



The International Association for
Pattern Recognition
Technical Committee 20

Pattern Recognition for Bioinformatics

Progress Report

July 2006 - June 2007

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1 TC-20 Aims and Scope

1.1 Background

Pattern recognition techniques and tools are not evolving at a sufficient rate to tackle associated bioinformatics problems at a comparable rate of emergence of life sciences data. In view of this, during ICPR meeting in Cambridge, UK, November 2004, a proposal to form the TC-20, put forward by the Founding Co-Chairs, Raj Acharya and Jagath C. Rajapakse, was accepted by the IAPR Executive Committee.

1.2 Aim

The aim of TC-20 is to investigate how pattern recognition techniques can be effectively used to resolve specific bioinformatics problems and handle high throughput life sciences data.

Statistical, structural, and syntactic pattern recognition, neural networks, computational intelligence, graphical and data mining techniques, and their hybrids have found many applications in computational biology and bioinformatics. Such applications include:

- Analyses of bio-sequences: DNA, proteins, structures, etc.
- Comparative genomics
- Gene expression analysis and functional genomics
- Phylogenic analysis of species, sequences, structures
- Structural genomics and proteomics
- Biological imaging: functional, molecular, and cellular imaging
- Data mining, text mining, data integration, and visualization
- Information fusion such as combining sequences, expressions, texts, and images, etc.
- Systems biology: pathway analysis, gene regulatory networks, etc.
- Disease modeling
- Medical informatics

1.3 Goal

The goal of TC-20 is to bring together pattern recognition scientists and life scientists to find solutions to problems in bioinformatics and to foster multidisciplinary research in pattern recognition community.

One of the goals is to facilitate the pattern recognition and the life science communities to interact through its memberships and associate memberships, thereby to match-make pattern recognition techniques and bioinformatics applications. An example of the benefits of proliferation of pattern recognition techniques in bioinformatics applications could be the discovery of new drugs.

The committee has a membership list and maintains a website for the exchange and dissemination of ideas among its members. The membership is currently for two years and offered by the invitation of TC-20 Chairs. The core membership is limited to 25 members who are expected to actively engage in TC-20 activities. Others interested in joining IAPR-TC20 will be given associate memberships initially. It plans its website as source for education and research in pattern recognition for bioinformatics. The TC-20 will organize and support related workshops and seminars to bring its members and interested researchers together and disseminate information on latest research in the field.

3. TC-20 Structure and Organization

3.1 Chairs

TC-20 is led by the Chair assisted by the Vice Chair. At ICPR 2006 meeting, Prof Jagath Rajapakse was appointed as the Chair of TC-20 for a two-year term. Prof Rajapakse invited Prof Acharya to act as Vice-Chair for his experience with IAPR and vast exposure in the area of pattern recognition and bioinformatics.

Chair: Jagath C. Rajapakse, Nanyang Technological University, Singapore

Vice Chair: Raj Acharya, The Pennsylvania State University, University Park, USA

3.2 Membership

The membership of TC-20 is by invitation of the TC-20 Chairs. Presently, TC-20 has 25 members worldwide (*expiring in July, 2007*).

