

ELM 2015

The 6th International Conference on Extreme Learning Machines

Shangri-La Hotel, Hangzhou, China

December 15 – 17, 2015

Conference Program



SUPPORT

ELM2015 is organized by:

- Nanyang Technological University, Singapore
- Zhejiang University, China
- Tsinghua University, China

Technical Co-Sponsor:

- Memetic Computing Society, Singapore

FOREWORD

During the planning stage of ELM2015 and after having decided on Hangzhou, we went around the city looking for suitable venue to hold the event. While there are many options available, one simply cannot ignore the lure of the Westlake, a UNESCO World Heritage Site. The natural beauty, expanse, history and the symbiosis of lively and serene dynamics around the lake is simply captivating! Welcome to the Shangri-Las (the Hotel and Westlake). We are convinced that this will be a great place for catching-up and to network; discussing and sharing ideas about our research. There is an old Chinese proverb that goes like this – "A thousand cups of wine do not suffice when true friends meet, but half a sentence is too much when there is no meeting of minds." In Chinese, it is written like this – “酒逢知己千杯少，话不投机半句多”。 For our friends who do not speak Chinese, you may try learning this phrase and you may capture the beauty in the meaning of this saying. This is exactly what the spirit of ELM2015 is all about.

The response to this year’s conference has been very encouraging. With increasing number of papers submitted, it makes the job of the Technical Program Committee for ELM2015 more challenging. We have also prepared an excellent lineup of keynote speeches by prominent speakers, sharing their thought provoking views and vision in the field of brain-inspired computing methodologies. In an era where the pace of development of any field of study is on high-gear, the need for constant consolidation of ideas and thoughts is ever so eminent. With so many active researchers from academia and industries, there is no lacking of collective brainpower to push the research frontier forward. In this context, the series of ELM conferences serve this objective well, being focused yet open enough to embrace the possibilities of infusing other ideas and methodologies. As researchers, we are all well aware that this is only natural and the norm of how research progress is made. We are hopeful that the conference will serve as a platform for a lively forum that strongly encourages open discussion, including expression of contradicting views and ideas. At the end of the day, each of us would collectively play a role in shaping the field and directions of the fast-changing field of machine learning.

This event would not have been possible without the help of a committed group of colleagues and friends who were forthcoming in their unambiguous expression of support even at the very early stage of planning. As organizers, we know too well that such supports are crucial, giving us the confidence to put in our best to make this conference a success. We would like to acknowledge with gratitude their contributions in this conference. Of course as organizers, we are able to pursue our interest in this conference simply because of the strong support from our affiliated universities. In particular, we are grateful to the School of Electrical and Electronic Engineering, NTU for granting us the flexibility to play a significant role in championing this event. The strong support from Zhejiang University is especially crucial for this conference. There is no doubt that Zhejiang University is one of the most important reason ELM2015 conference is held in Hangzhou. Two years ago, ELM2013 enjoyed the support of Tsinghua University playing host in Beijing. For ELM2015, we continue to enjoy the endorsement and support of Tsinghua University. Together, this tripartite partnership of 3 major institutions is a strong testimony of the significance of this event.

Hangzhou indeed is a beautiful city. With the support and backing of the renowned Zhejiang University playing host to this conference, it certainly adds to the appeal of hosting this significant event in this city. Do take time out to enjoy the charm of the city and the splendor of Westlake while at the conference. We can confidently say that quite a few attending ELM2015 are old acquaintances from earlier ELM conferences. There is a Chinese proverb that says “Things are good when new, friends are good when old” (东西是新的好，朋友是老的亲). However, judging from the submissions that were received and accepted for this conference, it is also evident that there are many new participants, meaning first time participants of ELM conference. Many are young researchers, including graduate students. For these young researchers, we sincerely hope that this conference will be an important platform that will help shape their future research outlook and look forward to your future participation in ELM conferences.

