



H a l l o f F a m e

# AI's Hall of Fame

In 2010, as the part of the celebration of the 25th anniversary of *IEEE Intelligent Systems* magazine, our editorial and advisory boards decided to launch the *IEEE Intelligent Systems* Hall of Fame to express our appreciation and respect for the trailblazers who have made significant contributions to the field of AI and intelligent systems and to honor them for their notable impact and influence on our field and our society.

When we first began our search for candidates, we did not think we would be so overwhelmed. It quickly became clear that there was an immense number of amazing, talented individuals conducting relevant and innovative research in the AI and intelligent systems field across the globe.

The task of selecting from such an accomplished list was an extremely difficult process, and we proceeded with great care and consideration. I would like to express my sincere thanks to all the members of our editorial and advisory boards for their great effort in this endeavor.

It is always exciting to see that there are people with such passion in a field, and we hope that our Hall of Fame will be a way to recognize and promote creative work and progress in AI and intelligent systems.

Now, I proudly present the inaugural induction of the *IEEE Intelligent Systems* Hall of Fame. Congratulations to our first ever Hall of Fame recipients!

—Fei-Yue Wang, Editor in Chief



## HALL OF FAME

# Lotfi Zadeh

**Lotfi Zadeh** is a mathematician, electrical engineer, computer scientist, professor of computer science, and the director of the Berkeley Initiative in Soft Computing (BISC) at the University of California, Berkeley. He received an MS in electrical engineering from the Massachusetts Institute of Technology and a PhD in electrical engineering from Columbia University. He published his seminal work on fuzzy sets in 1965, in which he detailed the mathematics of fuzzy set theory. In 1973, he proposed his theory of fuzzy logic. Zadeh is also credited, along with John R. Ragazzini, with having pioneered the development of the z-transform method in discrete time signal processing and analysis in 1952. These methods are now standard in digital signal processing, digital control, and other discrete-time systems used in industry and research. In 1991, Zadeh introduced the concept of soft computing, which highlights the emergence of computing methodologies in which the accent is on exploiting the tolerance for imprecision and uncertainty to achieve tractability, robustness, and low solution cost. He has received the Benjamin Franklin Medal, IEEE Richard W. Hamming Medal, ACM Allen Newell Award, and AIM Information Science Award. He is also a member of the National Academy of Engineering and a foreign member of the Russian Academy of Natural Sciences.

# Fuzzy Logic and Computational Intelligence

By Derong Liu

**A**s an indispensable constituent of AI, fuzzy logic is a super-set of conventional (Boolean) logic that has been extended to handle the concept of partial truth, where the truth value can range between completely true and completely false. As the creator

of a new field of mathematics—fuzzy set theory and fuzzy logic—Lotfi Zadeh’s intellectual contributions are myriad. He is also known for his research in system theory, information processing, AI, expert systems, natural language understanding, and the theory of evidence. His current research is focused on fuzzy logic, computing with words, and soft computing, which is a coalition of fuzzy logic, neurocomputing, evolutionary computing, probabilistic computing, and parts of machine learning.

In 1965, Zadeh conceived of the idea that developed into what is now known as fuzzy logic, a model for human reasoning in which everything, including truth, is a matter of degree. The theory challenges classical logic’s belief in absolute true or false. Although initially met with disdain, fuzzy logic is widely accepted today, with

applications for everything from consumer products, industrial systems, and operations research to medicine, geology, and physics.

Because of the importance of the relaxation of Aristotelian logic, which opens up applicability of rational methods to the majority of practical situations without dichotomous truth values, Zadeh is one of the most referenced authors in the applied mathematics and computer science fields. In the theory of fuzzy sets, he proposed using a membership function (with a range covering the interval  $[0, 1]$ ) operating on the domain of all possible values. He proposed new operations for the calculus of logic and showed that fuzzy logic was a generalization of classical and Boolean logic. He also proposed fuzzy numbers as a special case of fuzzy sets, as well as the

corresponding rules for consistent mathematical operations (fuzzy arithmetic). In addition, Zadeh is credited, along with John R. Ragazzini, in 1952, with having pioneered the development of the z-transform method in discrete time signal processing and analysis. These methods are now standard in digital signal processing, digital control, and other discrete-time systems used in industry and research.

Lotfi Zadeh belongs to a world where there are no boundaries limited to time or place. He really is best characterized as an internationalist. He is a fellow of IEEE, American Academy of Arts and Sciences, ACM, AAAI, and International Fuzzy Systems Association (IFSA). He has published extensively on a wide variety of subjects relating to the conception, design, and analysis of information and intelligent systems and serves on the editorial boards of more than 60 journals.

**Derong Liu** is a professor in the Institute of Automation, Chinese Academy of Sciences, and a professor in the Department of Electrical and Computer Engineering at the University of Illinois at Chicago. He is also the editor in chief of the *IEEE Transactions on Neural Networks*.