

CURRICULUM VITAE

Prof. Juha Karhunen

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1 Personal Information

Family name: Karhunen

Given names: Juha Tuomas

Date of birth: April 23, 1954

Place of birth: Juva, Finland

Parents: Tuomas Karhunen and Valma Karhunen (born Nykänen)

Wife: Pirkko Paula Tellervo Karhunen (born Annala) from 1979

Children: Antti Petteri (born 1982) and Hanna Pauliina (born 1988)

2 Education

- Diploma Engineer, Helsinki University of Technology, Department of Technical Physics, Espoo, Finland, January 1980.
- Licentiate of Technology, Helsinki University of Technology, Department of Technical Physics, Espoo, Finland, August 1982.
- Doctor of Technology, Helsinki University of Technology, Department of Technical Physics, Espoo, Finland, September 1984.

3 Professional Career

Major Positions

- Acting Teaching (or Research) Assistant, Helsinki University of Technology, Laboratory of Computer and Information Science, 1976-1979.
- Teaching Assistant, Helsinki University of Technology, Laboratory of Computer and Information Science, 1980-1984.

- Acting Senior Teaching Assistant, Helsinki University of Technology, Laboratory of Computer and Information Science, 1985-1986.
- Acting Assistant Professor, Helsinki University of Technology, Laboratory of Computer and Information Science, 1986-1990.
- Senior Teaching Assistant, Helsinki University of Technology, Laboratory of Computer and Information Science, 1990-1997.
- Senior Research Fellow of Academy of Finland, August 1997 - July 2002.
- Associate Professor of Computer Science, Helsinki University of Technology, Laboratory of Computer and Information Science, January 1999 - December 2003 (off duty January 1999 - July 2002).
- Professor of Computer Science (by invitation), Helsinki University of Technology, Laboratory of Computer and Information Science, January 2004 - . Specialization area: neural networks and signal processing.
- Half-time Professor of Computer Science 2005-2011. From January 2012, I have worked 75% of full time.

Minor Positions

- Course Assistant, Helsinki University of Technology, Laboratory of Computer and Information Science, on several years 1979-.
- Lecturer, Helsinki University of Technology, Laboratory of Computer and Information Science, on several years 1982-.
- Docent in Statistical Signal Analysis, Helsinki University of Technology, Faculty of Information Technology, Espoo, Finland, 1994-.
- Member in various boards and committees in Helsinki University of Technology, Department of Technical Physics, Faculty of Information Technology, and Faculty of Electrical Engineering, 1982-

4 Teaching

- I began my teaching activities already in autumn 1976 when I was assistant in the Finnish course “Hahmontunnistuksen perusteet” (Principles of Pattern Recognition).
- After this I was in late 1970’s on several years assistant in the Finnish course “Estimointiteorian perusteet” (Principles of Estimation Theory). And in early 1980’s I lectured this course on several years and renewed it.
- From 1987 to 1991 I was acting as an associate professor 4 years. During those years, I had to teach 5 courses each year. I lectured every year the Finnish courses “Estimointiteorian perusteet” (Principles of Estimation Theory) and “Digitaalinen kuvankäsittely” (Digital Image Processing). Furthermore, I arranged each year 3 seminar courses to graduate and undergraduate students on a wide variety of topics which changed every year.

- From 1992 to 1998, I lectured the Finnish course “Signaalien tilastollinen estimointi” (Statistical estimation of signals), and participated in organizing some seminar courses.
- In spring 1999, I renewed completely the English course “Principles of Neural Computing”, and lectured it up to the year 2001.
- From autumn 2002 to autumn 2006 I lectured the course “Advanced course in neural computing”, renewing also it to some extent.
- In autumn 2007, these two courses on neural networks were merged together to form the new course “Machine Learning and Neural Networks”. I made completely new lecture slides and exercise problems and their solutions to this course, which I have been lecturing since then.
- On some years I have organized a seminar course each year on a different topic: Nature-Inspired Computing, Independent Component Analysis (twice as a lecture course), Information Theory and Machine Learning, and Support Vector Machines and Kernel Methods.
- I am currently responsible for our courses “Machine Learning and Neural Networks”, “Principles of Pattern Recognition”, “Digital Image Processing”, and “Computer Vision”. I am lecturing the first course myself, while Teaching Researcher Dr. Jorma Laaksonen currently lectures the remaining three courses.
- In autumn 2015, I renewed my lecture course “Machine Learning and Neural Networks”.