Finally to all participants of ELM2015, let’s Gānbēi (干杯)! There is a thousand cups of wine we need to work on ...

ELM 2015 General Chair

Guang-Bin Huang, Nanyang Technological University, Singapore

ELM 2015 Organizing Chairs

Min Yao, Zhejiang University, China

Meng-Hiot Lim, Nanyang Technological University, Singapore

Fuchun Sun, Tsinghua University, China

PROGRAM CHAIRS' MESSAGE

The 2015 International Conference on Extreme Learning Machines (ELM2015) will be held in Hangzhou, China, December 15–17, 2015. This conference aims to bring together the researchers and practitioners of extreme learning machines to promote research and scientific discussions of “learning without iterative tuning hidden neurons”. The ELM2015 received submissions from 13 countries and regions, including Australia, Canada, China, Finland, India, Italy, Macau, Netherlands, Singapore, South Korea, Spain, United Kingdom, and United States. The topics addressed by the submitted papers cover theory, algorithm and practical application.

The conference features 7 distinguished keynote speeches given by Bernard Widrow (Stanford University, USA), Zhaoyang Dong (University of Sydney, Australia), Guang-Bin Huang (Nanyang Technological University, Singapore), Sushing Chen (University of Florida, USA), Jonathan Wu (University of Windsor, Canada), Laurent Daudet (Paris Diderot University, France), and Newton Howard (Oxford University, UK). In addition, the conference will be concluded by one panel discussion chaired by C. L. Philip Chen (University of Macau, China). Their talks will be of great interest to the attendees.

All papers were peer reviewed by at least three program committee members, and 108 papers have been selected for presentation at the conference. Selected papers (after major revisions) have been recommended to reputed international journals including Neurocomputing, International Journal of Machine Learning and Cybernetics, Cognitive Computation, Memetic Computing, and Multidimensional Systems and Signal Processing. Most papers are included in the specially edited ELM2015 Conference Proceedings published by Springer-Verlag.

We would like to thank all authors who submitted papers. We also would like to thank the members of the program committee and other reviewers for their time and efforts in carefully reviewing the papers.

Special thanks are given to Nanyang Technological University, Zhejiang University, Tsinghua University, and Memetic Computing Society of Singapore for providing all the strong supports to the conference and related activities.

See you at the conference!

ELM2015 Program Chairs

Kezhi Mao, Nanyang Technological University, Singapore

Stefano Fusi, Columbia University, USA

Amaury Lendasse, University of Iowa, USA

M. Brandon Westover, Harvard Medical School, USA

Jonathan Wu, University of Windsor, Canada

CONFERENCE INFORMATION

Registration fees for conference

Early bird rate, payment must be received by October 15 2015 (Hangzhou local time)

Full registration for one accepted paper	SGD\$950
Registration without paper (participants from academia/research institutions, attending all events)	SGD\$530
Registration without paper (participants from academia/research institutions, only keynotes, technical sessions and banquet)	SGD\$350
Registration without paper (participants NOT from academia/research institutions)	SGD\$1500
Additional tickets	
Additional banquet ticket	SGD\$100

Standard rate, payment received after October 15 2015 (Hangzhou local time)

Full registration for one accepted paper	SGD\$1050
Registration without paper (participants from academia/research institutions, attending all events)	SGD\$580
Registration without paper (participants from academia/research institutions, only keynotes, technical sessions and banquet)	SGD\$400
Registration without paper (participants NOT from academia/research institutions)	SGD\$1600
Additional tickets	
Additional banquet ticket	SGD\$100

For each accepted paper, at least one of the authors needs to register and present the paper.

Conference venue

The conference venue is the Shangri-La Hotel, Hangzhou, China.

Language

All presentations need to be made in English. English is the only official language of this conference.

