Obituary

Alberto Bertoni

(1946-2014)

Alberto Bertoni passed away on February 10, 2014, after a long struggle with a cancer that resisted surgery and therapy. This is a tremendous loss for his wife Luciana, for his friends and colleagues, and for the community of theoretical computer science in which he played a prominent role.

Alberto was born in Barlassina, Italy, the 17th of July, 1946. He obtained the degree in Physics, cum laude, at the University of Milan, 22nd July, 1970. He was Assistant Professor in Cybernetics at the Department of Physics, University of Milan, from 1976 to 1980. In 1981 he obtained a position as full professor in Computer Science and, after a short period at the University of Cosenza, he came back to Milan and was one of the founders of the Department of Information Sciences of the University of Milan and one of the organizers and first professors of the degree in Information Sciences, a degree that did not exist before in Milan.

In the booming decade from 1980 to 1990 the number of students rapidly increased to about 5000, and Alberto passionately devoted much of his energies to an intense and varied teaching activity. In 35 years he taught courses that covered many aspects of algorithms and theoretical computer science, but also of combinatorics and discrete mathematics. These course ranged from first or second year classes on Algebra, Algorithms and Data Structures, Analysis and Design of Algorithms, Formal Languages and Compilers, to more advanced courses on Signal Processing, Neural Networks, Computability, to very specialized courses on research related topics in the areas of Structural Complexity Theory, Algorithms and Combinatorics, Signal Processing, Combinatorial Optimization, Game Theory for the PhD students in Computer Science.

His lectures were always well prepared and fascinating, and he was able to captivate the students attention even when explaining very complex topics.

He was advisor of more than 200 laurea theses in the degrees of Computer Science, Mathematics, Physics and more than 20 PhD theses in Computer Science, Mathematics and Engineering.

To his disciples and advisees Alberto taught not only the notions, the methods and the technicalities of the different topics of theoretical computer science, but above all the love for pure research itself.

In fact, Alberto was a very gifted researcher, guided by his curiosity and enthusiasm, with a rare capability of identifying interesting research problems, formalizing them, and finding solutions.

His research activity covered an impressive range in the area of Theoretical Computer Science: in computability and complexity, probabilistic and quantum machines, formal languages, computational learning, theoretical aspects of neural networks and genetic models. This research is documented by more than 120 papers in international journals and conference proceedings. In particular, in complexity theory he solved open problems on probabilistic automata and studied problems of simulation among computational models (for instance he proved that the enumeration problems in the class #-PSPACE can be solved by arithmetic RAMs with a polynomial number of operations) and the classification of counting and ranking problems. Furthermore, he studied the minimum amount of resources such as space, head inversions and non determinism degree needed to recognize non regular languages in some models of Turing Machines. Similar techniques were applied to picture languages, showing that the class of unary tiling recognizable picture languages is characterized by languages accepted by Turing machines with bounds on space and head inversions.

An important example of his ability to apply deep mathematical concepts to problems arising in computer science is his proposal to use the theory of free partially commutative monoids to model concurrent processes. This idea linked the theory of trace languages to the more general context of formal languages, to

which Alberto and his research group contributed many results on membership problems and on characterization of classes of trace languages.

In the area of random generation and counting algorithms, he designed a linear algorithm for random generation of words in regular languages with fixed number of occurrences of the symbols, and also gave results on asymptotic estimation of the number of words in regular languages with fixed number of occurrences of the symbols, with applications to pattern statistics. More recently, he introduced new models of quantum automata, and compared them with stochastic automata, exploring the advantages of using quantum devices in computation over probabilistic models. Furthermore, he gave significant contributions to the area of bioinformatics, designing and experimenting supervised and unsupervised learning algorithms based on random projections with application to biomolecular data clustering.

The Italian and European community of theoretical computer science owe much to Alberto also for his promotional and organizing activity.

He was co-promoter of the Italian Chapter of the European Association of Theoretical Computer Science (ICh-EATCS) and first President of the Chapter for 6 years. He was for 6 years the Italian member in the Council of the European Association of Theoretical Computer Science.

He contributed to the birth of the Italian Society for Neural Networks (SIREN), and was member of its Scientific Council. He was member of the Academic Senate for the revision of the Statute of the University of Milan. He was member of Scientific Committee of the Institute for Applied Mathematics and Informatics of the CNR (IAMI-CNR), and member IFIP TC1. He was the Director of the PhD school in Computer Science, Milano-Torino, for 4 years and President of the Council of the degree in Computer Science, University of Milan, for 6 years.

He was the Director of the Department of Information Sciences, University of Milan, for 6 years (2003-09). He was member of the programme committee of several International Conferences (CAAP, STACS, AdPeNets, DLT, MFCS, SOFSEM, . . .), and of the Editorial Board of Theoretical Informatics and Applications.

Those who had the fortune to study and work with Alberto will always remember his strong personality, his honesty, his warm friendship, his scientific generosity, his clarity and originality, and also his passion for the mountains which he transmitted to many of his students and collaborators.

Giancarlo Mauri and Nicoletta Sabadini
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