5 Other Professional Activities

Editorial Board Memberships in International Scientific Journals

- Neurocomputing (Elsevier), 1997-2004.
- Neural Processing Letters (Kluwer), 1999-2003; again 2008-2010.

Memberships in Scientific Societies

- IEEE (Institute of Electrical and Electronics Engineers): Student Member 1979-1982, Member 1982-1984, 1991-1998, Senior Member 1998-2014.
- INNS (International Neural Network Society), Member 1994-
- Pattern Recognition Society of Finland, Member 1983-

Memberships in Program Committees of Conferences etc.

- Int. Conf. on Artificial Neural Networks (ICANN’91), Espoo, Finland, June 1991.
- IEEE 1993 Workshop on Neural Networks in Signal Processing (NNSP’93), Baltimore, Maryland, September 1993.
- Third Int. Conf. on Neural Networks and Their Applications (NEURAP’97), Marseilles, France, March 1997

- Int. Workshop on Independence and Artificial Neural Networks (I&ANN'98), Tenerife, Spain, February 1998.
- Fourth Int. Conf. on Neural Networks and Their Applications (NEURAP'98), Marseilles, France, March 1998.
- The 7th European Symposium on Artificial Neural Networks (ESANN'99), Bruges, Belgium, April 1999.
- The 2nd Int. Workshop on Independent Component Analysis and Blind Source Separation (ICA2000), Espoo, Finland, June 19-22, 2000, Chairman of the Program Committee.
- The 10th European Signal Processing Conference (EUSIPCO 2000), Tampere, Finland, September 5-8, 2000.
- Int. Conf. on Advances in Intelligent Systems: Theory and Application (AISTA'2000), Canberra, Australia, February 2000.
- The 8th European Symposium on Artificial Neural Networks (ESANN'2000), Bruges, Belgium, April 26-28, 2000.
- Int. Conf. on Artificial Neural Networks in Medicine and Biology (ANNIMAB-1), Gothenburg, Sweden, May 13-16, 2000.
- The 9th European Symposium on Artificial Neural Networks (ESANN'2001), Bruges, Belgium, April 2001.
- Int. Work-Conference on Artificial Neural Networks (IWANN01), Granada, Spain, June 13-15, 2000.
- Third Int. Conf. on Independent Component Analysis and Signal Separation (ICA2001), San Diego, California, December 9-13, 2001.
- The 10th European Symposium on Artificial Neural Networks (ESANN'2002), Bruges, Belgium, April 2002.
- 2002 Int. Joint Conf. on Neural Networks (IJCNN2002), Honolulu, Hawaii, USA, May 12-17, 2002.
- 2002 IEEE Int. Symposium on Circuits and Systems (ISCAS2002), Phoenix, Arizona, USA, May 26-29. Chairman of the Blind DSP Track, attending a Program Committee meeting in Phoenix, Arizona, in January 2002.
- The 4th Int. Workshop on Independent Component Analysis and Blind Source Separation (ICA2003), Nara, Japan, April 1-4, 2003.
- The 11th European Symposium on Artificial Neural Networks (ESANN'2003), Bruges, Belgium, April 2003.
- 2003 IEEE Int. Symposium on Circuits and Systems (ISCA32002), Bangkok, Thailand, May 25-28, 2003. Member of the review committee, acting as the Chairman of the Blind DSP Track on behalf of Prof. Rueywen Liu in the Program Committee meeting in London on 14th December, 2002.
- 2003 Int. Joint Conf. on Neural Networks (IJCNN2003), Portland, Oregon, July 20-24, 2003.

