Preface

The Laboratory of Computer and Information Science (CIS, informaatiotekniikan laboratorio) is one of the research and teaching units of the Department of Computer Science and Engineering at Helsinki University of Technology. The laboratory has its roots in the Electronics Laboratory, established in the 1960's by Professor Teuvo Kohonen. For more than 30 years, the research in the laboratory has concentrated on some aspects of neural networks, especially associative memories, self-organization, and adaptive signal and image processing, as well as on their applications on pattern recognition.

The Neural Networks Research Centre (NNRC, neuroverkkojen tutkimusyksikkö) was established by Professor Kohonen in 1994 as a separate research unit with its own funding and own administrative position. It was selected as one of the first national Centers of Excellence in research in 1995. The Academy of Finland extended its Center of Excellence status for the years 2000 to 2005 under the research proposal "New Information Processing Principles". This status also implies financial resources from the Academy, Tekes, and HUT, which are gratefully acknowledged.

The Neural Networks Research Centre operates within the Laboratory of Computer and Information Science, coordinating the major part of its research activities. It is not possible to separate the personnels of these two units, as the teaching staff of the LCIS also participate in some research project of the NNRC. Professor Erkki Oja is presently the director of NNRC, with Professor Olli Simula the vice-director, and Professor Juha Karhunen participating in its research projects. In addition, 15 post-doctoral researchers, 25 graduate students, and a number of undergraduate students are working in the NNRC projects.

Professor Heikki Mannila joined the CIS laboratory in 1999. He is partner and vice-director of the **From Data to Knowledge (FDK) research unit**, a joint effort between Helsinki University of Technology and the University of Helsinki. Also this research group was selected as a national Center of Excellence from the beginning of 2002. Although the Neural Networks Research Centre and the From Data to Knowledge research unit are financially separate and stem from different research traditions, there is an overlap in the research directions and projects between these two Centers of Excellence. This overlap has already produced fruitful joint research which is expected to increase in the future.

The present report covers the activities during the years 2000 and 2001. Basically, the report is divided in two parts. In the first part, the research of the NNRC is reviewed. In the second part, those projects of the FDK research unit are reviewed, that pertain to the research activities in the CIS laboratory. The main reason for this separation is that the present booklet also serves as the official report of the NNRC to its sponsors, and it is important to clearly distinguish exactly what work has been done under those finances.

The earlier status of the NNRC, up to the beginning of 2000, was thoroughly explained in the triennial reports 1994 - 1996 and 1997 - 1999. The web pages of the laboratory, `http://www.cis.hut.fi/` also contain up-to-date texts.

To briefly list the main achievements and highlights of the period 2000 - 2001, the laboratory produced 6 D.Sc. (Eng.) degrees, 4 Lic.Tech. degrees, and 38 M.Sc. (Eng.) degrees. The number of scientific publications appearing during the period was 194, of which 38 were journal papers. Special mention should be given to three scientific text-books authored or co-authored by our staff: *Self-Organizing Maps* (third, extended edition, T. Kohonen, Springer, 2001); *Independent Component Analysis* (A. Hyvärinen, J. Karhunen, and E. Oja, Wiley-Interscience, 2001); and *Principles of Data Mining* (D. Hand, H. Mannila, and P. Smyth, The MIT Press, 2001). Such text-books, with wide circulation, are indispensable in spreading our research results to a wide international audience, including practitioners and students.

A large number of talks, some of them plenary and invited, were given by our staff in the major conferences in our research field. We had several foreign visitors participating in our research, and our own researchers made visits to universities and research institutes abroad. The research staff were active in international organizations, editorial boards of journals, and conference committees. The largest effort in this respect was the *Second International Workshop on Independent Component Analysis and Blind Signal Separation*, which was arranged by us on June 20 to 22, 2000 at the Hanasaari conference center, Espoo. During the reporting period, Professor Erkki Oja was the President of the European Neural Network Society. Also, some prices and honours, both national and international, were granted to members of our staff, the most prestigious one being the nomination to the rank of Academician of Professor (Emeritus) Teuvo Kohonen.

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