

# Franco Davoli

Full professor

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## *Education and training*

1975

### **Laurea degree in Electronic Engineering**

Theory and Programming of the Kalman Filter with Partial Information on Disturbance Statistics

University of Genoa - Genoa - IT

## *Academic experience*

1990 - ONGOING

### **Full Professor**

University of Genoa - Genoa - IT

Teaching and Research in Telecommunication Networks

1985 - 1990

### **Associate Professor**

University of Genoa - Genoa - IT

Teaching and Research in Telecommunication Networks

1989 - 1991

### **Adjunct Professor**

University of Parma - Parma - IT

Teaching Telecommunication Networks

1979 - 1985

### **Research Assistant and Adjunct Professor**

University of Genoa - Genoa - IT

Teaching and Research in Control Theory and Telecommunication Networks

1976 - 1978

### **Research Fellow**

National Research Council (CNR) - Genoa - IT

Research activity in estimation theory and decentralized control

## *Language skills*

### **Italian**

Mother tongue

### **English**

Proficient

### **Polish**

Independent

### **German**

Basic

## **French**

Basic

### ***Teaching activity***

My teaching activity started in 1979, first in Control Theory and then in Telecommunication Networks at the University of Genoa. In 1985 I became Associate Professor and since 1990 I have been Full Professor of Telecommunication Networks at the University of Genoa. From 1989 to 1991 I was also with the University of Parma, Italy, where I taught a class in Telecommunication Networks. I held again the same course from Genoa in the academic years from 1993/94 to 1995/96, by using interactive distance learning tools over ISDN. In 1995 I recorded 40 hours of lectures, with the related supporting material, for the first level degree in Telecommunications Engineering of the NETTUNO Consortium, an organization that produced and broadcasted distance learning courses all over Italy. Since 1985 I have been teaching continuously various courses in the area of Networking, at the BSc and MSc level, covering basic principles, architectures and protocols and performance evaluation.

### ***Postgraduate research and teaching activity***

#### **Supervision of PhD students, residents and post-doctoral fellows**

I have supervised over 10 PhD students and coordinated the activity of several PostDoc research fellows. I have been a member of the Council of the PhD in SCIENCE AND TECHNOLOGY FOR ELECTRONIC AND TELECOMMUNICATION ENGINEERING (STIET) at the University of Genoa since its inception.

With CNIT, I have participated in the projects Teledoc1 and Teledoc2 for the organization of lectures in ICT and their distance learning delivery to PhD students in a number of Italian university over a mixed satellite and terrestrial networks. Together with my colleague Prof. Riccardo Minciardi I produced a 10-hour module within Teledoc2 on 'Control Techniques for Quality of Service Guarantees in Multiservice Telecommunication Networks'.

### ***Research interests***

I started my research activity in Automatic Control, particularly in adaptive and decentralized control, team decision theory, large-scale systems, modeling and control of dynamic routing and multiple access in packet-switched communication networks. Even after orienting the activity to Telecommunications and, more specifically, to networking, this background has continued to be present with the constant adoption of control and optimization techniques, which have been applied in the late 80s and the 90s to dynamic resource allocation among multiple users in the presence of differentiated traffic types (best effort and guaranteed bandwidth) in multiple access protocols, routing, TDM and ATM networks, and wireless networks. Later on, starting in the early 2000s with the cooperation of

colleagues from ISTI-CNR in Pisa, we have adopted similar concepts in satellite networking, also in the presence of cross-layer optimization. At the same time, fostered by a large national project and a number of European projects, I developed an interest in more experimental sectors, focusing on distance learning with the presence of remote laboratory instrumentation, which evolved toward remote instrumentation services based on grid computing middleware and infrastructures, lasting until 2010. In that period, also stemming from a large EC-funded project, my research group focused on green networking, with particular emphasis in developing models and control strategies for networking devices adopting dynamic adaptation methods for the tradeoff between energy consumption and performance. With the growing interest in network 'softwarization' and the presence of Software Defined Networking (SDN) and Network Functions Virtualization (NFV), we have shifted our attention to control and optimization methods applied to the interaction and orchestration of virtualized networking, cloud, edge and fog computing environments and to the evolution toward fifth-generation wireless networks (5G). My current research interests are in resource allocation and control in high-speed multiservice networks, satellite and mobile radio networks, sensor networks and IoT, multimedia communications, cooperative distributed laboratories, green networking, flexible and programmable heterogeneous networks, Future Internet and 5G networks. On these and other aspects I have co-authored over 350 scientific publications in international journals, international book chapters and international conference proceedings.