- The 12th Turkish Symp. on Artificial Intelligence and Neural Networks (TAINN 2003), Canakkale, Turkey, July 2-4, 2003. Member of the Advisory Board.
- The 12th European Symposium on Artificial Neural Networks (ESANN'2004), Bruges, Belgium, April 2004.
- The 5th Int. Conf. on Independent Component Analysis and Blind Source Separation (ICA2004), Granada, Spain, September 2004.
- The 13th European Symposium on Artificial Neural Networks (ESANN'2005), Bruges, Belgium, April 2005.
- The 6th Int. Conf. on Independent Component Analysis and Blind Source Separation (ICA2006), Charleston, SC, USA, March 2006. A chair in the program committee.
- The 14th European Symposium on Artificial Neural Networks (ESANN'2006), Bruges, Belgium, April 2006.
- The 2006 IEEE Int. Joint Conf. on Neural Networks (IJCNN2006), Vancouver, BC, Canada, July 2006. A part of the 2006 IEEE World Congress on Computational Intelligence.
- The 7th Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL2006), Burgos, Spain, September 2006.
- The 1st European Symp. on Time Series Prediction (ESTSP'07), Espoo, Finland, February 2007.
- The 15th European Symposium on Artificial Neural Networks (ESANN2007), Bruges, Belgium, April 2007.
- The 2007 IEEE Int. Joint Conf. on Neural Networks (IJCNN2007), Orlando, Florida, USA, August 2007. Member of the technical committee.
- IEEE 2007 Workshop on Machine Learning in Signal Processing (MLSP2007), Thessaloniki, Greece, August 2007.
- The 7th Int. Conf. on Independent Component Analysis and Blind Source Separation (ICA 2007), London, United Kingdom, September 2007.
- The 8th Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL'07), Birmingham, United Kingdom, December 2007.
- The 2nd Int. Workshop on Hybrid Artificial Intelligence Systems (HAIS'07), Salamanca, Spain, November 2007.
- The 16th European Symposium on Artificial Neural Networks (ESANN2008), Bruges, Belgium, April 2008.
- The 2008 IEEE Int. Joint Conf. on Neural Networks (IJCNN2008), Hong Kong, China, June 2008. A part of the 2008 IEEE World Congress on Computational Intelligence (WCCI2008). Member of the technical committee.
- The 9th Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL2008), Daejeon, South Korea, November 2008.

- The 2008 IEEE Workshop on Machine Learning in Signal Processing (MLSP2008), Cancun, Mexico, October 2008.
- The 3rd Int. Workshop on Hybrid Artificial Intelligence Systems (HAIS'08), Burgos, Spain, September 2008.
- The 2008 European Signal Processing Conf. (EUSIPCO-2008), Lausanne, Switzerland, August 2008.
- Int. Workshop on Computational Intelligence in Security for Information Systems (CISIS'08), Genoa, Italy, October 2008.
- IEEE Symposium on Computational Intelligence in Data Mining (CIMD 2009), Nashville, Tennessee, USA, April 2009.
- The 4th Int. Workshop on Hybrid Artificial Intelligence Systems (HAIS'09), Salamanca, Spain, June 2009.
- The 2009 Int. Conf. on Independent Component Analysis and Signal Separation (ICA 2009), Paraty, Brazil, March 2009.
- The European Symposium on Artificial Neural Networks - Advances in Computational Intelligence and Learning (ESANN'2009), Bruges, Belgium, April 2009.
- The 2nd Int. Workshop on Computational Intelligence in Security for Information Systems (CISIS'09), Burgos, Spain, September 2009.
- The 2009 IEEE Int. Workshop on Machine Learning for Signal Processing (MLSP 2010), Grenoble, France, September 2009.
- The 10th Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL 2009), Burgos, Spain, September 2009.
- The European Symposium on Artificial Neural Networks (ESANN 2010), Bruges, Belgium, April 2010.
- The 5th Int. Conf. on Hybrid Artificial Intelligence Systems (HAIS2010), San Sebastian, Spain, June 2010.
- The 20th IEEE Int. Workshop on Machine Learning for Signal Processing (MLSP 2010), Kittila, Finland, August-September 2010.
- The 9th Int. Conf. on Latent Variable Analysis and Signal Separation (LVA/ICA 2010), Saint-Malo, France, September 2010.
- The 11th Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL 2010), Paisley, Scotland, UK, September 2010.
- Int. Conf. on Neural Computation (ICNC 2010), Valencia, Spain, October 2010.
- The 4th Int. Conf. on Computational Intelligence in Security for Information Systems (CISIS'11), Torremolinos, Spain, June 2011.
- The European Symposium on Artificial Neural Networks (ESANN 2011), Bruges, Belgium, April 2011.