Publications

All submitted papers will be thoroughly reviewed to maintain a good quality and standard in order to be considered for ELM2015. Accepted papers need to be presented at the conference. Accepted papers will be published in special edited ELM Proceedings volumes by Springer-Verlag. No additional conference proceedings are provided. Selected accepted papers with significant extensions will be recommended for further review for publication consideration in special issues of reputable ISI indexed international journals (*Neurocomputing*, *International Journal of Machine Learning and Cybernetics*, *Cognitive Computation*, *Memetic Computing*, and *Multidimensional Systems and Signal Processing*).

Conference welcome reception, lunches, dinners, and social activities

A welcome reception will be arranged on December 14 2015. Registration fees include lunches on the 15th and 16th December, 2015, and conference banquet on December 16, 2015. To promote interactions among participants, interactive networking activities will be arranged on December 17, 2015.

ORGANIZING COMMITTEE

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ELM2015 CONFERENCE SCHEDULE

December 14 2015, Monday	
4:00pm – 6:00pm	Registration Venue: <i>The Lobby, Shangri-La Hotel</i>
7:00pm – 10:00pm	Welcome Reception Venue: <i>Shangri-La Hotel</i>

December 15 2015, Tuesday				
Venue	<i>Ballroom, Level 3, Shangri-La Hotel</i>			
8:00am – 8:10am	Opening Ceremony			
8:10am – 8:50am	Keynote 1:	Nature's Little Secret: Hebbian-LMS Learning Algorithm?		
	Speaker:	Bernard Widrow, Stanford University, USA		
	Chair:	Guang-Bin Huang, Nanyang Technological University, Singapore		
8:50am – 9:30am	Keynote 2:	Extreme Learning Machines based Intelligent Systems for Power System Security Assessment and Risk Management		
	Speaker:	Zhaoyang Dong, University of Sydney, Australia		
	Chair:	Meng-Joo Er, Nanyang Technological University, Singapore		
9:30am – 10:10am	Keynote 3:	Hierarchical Extreme Learning Machines (ELM) – New Trend of Machine Learning		
	Speaker:	Guang-Bin Huang, Nanyang Technological University, Singapore		
	Chair:	Yoan Miche, Nokia Solutions and Networks, Finland		
10:10am – 10:30am	Coffee Break and Discussions Venue: <i>Ballroom: Foyer, Level 3, Shangri-La Hotel</i>			
Venues	Yingbo Hall (映波厅)	Tingtao Hall (听涛厅)	Ballroom, Level 3	Yingchao Hall (迎潮厅)
10:30am – 12:30pm	Session TM1: ELM Algorithm (I)	Session TM2: ELM Applications (I)	Session TM3: ELM in Big and Large Scale Data Learning	Session TM4: ELM and Sparse Representation
12:30pm – 2:00pm	Lunch Venue: <i>Ballroom, Level 2, Shangri-La Hotel</i>			
Venues	Yingbo Hall (映波厅)	Tingtao Hall (听涛厅)	Ballroom, Level 3	Yingchao Hall (迎潮厅)
2:00pm – 4:00pm	Session TA1: ELM Algorithms (II)	Session TA2: ELM Applications (II)	Session TA3: ELM in Image Processing	Session TA4: ELM in Biomedical Engineering
4:00pm – 4:20pm	Coffee Break and Discussions Venue: <i>Ballroom: Foyer, Level 3, Shangri-La Hotel</i>			
4:20pm – 6:00pm	Session TA5: ELM Algorithms (III)	Session TA6: ELM Applications (III)	Session TA7: ELM in Feature Extraction and Applications	Session TA8: ELM in Sequential and Multi-Label Learning
6:30pm – 8:30pm	Dinner Venue: <i>Luo Wai Luo Restaurant (楼外楼)</i>			

