus for probabilistic and causal reasoning.

Pearl's Work

Judea Pearl's work has transformed artificial intelligence (AI) by creating a representational and computational foundation for the processing of information under uncertainty. Pearl's work went beyond both the logic-based theoretical orientation of AI and its rule-based technology for expert systems. He identified uncertainty as a core problem faced by intelligent systems and developed an algorithmic interpretation of probability theory as an effective foundation for the representation and acquisition of knowledge.

Focusing on conditional independence as an organizing principle for capturing structural aspects of probability distributions, Pearl showed how graph theory can be used to characterize conditional independence, and invented message-passing algorithms that exploit graphical structure to perform probabilistic reasoning effectively. This breakthrough has had major impact on a wide variety of fields where the restriction to simplified models had severely limited the scope of probabilistic methods; examples include natural language processing, speech processing, computer vision, robotics, computational biology, and error-control coding.

Equally significant is Pearl's work on causal reasoning, where he developed a graph-based calculus of interventions that makes it possible to derive causal knowledge from the combined effects of actions and observations. This work has been transformative within AI and computer science, and has had major impact on allied disciplines of economics, philosophy, psychology, sociology, and statistics.