- The 6th Int. Conf. on Hybrid Artificial Intelligence Systems (HAIS11), Wroclaw, Poland, May 2011.
- Int. Conf. on Neural Computation Theory and Applications (NCTA 2011), Paris, France, October 2011.
- The 2011 IEEE Machine Learning for Signal Processing Workshop (MLSP 2011), Beijing, China, September 2011.
- Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL 2011), Norwich, United Kingdom, September 2011.
- Int. Conf. on Artificial Neural Networks (ICANN 2011), Espoo, Finland, June 2011.
- The 10th Int. Conf. on Latent Variable Analysis and Signal Separation (LVA/ICA 2012), Tel-Aviv, Israel, March 2012.
- The European Symposium on Artificial Neural Networks (ESANN 2012), Bruges, Belgium, April 2012.
- The 4th Int. Conf. on Neural Computation Theory and Applications (NCTA 2012), Barcelona, Spain, October 2012.
- The 5th Int. Conf. on Computational Intelligence in Security for Information Systems (CISIS'12), Ostrava, Czech Republic, September 2012.
- The 14th Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL 2013), Hefei, Anhui, China, October 2013.
- The 21st European Symposium on Artificial Neural Networks (ESANN 2013), Bruges, Belgium, April 2013.
- The 1st Int. Conf. on Learning Representations (ICLR2013), Scottsdale, Arizona, USA, May 2013.
- The 2013 IEEE Machine Learning for Signal Processing Workshop (MLSP 2013), Southampton, United Kingdom, September 2013.
- The 23rd Int. Conf. on Artificial Neural Networks (ICANN 2013), Sofia, Bulgaria, September 2013.
- The 5th Int. Conf. on Neural Computation Theory and Applications (NCTA 2013), Vilamoura, Portugal, September 2013.
- The 22nd European Symposium on Artificial Neural Networks (ESANN 2014), Bruges, Belgium, April 2014.
- The 6th Int. Conf. on Neural Computation Theory and Applications (NCTA 2014), Rome, Italy, October 2014.
- The 15th Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL 2014), Salamanca, Spain, September 2014.
- The 24th Int. Conf. on Artificial Neural Networks (ICANN 2014), Hamburg, Germany, September 2014.
- The 2nd Int. Conf. on Learning Representations (ICLR2014), Banff, Canada, April 2014.

- The 2014 IEEE Int. Workshop on Machine Learning for Signal Processing (MLSP 2014), Reims, France, September 2014.
- The 23rd European Symposium on Artificial Neural Networks (ESANN 2015), Bruges, Belgium, April 2015.
- The 7th Int. Conf. on Neural Computation Theory and Applications (NCTA 2015), Lisbon, Portugal, October 2015.
- The 16th Int. Conf. on Intelligent Data Engineering and Automated Learning (IDEAL 2015), Wroclaw, Poland, October 2015.
- The 2015 IEEE Int. Workshop on Machine Learning for Signal Processing (MLSP 2015), Boston, USA, September 2015.
- The 24th European Symposium on Artificial Neural Networks (ESANN 2016), Bruges, Belgium, April 2016.

Reviewer of Scientific Papers

Reviewer of numerous manuscripts in the following journals:

IEEE Trans. on Signal Processing (formerly Acoustics, Speech, and Signal Processing), IEEE Trans. on Pattern Analysis and Machine Intelligence, IEEE Trans. on Neural Networks, IEEE Trans. on Circuits and Systems, IEEE Trans. on Industrial Electronics, IEEE Trans. on Biomedical Engineering, IEEE Trans. on Information Theory, Signal Processing, Neural Networks, Neural Computation, Neurocomputing, Neural Processing Letters, Int. J. of Neural Systems, Circuits, Systems, and Signal Processing, Scientia Iranica, Acta Scandinavica Polytechnica, IEE Proc. Circuits, Devices, and Systems, Digital Signal Processing, J. of Proteomic Research, Mathematical Problems in Engineering.

