Franco Scarselli

Prof. Franco Scarselli received the Laurea degree with honors in Computer Science from the University of Pisa, Italy, and the PhD degree in Computer Science and Automation Engineering from the University of Florence. From 1999, he is at the University of Siena, where he was, initially, a research associate and, presently, an associate professor at Department of Information Engineering and Mathematics. In 2013, he received the Italian scientific habilitation as full professor.

Franco Scarselli has been visiting researcher at the University of Queensland, Australia, in 1994, at the University of Wollongong, Australia, in 2001 and 2004, and at the Macau University of Science and Technology, Macau, in 2012. He has given invited talks on Deep learning and Graph Neural Networks at Chu Hai College of Higher Education, Hong Kong, in April, June and October 2017, at Kickoff-GAIN, University of Kassel, in May 2021, at GNNNet Workshop in Rome in 2022.

He has been guest editor of a special issue on "Pattern Recognition in Graphical Domains", on Neurocomputing, 2009, co-editor of the book "Innovations in Neural Information Paradigms and Applications", in Studies in Computational Intelligence, Springer, 2009, co-organizer of three special sessions at KES conferences (International Conference on Knowledge-Based and Intelligent Information & Engineering Systems), a special session at ESANN 2021, of GNNNet Workshop in Rome in 2022, and IEEE WCCI 2022. He has been in the program committees of several major conferences including, f.i., IJCNN, IJCAI, ESANN. He is member of IEEE, AIxIA and CVPL.

Franco Scarselli is member of the committee of the PhD in “Smart computing” run by a consortium of the University of Florence, Pisa, and Siena. He has been in charge of teaching 5 courses at PhD programmes (in Florence, Siena, Hong Kong), two on computational complexity and three on theoretical properties of neural networks. He has been tutor/co-tutor of nine PhD students.

Franco Scarselli has been involved in more than 20 research projects focused on machine learning and information retrieval, founded by the Italian Ministry of Education (PRIN and COFIN schemes), by the Australian Research Council (linkage international and discovery schemes), by the Macau Ministry (FDT scheme), by the University of Siena (PAR scheme), and by private companies.

The research activity of Franco Scarselli is in the field of machine learning, with a particular focus on artificial neural networks, neural networks for graphs, and approximation theory. From an applicative point of view, his focus is on computer vision, bioinformatics, and information retrieval.

Main contributions related to machine learning include:

- The introduction of the Graph Neural Network (GNN). The GNN has become the basis of several modern Deep Network for graphs. (see “The graph neural network model” F Scarselli, M Gori, AC Tsoi, M Hagenbuchner, G Monfardini IEEE TNNN 20 (1), 61-80, 2009).
- The study of the approximation and the generalization capability of GNNs (see “Computational capabilities of graph neural networks” F Scarselli, M Gori, AC Tsoi, M Hagenbuchner, G Monfardini IEEE TNN 20 (1), 81-102, 2009 and “The Vapnik–Chervonenkis dimension of graph and recursive neural networks”, F Scarselli, AC Tsoi, M Hagenbuchner”, Neural Networks 108, 248-259, 2018).
- The introduction of a novel measure based on topology aimed at evaluating the complexity of the function implemented by neural networks. Such a measure allows to compare deep and shallow neural networks, proving that deep networks are able to address more difficult problems, with the same number of resources. (see “On the complexity of neural network classifiers: A comparison between shallow and deep architectures”, M Bianchini, F Scarselli, IEEE TNNLS, 25 (8), 1553-1565, 2014)

- A theoretical analysis of Google's PageRank, i.e., the algorithm originally used by Google to measure the authority (importance) of Web pages. Some modern algorithms operating on graphs exploit the diffusion mechanism of PageRank (see "Inside PageRank", M Bianchini, M Gori, F Scarselli, ACM TOIT 5 (1), 92-128, 2005, more than 600 citations).
- A study on approximation properties of artificial neural networks, which provided an intuitive explanation of existing results and a simple method to construct the approximating network (see "Universal approximation using feedforward neural networks: A survey of some existing methods, and some new results", F Scarselli, AC Tsoi, Neural networks 11 (1), 15-37; 1998).