

Citation

For outstanding contributions to research in language technologies, machine learning and computational biology in the field of artificial intelligence



Dr. Jaime Carbonell

Positions and Organizations :

Director, Language Technologies Institute, Carnegie Mellon University (CMU)
 Allen Newell Professor of Computer Science, Carnegie Mellon University
 University Professor, Carnegie Mellon University

Doctorate : Ph.D. in Computer Science(Yale University. 1979)

Date of Birth : July 29, 1953

Brief Biography :

1975 BS in Physics and Mathematics, MIT
 1976 MS in Computer Science, Yale University
 1979 Ph.D. in Computer Science, Yale University
 1979 Assistant Professor, Computer Science, CMU
 1983 Associate Professor, Computer Science, CMU
 1987 Professor, Computer Science, CMU
 1995 Allen Newell Chair, Computer Science, CMU
 1996 Director, Language Technologies Institute, CMU
 2012 University Professor, CMU

Main Awards and Honors :

1984 Sperry Research-Excellence Award
 1986 Inaugural Herbert Simon Award for Teaching Excellence
 1988 Elected AAAI Fellow
 1988-1992 Appointed to NIH Human Genome Scientific Committee
 1997-2014 Multiple best-paper nominations and awards

Research grants from NSF, DARPA, IARPA, NIH, Industry, totaling over \$100M USD

Main Achievements :

Dr. Carbonell received a dual BS degree in Physics and Mathematics from MIT in 1975 with an undergraduate thesis in high-energy X-ray Astronomy. He received MS and Ph.D. degrees from Yale University in Computer Science in 1976 and 1979, respectively, completing a dissertation titled "Subjective Understanding: Computer Models of Belief Systems." He was the appointed Assistant Professor of Computer Science at Carnegie Mellon University in 1979, and was promoted to Associate Professor in 1983, Full Professor in 1987, and University Professor in 2012.

In the early 1980's, Dr. Carbonell, Dr. Mitchell, and Dr. Michalski founded the field of modern Machine Learning, publishing: *Machine Learning: An Artificial Intelligence Approach, volumes I and II*, launching and organizing the first three *International Conferences in Machine Learning (ICML)*, and starting the journal *Machine Learning*; Dr. Carbonell served as editor-in-chief for four years. He has continued working actively in machine learning making multiple contributions with his students, among them: 1) Learning by Transformational Analogy and by Derivational Analogy (1981-1986), 2) Generalizing

Conditional Random Fields (CRFs) into joint-optimization networks of CRFs for contextualized processing of biological sequences and natural language semantics (2002-2007), 3) Inventing Proactive Machine Learning, as the joint-optimization of information value, information acquisition cost, and information source reliability (2007-2015), and 4) making major contributions to the theory and practice of Transfer Learning and Multi-Task Learning (2012-2015).

In parallel with his foundational research in Machine Learning, Dr. Carbonell has worked on machine translation, following an interlingual approach for semantically well-defined domains (1981-1992), and an example-based approach for more open domains (1990-2000). The latter was based on Dr. Nagao's early proposal of "translation by analogy", scaled up, and subsequently merged with statistical machine translation. Having also worked on natural language human-machine interfaces, Dr. Carbonell unified the fields of natural language processing, machine translation, information retrieval, information extraction, speech processing and dialog modeling, coining the term "Language Technologies." This included founding the institute at CMU by that name, which he directs. He made many contributions to the field beyond the cited machine translation methods, including: 1) robust semantic parsing of ungrammatical language (1983-1990), 2) the Maximal Marginal Relevance principle for text summarization and information retrieval (1996-2000), and 3) analysis and translation methods for rare languages with very sparse resources (2010-Present).

On a third parallel track, Dr. Carbonell and his students made substantial contributions to Computational Biology, focusing on Computational Proteomics, including: 1) Prediction of 3D protein structure (a.k.a. the "protein folding problem") using machine learning methods such as generalized CRFs based on primary sequences and biophysical features (his student Yan Liu received a runner-up award in the ACM international dissertation competition in 2007 for this work, the only such ACM award for computational biology), 2) Predicting protein-protein interactions within an organism and also across organisms for host-pathogen infection pathways, based on proactive learning and multi-task transfer learning (2009-Present).

In addition to his academic achievements, Dr. Carbonell has served in multiple scientific advisory boards in the United States and Europe, including the NSF-CISE scientific advisory board, the NIH human genome scientific committee (the only computer scientist at its inception), and the German National Laboratories for Artificial Intelligence (DFKI). He has also co-founded several successful start-up companies in Artificial Intelligence and in technology-enhanced education.

For outstanding contributions to research in language technologies, machine learning and computational biology in the field of artificial intelligence, Dr. Jaime Carbonell is hereby awarded the Okawa Prize.