December 16 2015, Wednesday	
Venue	<i>Ballroom, Level 3, Shangri-La Hotel</i>
8:30am – 9:10am	Keynote 4: Big Data and ELM for Biomedicine Speaker: Sushing Chen, University of Florida, USA Chair: Amaury Lendasse, University of Iowa, USA
9:10am – 9:50am	Keynote 5: Multi Extreme Learning Machines for Image Feature Representation Speaker: Q. M. Jonathan Wu, University of Windsor, Canada Chair: Kar-Ann Toh, Yonsei University, Korea

9:50am – 10:30am	Keynote 6: From Computational Imaging to Optical Computing: ELMs at the Speed of Light Speaker: Laurent Daudet, Paris Diderot University, France Chair: Hua-Jun Chen, Zhejiang University, China			
10:30am – 10:50am	Coffee Break and Discussions Venue: <i>Ballroom, Level 3, Shangri-La Hotel</i>			
Venues	Yingbo Hall (映波厅)	Tingtao Hall (听涛厅)	Ballroom, Level 3	Yingchao Hall (迎潮厅)
10:50am – 12:30pm	Session WM1: ELM Theory	Session WM2: ELM in Identification and Detection	Session WM3: ELM in Web Applications	Session WM4: ELM in Facial and Emotion Classification
12:30pm – 2:00pm	Lunch Venue: <i>Ballroom, Level 2, Shangri-La Hotel</i>			
2:00pm – 3:20pm	Session WA1: ELM in Prediction and Forecasting	Session WA2: ELM in Industrial Applications	Session WA3: ELM in Tracking and Localization	Session WA4: ELM in Image and Text Processing
3:20pm – 3:40pm	Coffee Break and Discussions Venue: <i>Ballroom, Foyer, Level 3, Shangri-La Hotel</i>			
Venue	<i>Ballroom, Level 3, Shangri-La Hotel</i>			
3:40pm – 4:40pm	Keynote 7: ELM and Brain Sciences: Into the Deep Mind and Beyond Speaker: Newton Howard, Oxford University, UK Chair: Erik Cambria, Nanyang Technological University, Singapore			
4:40pm – 6:00pm	Panel Discussions <i>Panel members:</i> Sushing Chen, University of Florida, USA Laurent Daudet, Paris Diderot University, France Zhaoyang Dong, University of Sydney, Australia Kar-Ann Toh, Yonsei University, Korea Newton Howard, Oxford University, UK Guang-Bin Huang, Nanyang Technological University, Singapore Q. M. Jonathan Wu, University of Windsor, Canada Xin Yao, University of Birmingham, UK <i>Chair:</i> C. L. Philip Chen, University of Macau, Macau			
6:30pm – 7:00pm	Banquet Cocktail			
7:00pm – 10:00pm	Conference Banquet Venue: <i>Ballroom, Level 3, Shangri-La Hotel</i>			

December 17 2015, Thursday	
9:00am – 4:00pm <i>(Time to be confirmed)</i>	Social and Networking Activities - Xixi National Wetland Park <i>(Only for confirmed registered participants)</i> Meeting Time: 9:00am Meeting Venue: <i>Shangri-La Hotel</i>

KEYNOTE I

Title

Nature's Little Secret: Hebbian-LMS Learning Algorithm?

By Bernard Widrow, Stanford University, USA

Abstract

To be confirmed

Biography



Bernard Widrow received the S.B., S.M., and Sc.D. degrees in Electrical Engineering from the Massachusetts Institute of Technology in 1951, 1953, and 1956, respectively. He joined the MIT faculty and taught there from 1956 to 1959. In 1959, he joined the faculty of Stanford University, where he is currently Professor of Electrical Engineering, Emeritus.

He began research on adaptive filters, learning processes, and artificial neural models in 1957. Together with M.E. Hoff, Jr., his first doctoral student at Stanford, he invented the LMS algorithm in the autumn of 1959. Today, this is the most widely used learning algorithm, used in every MODEM in the world. He has continued working on adaptive signal processing, adaptive controls, and neural networks since that time.