Reviewer in many international conferences and workshops.

Organization of Special Sessions in International Conferences

- Organizer of two special sessions on blind signal separation together with Profs. C. Jutten and C. Puntonet in the Int. Work-Conference on Artificial Neural Networks (IWANN01), Granada, Spain, June 13-15, 2000.
- Organizer of a special session on advances in independent component analysis together with Prof. E. Oja in the 2002 Int. Joint Conf. on Neural Networks (IJCNN2002), Honolulu, Hawaii, USA, May 12-17, 2002.
- Organizer of a special session on nonlinear independent component analysis and blind signal separation together with Prof. C. Jutten in the 4th Int. Workshop on Independent Component Analysis and Blind Source Separation (ICA2003), Nara, Japan, April 1-4, 2003.

Invited Talks/Papers in International Conferences

- IEEE Int. Conf. on Neural Networks (ICNN'94), Orlando, Florida, USA, June 1994 (in special invited session on nonlinear PCA).

- The 7th Italian Workshop on Neural Nets (WIRN'95), Vietri sul Mare, Salerno, Italy, May 1995 (invited talk given by Prof. Erkki Oja).
- IEEE Int. Conf. on Neural Networks (ICNN'95), Perth, Australia, November 1995 (plenary talk given by Prof. Erkki Oja).
- European Symp. on Artificial Neural Networks (ESANN'96), Bruges, Belgium, April 1996.
- Neural Information Processing Systems (NIPS'96) Postconference Workshop on Blind Signal Processing and Their Applications, Snowmass (Aspen), Colorado, USA, December 1996 (invited talk given by Prof. Erkki Oja).
- IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP'97), Munich, Germany, April 1997.
- Int. Conf. on Artificial Neural Networks (ICANN'97), Lausanne, Switzerland, October 1997 (plenary talk given by Prof. Erkki Oja).
- Int. Conf. on Neural Information Processing (ICONIP'97), Dunedin, New Zealand, November 1997 (plenary talk given by Prof. Erkki Oja).
- Workshop on Bayesian Methods in Neural Networks, Cambridge, UK, December 1997.
- Workshop on Machines That Learn, Snowbird, Utah, April 1998.
- Workshop on Machines That Learn, Snowbird, Utah, April 1999.
- Workshop on Machines That Learn, Snowbird, Utah, April 2000.
- 2001 Int. Joint Conf. on Neural Networks (IJCNN2001), Washington, D.C., July 2001 (in special invited session on information-theoretic learning).
- Workshop on Learning, Snowbird, Utah, April 2002.
- 2002 Int. Joint Conf. on Neural Networks (IJCNN2002), Honolulu, Hawaii, May 2002 (in special invited session on advances in independent component analysis, presented by A. Honkela).
- 4th Int. Workshop on Independent Component Analysis and Blind Source Separation (ICA2003), Nara, Japan, April 1-4, 2003 (in a special session on nonlinear independent component analysis and blind signal separation, presented by Prof. C. Jutten)
- European Summer School on ICA, Berlin, Germany, June 16-17, 2003 (presented by T. Raiko).
- The Learning Workshop, San Juan, Puerto Rico, USA, March 19-22, 2007.
- Invited tutorial on Deep learning on November 20, 2013 in the Deep learning event organized by COIN Center of Excellence, Espoo, Finland.

Other activities

- Opponent of a doctoral disputation (Harri Saarnisaari).
- Custos in several defences of doctoral theses (Harri Valpola, Tapani Raiko, Markus Harva, KyungHyun Cho, Emil Eirola, and Dusan Sovilj).