- Raj Acharya, The Pennsylvania State University, USA, (acharya@cse.psu.edu) (Vice-Chair)
- Francisco Azuaje, University of Ulster, Northern Ireland (fj.azuaje@ulster.ac.uk)
- Vladimir Brusica, Dana-Farber Cancer Institute, USA (vladimir_brusic@dfci.harvard.edu)
- Phoebe Chen, Deakin University, Australia, (phoebe.chen@deakin.edu.au)
- Dave W. Corne, Heriot Watt University, United Kingdom (dwcorne@macs.hw.ac.uk)
- Marchiori Elena, Vrije Universiteit Amsterdam, The Netherlands, (elena@cs.vu.nl)
- Mariofanna Milanova, University of Arkansas at Little Rock, USA, (mgmilanova@ualr.edu)
- Gary Fogel, Natural Selection, Inc., USA, (gfogel@natural-selection.com)
- Saman Halgamuge, University of Melbourne, Australia, (saman@unimelb.edu.au)
- Visakan Kadirkamanathan, The University of Sheffield, United Kingdom, (visakan@sheffield.ac.uk)
- Nik Kasabov, Auckland University of Technology, New Zealand, (nkasabov@aut.ac.nz)
- Irwin King, Chinese University of Hong Kong, Hong Kong, (king@cse.cuhk.edu.hk)
- Alexey V. Kochetov, Russian Academy of Sciences, Russia, (ak@bionet.nsc.ru)
- Graham Leedham, The University of New South Wales Asia, Singapore (g.leedham@unswasia.edu.sg)
- Nikhil R. Pal, Indian Statistical Institute, India, (nikhil@isical.ac.in)
- Muthu Palaniswami, The University of Melbourne, Australia, (swami@ee.mu.oz.au)
- Jagath C. Rajapakse, Nanyang Technological University, Singapore (asjagath@ntu.edu.sg) (Chair)
- Gwenn Volkert, Kent State University, USA, (volkert@cs.kent.edu)
- Roy E. Welsch, Massachusetts Institute of Technology, USA, (rwelsch@mit.edu)
- Kay C. Wiese, Simon Fraser University, Canada, (wiese@sfu.ca)
- Limsoon Wong, National University of Singapore, Singapore, (limsoon@nus.edu.sg)
- Jerry Wu, Wellcome Trust Sanger Institute, United Kingdom (jerry.wu@sanger.ac.uk)
- Qiang Yang, Hong Kong University of Science and Technology, Hong Kong, (qyang@cs.ust.hk)
- Yanqing Zhang, Georgia State University, USA, (yzhang@cs.gsu.edu)

3.4 Website

The IAPR website is currently has the following URL:

<http://www.ntu.edu.sg/home/asjagath/iapr-tc20/>

It is hosted by Nanyang Technological University, Singapore.

The website still needs a lot of improvements, with links to major information sources, data sources, software tools, literature, etc.

3.6 IAPR TC-20 Secretariat

IAPR secretariat is maintained at the BioInformatics Research Centre (BIRC), Nanyang Technological University, Singapore. Ms. Norhana Ahmad will serve as the secretary for IAPR TC-20. Norhana has served as the secretary for PRIB 2006 and PRIB 2007 workshops.

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3.5 Mailing List

The current mailing list consists of the members and associate members. In addition, it maintains email lists for publicity of PRIB workshops, which is owned exclusively by IAPR TC-20

4. Events

TC-20 will support and organize events pertaining to bioinformatics and pattern recognition. As a regular event, TC-20 initiated the Workshop on Pattern Recognition in Bioinformatics (PRIB) to be held in conjunction with the biennial International Conference on Pattern Recognition (ICPR), a major event of IAPR or as an isolated event, and as a standalone event in the alternate years.

1st International Workshop on Pattern Recognition in Bioinformatics (PRIB 2006)

Hong Kong Conference and Exhibition Centre
Hong Kong
August 20, 2006
<http://www.ntu.edu.sg/sce/prib06/>

PRIB 2006 was jointly organized by the Nanyang Technological University, Singapore, and the Pennsylvania State University, USA.

PRIB 2006 Organizing Committee

Workshop Chair:	Raj Acharya, Pennsylvania State University, USA
Program Co-Chairs:	Jagath C. Rajapakse, Nanyang Technological University, Singapore Limsoon Wong, Institute of Infocomm Research, Singapore
Secretary:	Norhana Ahmad, Nanyang Technological University, Singapore
Publicity Chairs:	Phoebe Chen, Deakin University, Australia Elena Marchiori, Vrije University of Amsterdam, Netherland Mariofanna Milanova, University of Arkansas at Little Rock, USA
Publication Chair:	Ho Sy Loi, Nanyang Technological University, Singapore
Local Organization Chair:	Irwin King, Chinese University of Hong Kong, Hong Kong
System Administrator:	Linda Ang, Nanyang Technological University, Singapore

The Program Committee consisted of 50 experts in the field. PRIB 2006 received 43 submission and 18 papers were selected for oral presentation. The proceedings was published as an edited volume of Springer *Lecture Notes in Bioinformatics (LNBI)* series.

The PRIB 2006 program began with a Tutorial on Pattern Recognition in Bioinformatics and ended with a TC-20/ PRIB 2007 OC meeting.