## ***Grants***

**2017 - ONGOING**

### **A Holistic Innovative Framework for Design Development and Orchestration of 5G-ready Applications and Network Services over Sliced Programmable Infrastructure (MATILDA)**

European Commission H2020

6664458.75 Euro - Pricipal investigator

The vision of MATILDA is to design and implement a holistic 5G end-to-end services operational framework tackling the lifecycle of design, development and orchestration of 5G-ready applications and 5G network services over programmable infrastructure, following a unified programmability model and a set of control abstractions. It aims to devise and realize a radical shift in the development of software for 5G-ready applications as well as virtual and physical network functions and network services, through the adoption of a unified programmability model, the definition of proper abstractions and the creation of an open development environment that may be used by application as well as network functions developers. Intelligent and unified orchestration mechanisms will be applied for the automated placement of the 5G-ready applications and the creation and maintenance of the required network slices. Deployment and runtime policies enforcement is provided through a set of optimisation

mechanisms providing deployment plans based on high level objectives and a set of mechanisms supporting runtime adaptation of the application components and/or network functions based on policies defined on behalf of a services provider. Multi-site management of the cloud/edge computing and IoT resources is supported by a multi-site virtualized infrastructure manager, while the lifecycle management of the supported Virtual Network Functions Forwarding Graphs (VNF-FGs) as well as a set of network management activities are provided by a multi-site NFV Orchestrator (NFVO). Network and application-oriented analytics and profiling mechanisms are supported based on realtime as well as a posteriori processing of the collected data from a set of monitoring streams. The developed 5G-ready application components, applications, virtual network functions and application-aware network services are made available for open-source or commercial purposes, re-use and extension through a 5G marketplace.

### ***Editorial activity***

I am a member of the Editorial Board of the international journals *International Journal of Communication Systems* (Wiley), *Studies in Informatics and Control*, *Infocommunications Journal*, and *Simulation: Transactions of The Society for Modeling and Simulation International (SCS)*. In 1994 I was Guest co-Editor (with Erich Lutz, DLR, Germany) of a Focus on “Multiple Access in Radio Communications Networks” in the international journal *European Transactions on Telecommunications (ETT)*, and in 2000 I was Guest co-Editor (with Hussein Mouftah, Queen’s University, Canada, and Davide Grillo, FUB, Italy) of a Special Issue of the same journal on “Service Quality Control in Multimedia Wireless Networks”. I was Guest co-Editor in 2002 (with Erina Ferro, ISTI-CNR, Italy, and Hussein Mouftah) of a Special Issue of the *International Journal of Communication Systems* (Wiley) on “Wireless Access to the Global Internet”.

I was Program Co-Chair of the 30th Summer Computer Simulation Conference (SCSC'98), Reno, NV, USA; Vice-Program Chair of the 1999 Symposium on Performance Evaluation of Computer and Communication Systems (SPECTS), Chicago, IL, USA; Program Chair of SPECTS 2000, Vancouver, Canada and of SPECTS 2001, Orlando, FL, USA; Senior Program Chair of SPECTS 2002, San Diego, CA, USA, and of SPECTS 2003, Montreal, Canada; I have been Vice-General Chair of SPECTS 2004, San Jose, CA, USA, and of SPECTS 2005, Philadelphia, PA, USA. In 2005 I was Program Co-Chair of the Tyrrhenian International Workshop on Digital Communications (TIWDC 2005), Sorrento, Italy. I was the General Co-Chair, initiator and main organizer of the INGRID Workshops (2007, 2008, and 2009), *International Workshop on Distributed Cooperative Laboratories – “Instrumenting” the Grid*. Starting in 2010, I have been Co-Chair of the Steering Committee of the INGRID Workshop series. I was Program Co-Chair of the 30th IEEE International Conference on Distributed Computing Systems (ICDCS 2010), Genoa, Italy, June 2010; General Co-Chair of the SCS Summer Simulation Multi-Conference, Genoa, Italy, July 2012; Workshop Co-Chair of IEEE INFOCOM 2013, Torino, Italy, April 2013; General Co-Chair of the 24th

