Guest Editorial
Special Issue on Computational Intelligence in Telecommunications Networks and Internet Services—Part II

IN RECENT YEARS, we have witnessed a rapidly growing role of the Internet that has already formed a conceptual backbone of the society in the information era. What becomes apparent and highly visible is a broad range of services and their enormous diversity being seamlessly available to those surfing cyberspace [1]–[3]. The ongoing developments not only have enabled a different way of doing business but also pushed toward ambient intelligence where the user fully interacts with his or her surrounding information environment.

However, while paving our way toward the realization of this vision, the complexity of the systems increases, the ever-growing need for high flexibility, remarkable fault-tolerance, superb quality of service, interoperability, security, reduced time-to-market service introduction and personalization become more evident. All of these require more vigorous and comprehensive developments of sophisticated information technologies. Openness, programmability of the infrastructure, and underlying Computational Intelligence (CI) viewed as a highly unified conceptual and algorithmic fabric of all such undertakings are deemed essential when striving toward the fulfilment of this ultimate goal.

A variety of detailed technologies, concepts, and models aim at the realization of intelligent integrated networks and services. Active and programmable networking enable the introduction of new network services by adding dynamic programmability to network devices and making aspects of the programmability accessible to third-party vendors and users via open interfaces. Open and programmable network elements help redefine network software architectures and move control and management systems away from traditional closed and rigid solutions, bringing us one step closer to an environment where all devices and services seamlessly interoperate and cooperate with each other. CI has emerged through a vivid and diversified synergy of technologies of granular computing, neural networks, and evolutionary computing. Each of the contributing technologies there plays an important and unique role. In essence, we can state that CI is a manifestation and implementation of a general design methodology applied to complex systems. Granular computing helps decompose the system by operating on information granules (such as intervals, fuzzy sets, rough sets, and alike and develop a hierarchy of models with each of them focused on a certain level of information granularity. Neurocomputing is aimed at addressing a variety of learning issues and provide systems with viable mechanisms of adaptation. Evolutionary computing with its conceptual and algorithmic variety of genetic algorithms, evolutionary programming, evolutionary strategies, to name a few, is an ideal vehicle of structural and parametric optimization—an indispensable design framework. In view of the key challenges we are faced with in the development of the sophisticated network architectures the centrality of CI in this setting becomes quite apparent. In the realization of the vision of ambient intelligence, a closer synergy between the broadly perceived communications networks and CI becomes a highly desired necessity. There have been some interesting developments so far, see e.g., [4] yet there are a number of challenges and open issues that lie ahead of us.

The three special issues bring together the ideas of CI to the network area in a systematic, coherent, and comprehensive fashion that will help us move one step closer to the realization of the vision of ambient intelligence.

The second special issue reflects the breadth and diversity inherent to the area and comprises a list of six submissions. The security issues for active networks are presented by Z. Liu *et al.* The Internet telephony along with a case study are discussed by R H. Glitho *et al.* Evolutionary optimisation with mechanisms of stochastic ranking is studied by J. Yu *et al.* E. Stroulia and M. Hatch present a software framework for developing intelligent multiagent applications for integrating services of web-based applications. An intelligent traffic load balance scheme for mobile cellular network and ensuing scheduler are presented by L. Du *et al.* T. C. K. Hui and C. K. Tham cover the development issues

of reinforcement learning-based adaptive provisioning scheme.

We would like to express our gratitude to the authors for their high caliber submissions and to reviewers for their countless hours of thorough assessment of the papers, in-depth comments, and constructive criticism. Chip White and his editorial staff provided us with their continuous encouragement and professional support. We really enjoyed working on this project and do hope it will be of significant benefit and relevance to the broad research community.

WITOLD PEDRYCZ, *Guest Editor*
University of Alberta
Department of Electrical and Computer Engineering
Edmonton, AB T6G 2G7 Canada
pedrycz@ee.ualberta.ca

ATHANASIOS VASILAKOS, *Guest Editor*
Institute of Computer Science
Foundation for Research and Technology-Hellas
Crete, GR-157 73 Greece
vasilako@ath.forthnet.gr

STAMATIS KARNOUSKOS, *Guest Editor*
Stamatis.Karnouskos@fokus.fraunhofer.de

REFERENCES

[1] (1996) DARPA Active Network Program. [Online]. Available: http://www.darpa.mil/ato/programs/activenetworks/actnet.htm
[2] Open Signalling Working Group. [Online]. Available: http://www.comet.columbia.edu/opensig/
[3] IEEE P 1520 Project. [Online]. Available: http://www.ieee-pin.org/
[4] W. Pedrycz and A. V. Vasilakos, Eds., *Computational Intelligence in Telecommunications Networks*. Boca Raton, FL: CRC, 2001.

Witold Pedrycz (F'99) is a Professor and Chair in the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, AB, Canada. He is also a Canada Research Chair in Computational Intelligence.

He is actively pursuing research in computational intelligence, fuzzy modeling, knowledge discovery and data mining, fuzzy control including fuzzy controllers, pattern recognition, knowledge-based neural networks, telecommunication networks, relational computation, and software engineering. He has published numerous papers in this area. He is also an author of seven research monographs covering various aspects of Computational Intelligence and Software Engineering.

Dr. Pedrycz has been a member of numerous program committees of IEEE conferences in the area of fuzzy sets and neurocomputing. He currently serves as an Associate Editor of the IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART B and the IEEE TRANSACTIONS ON FUZZY SYSTEMS.

Athanasios Vasilakos has born in Pella, Greece, in 1959. He received the B.S. degree in electrical engineering from the University of Thrace, Greece, in 1983, the M.S. degree in computer engineering from the University of Massachusetts, Amherst, 1986, and the Ph.D. degree in computer engineering from the University of Patras, Greece, in 1988.

From 1988 to 1991, he was with Computer Technology Institute, University of Patras. From 1991 to 1995, he was Professor at the Hellenic Air Force Academy, Greece. From 1995 to 2002, he was Researcher at the Computer Science Institute, Foundation for Research and Technology-Hellas(FORTH), Greece. Since 2002, he is a Professor at the University of Thessaly, Greece, and Manager in the Hellenic Aerospace Industry. His research interests involve telecommunication networks (IP/ATM, mobile, active nets) and computational intelligence. He is a co-editor (with W. Pedrycz) of the volume entitled *Computational Intelligence in Telecommunications Networks*, (Boca Raton, FL: CRC Press, 2001). He has published more than 90 peer-reviewed journal and conference papers.

Dr. Vasilakos is a member of the technical progeram committees of a number of conferences and serves on editorial boards of several journals, including *Computer Communications* (1997–2002), *ACM Applied Computing Review*, *Soft Computing*, and *IEEE Communications Magazine*. He has been a Guest Editor of several journals, such as IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS, IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, *Soft Computing*, and the *Journal of Interactive Learning Research*. He is a member of the ACM.

Stamatis Karnouskos received the M.S. degree in computer engineering and informatics (summa cum laude) from the Unversity of Patras, Greece.

He joined the Research Institute for Open Communication Systems (FOKUS) in 1997, and is currently a Senior Scientist and R&D Project Leader at Fraunhofer Institute FOKUS, Berlin, Germany. He is involved in several projects related to software agents, active networks, security, and mobility within national (German), industrial and European Union projects. His contributions include project management and coordination as well as technical research and development in the aforementioned domains. His research aims at making networks more open, secure and flexible. He is author of more than 20 technical papers in international journals and conferences, and participates as a reviewer and member of the technical program committee in several others.