2nd IAPR Workshop on Pattern Recognition in Bioinformatics (PRIB 2007)

Grand Plaza Park Royal, Singapore
Oct 1 - 2, 2007
www.ntu.edu.sg/sce/prib/prib07

The arrangements are under way to hold from Oct 1 - 2, 2007 at Grand Plaza Park Royal, Singapore. The two-day workshop is jointly organized by TC-20 and the School of Computer Engineering, Nanyang Technological University, Singapore, and sponsored by IAPR.

PRIB 2007 Organizing Committee

General Chair: Jagath C. Rajapakse, Nanyang Technological University, Singapore
General Co-Chair: Raj Acharya, Pennsylvania State University, USA
Program Chairs: Bertil Schmidt, University of New South Wales Asia, Singapore
Gwenn Volkert, Kent State University, USA
Special Session Chairs: Shandar Ahmad, National Institute of Biomedical Innovation, Japan
Madhu Chetty, Monash University, Australia
Elena Marchiori, Vrije University of Amsterdam, the Netherlands
Publicity Chairs: Saman K. Halgamuge, University of Melbourne, Australia
Roberto Tagliaferri, Università Di Salerno, Italy
Wei Wang, Fudan University, China
Yanqing Zhang, Georgia State University, USA
Publication Chairs: Sy Loi Ho, Nanyang Technological University, Singapore
Feng Lin, Nanyang Technological University, Singapore
Local Chair: Graham Leedham, University of New South Wales Asia, Singapore
Local Organizing: Byron Koon Kau Choi, Nanyang Technological University, Singapore
Yulan He, Nanyang Technological University, Singapore
Hwee Kuan Lee, Bioinformatics Institute, Singapore
Jinming Li, Nanyang Technological University, Singapore
Secretary: Norhana Ahmad, Nanyang Technological University, Singapore
Technical Executive: Sing Yau Tan, Nanyang Technological University, Singapore
Webmaster: Linda Ang, Nanyang Technological University, Singapore
Program Committee: Tatsuya Akutsu, Kyoto University, Japan
Guillaume BOURQUE, Genome Institute of Singapore, Singapore
Timo Rolf Bretschneider, Nanyang Technological University, Singapore
Zehra Cataltepe, Istanbul Technical University, Turkey
Phoebe Chen, Deakin University, Australia
Francis Y.L. Chin, University of Hong Kong, Hong Kong
Peter Clote, Boston College, USA
David Corne, Heriot-Watt University, UK
Carlos Cotta, University of Malaga, Spain
Antoine Danchin, Institut Pasteur, France
Joaquín Dopazo, Centro de Investigación Príncipe Felipe, Spain
James G. Evans, Massachusetts Institute of Technology, USA
Alexandru Floares, Oncological Institute Cluj-Napoca, Romania
Mikhail S. Gelfand, Institute for Information Transmission Problems, Russia
Ilkka Havukkala, Auckland University of Technology, New Zealand
Jaap Heringa, Vrije Universiteit, the Netherlands
Lisa Holm, University of Helsinki, Finland
Ming-Jing Hwang, Academia Sinica, Taiwan
Visakan Kadirkamanathan, University of Sheffield, UK
Nikola Kasabov, Auckland University of Technology, New Zealand
Irwin King, The Chinese University of Hong Kong, Hong Kong
Alex V. Kochetov, Russian Academy of Sciences, Russia
Vladimir A. Kuznetsov, Genome Institute of Singapore, Singapore
Chee Keong Kwoh, Nanyang Technological University, Singapore
Wing-Ning Li, University of Arkansas, USA
Alan Wee-Chung Liew, Chinese University of Hong Kong, Hong Kong
Frederique Lisacek, Swiss Institute of Bioinformatics, Switzerland
Hiroshi Matsuno, Yamaguchi University, Japan
Martin Middendorf, Universität Leipzig, Germany
Mariofanna Milanova, University of Arkansas at Little Rock, USA
Aleksandar Milosavljevi, Baylor College of Medicine, USA