Dr. Widrow is a Life Fellow of the IEEE and a Fellow of AAAS. He received the IEEE Centennial Medal in 1984, the IEEE Alexander Graham Bell Medal in 1986, the IEEE Signal Processing Society Medal in 1986, the IEEE Neural Networks Pioneer Medal in 1991, the IEEE Millennium Medal in 2000, and the Benjamin Franklin Medal for Engineering from the Franklin Institute of Philadelphia in 2001. He was inducted into the National Academy of Engineering in 1995 and into the Silicon Valley Engineering Council Hall of Fame in 1999.

Dr. Widrow is a past president and member of the Governing Board of the International Neural Network Society. He is associate editor of several journals and is the author of over 125 technical papers and 21 patents. He is co-author of *Adaptive Signal Processing* and *Adaptive Inverse Control*, both Prentice-Hall books. A new book, *Quantization Noise*, was published by Cambridge University Press in June 2008.

KEYNOTE II

Title

Extreme Learning Machines based Intelligent Systems for Power System Security Assessment and Risk Management

By Zhaoyang Dong, University of Sydney, Australia

Abstract

Smart Grid technologies can be used to enable large-scale integration of renewable energies such as wind and solar power. However, the stochastic and volatile nature of such renewables bring significant challenges to the operational security of the smart grid. Conventional security assessment (SA) methods are simulation-based, which are insufficiently fast to accommodate the fast and random changes of the renewable generation outputs. The University of Sydney Smart Grid research group has developed a series of data-driven approaches to enable real-time SA to protect the smart grid against the risk of blackouts. This talk will introduce an intelligent SA system based on ELM. An ensemble model is developed to generalize the randomness of single ELMs during the training. Benefiting from the unique properties of ELM and the strategically designed decision-making rules, the intelligent system learns and works very fast and can estimate the credibility of its SA results, allowing an accurate and reliable real-time SA process.

Biography



Zhaoyang Dong obtained Ph.D. from the University of Sydney in 1999. He is Professor and Head of School of Electrical and Information Engineering, Director of Sydney Energy Systems Research Institute, the University of Sydney, and a contractor with Ausgrid and EPRI, USA. He is also director of Faculty of Engineering and IT research cluster on Clean Intelligent Energy Networks, and Academic Director of Tsinghua University - Sydney University Research Alliance on Energy Networks at the University of Sydney. His immediate role was Ausgrid Chair and Director of Centre for Intelligent Electricity Networks (CIEN), the University of Newcastle, Australia. He also worked at the Hong Kong Polytechnic University and as Manager for system planning with Transend Networks (now TASNetworks), Australia (power transmission company for TAS). His research interest includes smart grid, power system planning and stability, load modeling, renewable energy, electricity market, and computational methods. He is an editor of IEEE TRANSACTIONS ON SMART GRID, IEEE PES LETTERS, IEEE TRANS ON SUSTAINABLE ENERGY, IET RENEWABLE POWER GENERATION, and Springer/State Grid Journal of Modern Power Systems and Clean Energy. He is an international Advisor for the journal of Automation of Electric Power Systems. He also served as guest editor for International Journal of Systems Science.

KEYNOTE III

Title

Hierarchical Extreme Learning Machines (ELM) – New Trend of Machine Learning

By Guang-Bin Huang, Nanyang Technological University, Singapore

Abstract

Neural networks (NN) and support vector machines (SVM) play key roles in machine learning and data analysis in the past 2-3 decades. However, it is known that these popular learning techniques face some challenging issues such as: intensive human intervene, slow learning speed, poor learning scalability. The objective of this talk is two-folds: 1) it will introduce the concept of hierarchical Extreme Learning Machines (ELMs); 2) it will show the potential trend of combining ELM and deep learning (DL), which not only expedites the learning speed (up to thousands times faster) and reduces the learning complexity but also improves the learning accuracy in benchmark applications such as OCR, traffic sign recognition, hand gesture recognition, object tracking, 3D Graphics, etc. ELM theories can indeed give some theoretical support to local receptive fields and pooling strategies which are popularly used in deep learning. ELM theories may have explained the reasons why the brain are globally ordered but may be locally random. This talk wishes to share with audiences the trends of machine learning: 1) turning point from machine learning engineering to machine learning science; 2) convergence of machine learning and biological learning; 3) from human and (living) thing intelligence to machine intelligence; 4) from Internet of Things (IoT) to Internet of Intelligent Things and Society of Intelligent Things.