- Referee (reviewer) of several Doctoral Theses (Heikki Riittinen, Jussi Parkkinen, Ari Vepsäläinen, Paavo Alku, Tomas Bäckström).
- Responsible leader of industrial projects with ABB Corporate Research (1994-1995) and Nokia Corp. (1995-1996).
- Invited visitor and evaluator of scientific research at the Artificial Brain Laboratory (Leader: Prof. A. Cichocki) of Frontier Research Program in RIKEN, Wako-Shi, Saitama (Tokyo), Japan, March 2-17, 1996.
- Responsible for guidance of the following doctoral theses (either principally or in part): Jyrki Joutsensalo, Liuyue Wang, Aapo Hyvärinen, Petteri Pajunen, Ricardo Vigario, Harri Valpola, Antti Honkela, Alexander Ilin, Tapani Raiko, Markus Harva, KyungHyun Cho, Emil Eirola, Dusan Sovilj, and Jaakko Luttinen.
- Responsible for guidance of a number of Licentiate and Diploma Theses at Helsinki University of Technology.
- Responsible for guidance of Diploma Theses for Ecole Polytechnique Federale Lausanne (EPFL), Lausanne, Switzerland, and Polytechnic Institute of Bucharest, Romania.
- From the year 2000, I have been leading the research group on “Bayesian algorithms for latent variable models”. In 2013, the name of the research group was changed to “Deep learning and Bayesian modeling”. Currently, I am responsible for this research group together with Assistant Prof. Tapani Raiko.
- Responsible leader of the contributor Laboratory of Computer and Information Sciences in the European joint project BLISS, funded by the European Union 2000-2003.
- Participant and leader of a subgroup in the Teletronics I and II programmes funded by the Academy of Finland, in the project “Blind signal separation in communications receivers and antenna array systems” led by Prof. Erkki Oja.
- Invited visitor and speaker in the national graduate school at the University of Regensburg, Regensburg, Germany, in November 2001.
- Member of the Blind DSP subcommittee of the IEEE Circuits and Systems Society, 2002-
- Evaluator of Dr. Juan K. Lin concerning Associate Professor position at the Rutgers University, New Jersey, USA.
- Evaluator of Dr. Fabian J. Theis concerning Chair and Full Professor position in Bioinformatics at UMIT (Univ. for Health Sciences, Medical Informatics and Technology), Hall, Austria.
- Evaluator of a research proposal to the Czech Science Foundation, June 2007.
- Evaluator of a research proposal to the Superior Council of the National Fund for Scientific and Technological Development (FONDECYT), Chile, October 2010.
- Joint project with Nokia Research Center in September 2013 - August 2014.
- From September 2013, the leader of the research group on “Environmental and Industrial Machine Learning (EIML)” in our department.

- The EIML research group is participating in the joint project “Data to Intelligence (D2I)” funded by Tekes in 2012-2015. Our subproject is classification of web sites based on their images together with the F-Secure corporation.
- The EIML research group is participating in the joint project “Cloud Security Services (CloSe)” funded by Tekes and the Academy of Finland in 2014-2016. We have there several academic and industrial partners.
- The name of the EIML research group was changed in 2015 to “Applications of Machine Learning (AML)” which describes better the current activities of this research group.
- From February 2014, I have been the supervising professor leading the research group “Computational methods and data analysis for astrophysics” in our department. This research group belongs to the ReSoLVE Center of Excellence of Academy of Finland. Its practical work and research are led by Dr. Maarit Käpylä (earlier Mantere).
- I am also the supervising professor and formal head of the research group on “Content-based image and information retrieval” after the retirement of Prof. Erkki Oja in February 2015. Its practical work and research are led in practice by Senior principal researcher Jorma Laaksonen.
- I am also now responsible for the research group on “Independent Component Analysis (ICA) and Blind Source Separation (BSS)” after Prof. Erkki Oja’s retirement. This group has existed since 1995. Its most important achievements are the publication of the book A. Hyvärinen, E. Oja, and J. Karhunen, “Independent Component Analysis”, Wiley 2001, which has become a standard reference in the field. The FastICA method introduced by Aapo Hyvärinen (and Erkki Oja) in 1996 is another quite important development. This method is still the most popular ICA/BSS algorithm due to its fast and good performance and applicability to fairly large scale problems.

6 Publications

See a separate list of publications.