Satoru Miyano, University of Tokyo, Japan
Jason H. Moore, Dartmouth Medical School, USA
Parvin Mousavi, Queen's University, Canada
See-Kiong Ng, Institute for Infocomm Research, Singapore
Yanay Ofran, Columbia University, USA
Christos Ouzounis, European Bioinformatics Institute, UK
Zoran Obradovic, Temple University, USA
Nikhil R. Pal, Indian Statistical Institute, India
Laxmi Parida, IBM T.J. Watson Research Center, USA
Mihail Popescu, University of Missouri, USA
Predrag Radivojac, Indiana University, USA
Nikolaus Rajewsky, Max Delbrück Center for Molecular Medicine, Germany
Jem Rowland, University of Wales Aberystwyth, UK
Meena Kishore Sakharkar, Nanyang Technological University, Singapore
Akinori Sarai, Kyushu Institute of Technology, Japan
Alexander Schliep, Max Planck Institute for Molecular Genetics, Germany
Christian Schoenbach, Nanyang Technological University, Singapore
N.Srinivasan, Indian Institute of Science, India
P. N. Suganthan, Nanyang Technological University, Singapore
Wing Kin Sung, National University of Singapore, Singapore
Anna Tramontano, University of Rome "La Sapienza", Italy
Michael Wagner, Cincinnati Children's Hospital Research Foundation, USA
Haiying Wang, University of Ulster at Jordanstown, N. Ireland
Lusheng Wang, City University of Hong Kong, Hong Kong
Michael Q. Zhang, Cold Spring Harbor Laboratory, USA

PRIB 2007 has received a total number of 138 papers and 48 papers were accepted (34%) for oral presentations. The papers presented at the oral sessions will be published as a volume in the *Lecture Notes in Bioinformatics* (a sub-series of *Lecture Notes in Computer Science*) by Springer and invited for consideration of publication in a *Special Issue of IEEE Engineering in Medicine and Biology Magazine*.

Poster presentations are published in a Supplementary Proceedings of PRIB 2007.

The workshop will feature talks by the following keynote speakers:

Gary Fogel, Natural Selection Inc., San Diego, USA
Nikhil R. Pal, Indian Statistical Institute, India
Raj Acharya, The Pennsylvania State University, USA
Glenn Tesler, University of California, San Diego, USA

There will be two parallel sessions of oral presentations and one poster session on each day of the workshop.

The awards will be given to the Best Paper, Best Student Paper, and Best Poster at the workshop. About twenty five PRIB 2007 Student Awards towards their registration will be awarded. Three travel awards will be offered to overseas students.

5. Member Activities

5.1 Conferences

Several TC-20 members are actively engaged as Chairs of related conferences:

- Limsoon Wong: conference chairs of *RECOMB 2008*, Singapore, from 30 March – 2 April, 2008; *GIW 2007*, Singapore from 3 - 5 Dec 2007; *BioDM 2007* in May 2007, China.
- Gwenn Volkert: general co-chairs for the *2007 IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology* in Honolulu, Hawaii from April 1-5, 2007.
- Phoebe Chen: conference co-chair of the *CMLSA2007*, November 05-09, 2007, Auckland, New Zealand.
- Elena Marchiori: conference co-chair and program co-chair for the *5th European conference On Evolutionary Computation Machine Learning And Data Mining In Bioinformatics (EvoBIO 2007)* in Valencia, Spain, 11-13 April 2007.
- Dave W. Corne: vice chair of *2007 International Conference on Genetic and Evolutionary Methods*, at *WorldComp'07*, Las Vegas; general co-chair for the *2007 IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology*; conference co-chair for the *5th European conference On Evolutionary Computation Machine Learning And Data Mining In Bioinformatics (EvoBIO 2007)* in Valencia, Spain, 11-13 April 2007.
- Saman Halgamuge: program vice-chair of *IEEE Vehicular Technology Conference* from 25 to 28 September 2006 in Montréal, Québec, Canada; general co-chair of *IEEE International Conference on Information Acquisition* from August 20 - 23, 2006 in Shandong University, China.
- Visakan Kadirkamanathan: co-chair, *IEEE UK&RI Control Systems Chapter Colloquium on 'Control in Systems Biology'*, Sheffield, 2007
- Irwin King: workshop chair, *World Congress on Computational Intelligence (WCCI2008)* in Hong Kong from June 1-6, 2008; technical track chair, *Pacific-Rim Conference on Multimedia* in Hong Kong from 11-14 December 2007 and as Technical Co-Chair, *International Joint Conference on Neural Networks (IJCNN2007)* in Orlando, Florida from August 12 -17, 2007.
- Yanqing Zhang: program co-chair: *IEEE 7th International Symposium on Bioinformatics & Bioengineering (BIBE07)*, Cambridge - Boston, Massachusetts, USA, October 15-17, 2007; as vice chair of the *2007 International Conference on Bioinformatics & Computational Biology (BIOCOMP'07)*, Las Vegas, June 25-28, 2007; vice chair of the *2007 International Conference on Artificial Intelligence*, Las Vegas, June 25-28, 2007; and organizing co-chair: *2007 International Symposium on Bioinformatics Research and Applications (ISBRA2007)*, Atlanta, May 7-10, 2007.
- Jagath C. Rajapakse: general co-chair of *2007 IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology* in Honolulu, Hawaii from April 1-5, 2007; program co-chair for the *5th European conference On Evolutionary Computation Machine Learning And Data Mining In Bioinformatics (EvoBIO 2007)* in Valencia, Spain, 11-13 April 2007.
- Vladimir Brusic: Congress Co-chair for the *International Congress of Immunogenomics and Immunomics (BCII 2006)*, Oct 8-12, 2006, Budapest, Hungary.