Biography



Guang-Bin Huang received the B.Sc degree in applied mathematics and M.Eng degree in computer engineering from Northeastern University, P. R. China, in 1991 and 1994, respectively, and Ph.D degree in electrical engineering from Nanyang Technological University, Singapore in 1999. During undergraduate period, he also concurrently studied in Applied Mathematics department and Wireless Communication department of Northeastern University, P. R. China. He serves as an Associate Editor of *Neurocomputing*, *Cognitive Computation*, *neural networks*, and *IEEE Transactions on Cybernetics*. He is a senior member of IEEE. He was awarded “*Highly Cited Researcher*” and listed in “*2014 The World’s Most Influential Scientific Minds*” by Thomson Reuters. He received the *best paper award* from IEEE Transactions on Neural Networks and Learning Systems (2013). He was invited to give keynotes on numerous international conferences.

His current research interests include big data analytics, human computer interface, brain computer interface, image processing/understanding, machine learning theories and algorithms, extreme learning machine, and pattern recognition. From May 2001, he has been working as an Assistant Professor and Associate Professor (with tenure) in the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore. He is Principal Investigator of BMW-NTU Joint Future Mobility Lab on Human Machine Interface and Assisted Driving, Principal Investigator (data and video analytics) of Delta – NTU Joint Lab, Principal Investigator (Scene Understanding) of ST Engineering – NTU Corporate Lab, and Principal Investigator (Marine Data Analysis and Prediction) of Rolls Royce – NTU Corporate Lab. He has led/implemented several key industrial projects (e.g., Chief architect/designer and technical leader of Singapore Changi Airport Cargo Terminal 5 Inventory Control System (T5 ICS) Upgrading Project, etc).

One of his main works is to propose a new machine learning theory and learning techniques called Extreme Learning Machines (ELM), which fills the gap between traditional feedforward neural networks, support vector machines, clustering and feature learning techniques. ELM theories have recently been confirmed with biological learning evidence directly, and filled the gap between machine learning and biological learning. ELM theories have also addressed “Father of Computers” J. von Neumann’s concern on why “an imperfect neural network, containing many random connections, can be made to perform reliably those functions which might be represented by idealized wiring diagrams.”

KEYNOTE IV

Title

Big Data and ELM for Biomedicine

By Sushing Chen, University of Florida, USA

Abstract

The Big Data Initiative was proposed by the OSTP (Office of Science and Technology Policy) of the White House in 2012. It has impacted the world significantly. In the biomedical field, there are several relevant programs, such as BD2K (Big Data to Knowledge), Big Brain and Precision Medicine. First, from the Big Brain data, we may ask: “what can we infer the true computational model of the human brain? Is it the ELM?” Next, we shall describe briefly these Big Data programs and explain their scientific contexts, which will lead to some exemplar research problems, which require statistical modeling by ELM (Extreme Learning Machine) methods. Then, we shall describe the Precision Medicine Program, which is actually the Personalized Medicine Problem. For this problem, we shall propose a solution, which is an integrated framework of diagnosis and therapeutics. Hereby, the exemplar research problems mentioned above will lay the foundation of this framework. Two important technologies used in these research problems: microarray of gene expression and NGS (Next Generation Sequencing) of SNP (Single Nucleotide Polymorphism) and how ELM is applied to them should briefly be described. Finally, there is a great digital library, PUBMED, established by NLM (National Library of Medicine) of all biomedical publications. How to classify the collection according to a certain ontology (e.g., GO, Gene Ontology) is a text-mining problem, for which ELM provides a potential solution. In this talk, we wish to explain the usefulness and efficiency of ELM on these research problems.