Tyrrhenian International Workshop on Digital Communications (TIWDC 2013) – Green ICT, Genoa, Italy, Sept. 2013; Workshop Co-Chair of the 26th International Teletraffic Congress (ITC 26), Karlskrona, Sweden; I was General Co-Chair of SPECTS 2015, Chicago, IL, USA, and General Co-Chair of the 29th International Teletraffic Congress (ITC 29), Genoa, Italy, Sept. 2017. I was a co-organizer of the Panel on “Energy efficiency, network performance and users’ Quality of Experience in a scalable Future Internet” at the 25th International Teletraffic Congress (ITC 25), Shanghai, China, Sept. 2013. I have also taken part in the Technical Program Committee of several other conferences, including IEEE Globecom, ICC and Infocom.

I has been invited as Keynote Speaker in international conferences, among which ICETE 2007 in Barcelona, Spain; ATNAC 2010 in Auckland, New Zealand; the 1st International Workshop on Sustainable Internet and Internet for Sustainability (Sustalnet 2011) in Lucca, Italy; NGI 2012 in Karlskrona, Sweden; the 22nd ITC Specialist Seminar on Energy Efficient and Green Networking (SSEEGN 2013) in Christchurch, New Zealand; SIMULTECH 2017, in Madrid, Spain. I gave a Tutorial on Green Networking at the 4th International Conference on Communications and Electronics (ICCE 2012), Hue, Vietnam, August 2012.

I have been serving as a reviewer for a number of international journals (among others, *IEEE/ACM Transactions on Networking*, *IEEE Transactions on Communications*, *IEEE Transactions on Automatic Control*, *IEEE Transactions on Vehicular Technology*, *IEEE Journal on Selected Areas in Communications*, *Computer Networks*, *International Journal of Communication Systems*, *International Journal of Satellite Communications and Networking*).

### ***Assignments abroad***

Visiting Erskine Fellow at the University of Canterbury, Christchurch, New Zealand, July-September 2011

(<https://www.canterbury.ac.nz/engage/erskine/roll/year/honour-roll-2011/>) - Course held: COSC473 - ***Green Networking***

Visiting Erskine Fellow at the University of Canterbury, Christchurch, New Zealand, July-September 2004

(<https://www.canterbury.ac.nz/engage/erskine/roll/year/honour-roll-2004/>) - Course held: ENEL571/671 - ***Control Techniques for Quality of Service Guarantees in Multiservice Telecommunication Networks***

### ***Other professional activities***

I acted as a member of the review panel of experts for the EC project ST-1999-20033 QOSIPS (“Quality of Service and pricing Differentiation for IP Services”) in the period 2001-2002; I was evaluator of a European Research Council (ERC) Starting Grant Proposal - ERC 2012; in 2013 I was a member of the panel of experts for the evaluation of national projects funded by FCT (*Fundação para a Ciência e a Tecnologia*), Lisbon, Portugal (rejoined in 2015, 2016 and 2018), and evaluator for the Polish Ministry of Science and Higher Education of research infrastructure projects to be included in the Polish Roadmap for Research Infrastructures. I have evaluated other research and education proposals for institutions in Italy, Poland, Latvia, Austria, Canada,

Kuwait and Hong Kong. I contributed to the foundation (in 1995) of the National Inter-University Consortium for Telecommunications (CNIT), a research organization that currently joins 37 Italian Universities; I was Vice-President of the CNIT Management Board for the term 2005-2007; I am currently the Head of the CNIT National Laboratory of Smart, Sustainable and Secure Internet Technologies and Infrastructures (S3ITI), based in Genoa, and a member of the CNIT Scientific Board. On behalf of CNIT, I was the PI of the methodological part of the LABNET-1 project in Naples, Italy (2000-2003), which received overall funding for about 3.5 million Euros from MIUR. I has been a co-founder and the Head of the CNIT National Multimedia Communications Laboratory in Naples for the term 2003-2004. I have served in the Management Board of the International Institute of Communications (IIC), a non-profit organization based in Genoa, Italy, for over ten years. I have been doing consulting activities in various areas in Telecommunication Networks, for both private companies and public administrations, including a long-lasting co-operation with some motorway administrations on transport telematics. I am a member of the Expert Advisory Group of the NetWorld2020 European Technology Platform for communications networks and services.