5.2 Editorial activities

Several TC-20 members serve as either Editors or Associate Editors of related journals:

- Nikhil Pal: the Editor-in-Chief of *IEEE Transactions on Fuzzy Systems*
- Limsoon Wong: Managing Editor of *Journal of Bioinformatics and Computational Biology* and in the editorial boards of *Bioinformatics* and *Drug Discovery Today*.
- Raj Acharya: Associate Editors of *IEEE/ACM Transactions on Bioinformatics and Computational Biology*.
- Francisco Azuaje: Associate Editor of *IEEE Transactions on Nanobioscience*. a Guest Editor of *IEEE Transactions on Systems, Man and Cybernetics (SMC) Part B: Cybernetics: Machine Intelligence Approaches to Systems Biology*.
- Vladimir Brusic: the Deputy Editor of the *Immunome Research*, and an Editorial Board Member of *Briefings in Bioinformatics*.
- Phoebe Chen: Associate Editor for the *IEEE Transactions on Multimedia*, an Associate Editor for the *Journal of Research and Practice in Information Technology*, an Associate Editor for the *International Journal of Intelligent Computing in Medical Sciences and Image Processing*
- Dave W. Corne: Editorial Boards for *IEEE Computational Intelligence Magazine (IEEE)*, *IEEE Transactions on Evolutionary Computation*, of *Evolutionary Computation* (MIT Press), of *Applied Soft Computing* (Elsevier), *International Journal of Bioinformatics Research and Applications* (Inderscience), *International Journal of Hybrid Intelligent Systems* (IOS Press), *Applied Intelligence* (Elsevier), the Editorial Board for *Journal of Computational Intelligence in Bioinformatics*
- Gary Fogel: an associate editor for the journals *BioSystems*, *IEEE Transactions on Evolutionary Computation*, *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, *IEEE Computational Intelligence Magazine*, and *Ecological Information*
- Visakan Kadirkamanathan: Co-Editor of the *International Journal of Systems Science*.
- Irwin King is the Special Issue Guest Editor, *Neurocomputing*, *International Journal of Computational Intelligent Research (IJCIR)*, 2006
- Jagath C. Rajapakse: Associate Editor of *IEEE/ACM Transactions on Bioinformatics and Computational Biology*; Editorial Board member, *Neural Information Processing -- Letters and Reviews* and Guest Editor for *IEEE Engineering in Medicine and Biology Magazine*.
- Qiang Yang is the Associate Editor of *Journal of Computational Intelligence in Bioinformatics*, *International Journal of Data Mining and Bioinformatics*; Guest Editor of *IEEE/ACM Transactions on Computational Intelligence Approaches in Computational Biology and Bioinformatics*.
- Gwenn Volkert: Associated Editor for the new *IEEE Computational Intelligence Magazine*.

6. Future Plans

The main objectives for the next year are:

- Successful PRIB 2007, Singapore
- Will decide on PRIB 2008 at PRIB 2007
- Invite TC-20 members for July 2007 – July 2009 period
- Open Associate Memberships of TC-20 via the website.
- As recommended by IAPR VP (Technical Committees), TC-20 activities will be expanded in the following areas:
 - Education: through the website, the educational materials such as lecture notes, tutorials, etc., will be made available.
 - Research: a database of bioinformatics applications, bioinformatics software and benchmark datasets will be maintained.
 - Events: look into organizing special sessions, special issues of journals, and competitions, etc.