Biography



After Sushing Chen received his BS in Mathematics from the National Taiwan University, he finished his PhD in Mathematics from the University of Maryland in 1970, and soon started as Assistant Professor and later became Professor of Mathematics at the University of Florida in 1980. He became Program Director of Geometric Analysis at the NSF (National Science Foundation) in 1983. In the meantime, his research started to change to computer science and high performance computing. In 1984, he took the position of Program Director of Intelligence Systems at NSF and began his research on artificial intelligence pattern recognition and machine learning. Since then, his research has focused on these topics and various applications: computer vision, robotics, manufacturing, uncertain reasoning, spatial reasoning, digital libraries, information access and bioinformatics. He has received numerous NSF and DARPA funding in these applications, and returned to governmental services as program director of various programs. He has also worked at industry as consultant, including IBM Watson Research Center, IBM Scientific Center and Boeing High Tech Center. Currently, he is Emeritus Professor of Computer, Information SEngineering at the University of Florida, Director of Systems Biology Lab, and affiliated faculty of the McKnight Brain Institute and UF Genetics Institute.

Sushing Chen’s scientific and engineering contributions include classification of discrete subgroups of Lie groups, isometries of negatively curved manifolds, computer vision of non-rigid motions, spherical modeling of human perception, neural network control of semiconductor manufacturing, evidential reasoning in expert systems, interoperability of distributed digital libraries, genomics of plants, clinical bioinformatics and text-mining of large corpora in knowledge bases. His management of the NSF/DARPA/NASA Digital libraries Initiative in 1994-1995 has led to a new Internet industry, such as Google, Amazon and Facebook. His current effort is the modernization of TCM (Traditional Chinese Medicine) by using OMICS (genomics and proteomics) technologies in pharmacology of herbal medicine.

KEYNOTE V

Title

Multi Extreme Learning Machines for Image Feature Representation

By Q. M. Jonathan Wu, University of Windsor, Canada

Abstract

Most of actual images such as human face image, industrial image and MRI image are high-dimensional data. The feature representation is mainly for the purpose of extracting useful information and of using this information to build non-supervised classifier/supervised classifier or other types of predictor because the image processing performance is often closely related to the feature data extracted and used. At present, there are three assumptions which are dominant in feature representation area, including: 1) Low-dimensional manifold assumption that the high-dimensional data exist in the embedded low-dimensional manifold; 2) Low-dimensional subspace assumption with high-dimensional data intrinsically existing in the low-dimensional subspace; 3) sparse assumption meaning that data representation on the over-complete base is sparse. It should be noted that we found the many multiple-layer ELMs based feature extraction and clustering learning are very similar to the above-mentioned three assumptions with respect to their intrinsic operation mechanism. Therefore, using these similarity relationships, we may perhaps greatly improve the practical application performance of feature representation. In this lecture, we first discuss these similarity relationships and further bring forward a generalized ELM learning frame which is intended to extract the optimized features. Then, we extend and apply this method for such application fields as dimension reduction, image identification, image reconstruction, etc. Compared with the other feature representation methods, the experimental results show that the generalization performance of the subject generalized learning frame is very advantageous.

Biography



Jonathan Wu is a Professor of Electrical and Computer Engineering and a Tier 1 Canada Research Chair in Automotive Sensors and Information Systems since 2005. He is the founding director of the Computer Vision and Sensing Systems Laboratory at the University of Windsor, Canada. Prior to joining the University, Dr. Wu was a Senior Research Officer and Group Leader at the National Research Council of Canada (NRC). He has published one book in the area of 3D vision and more than 300 peer-reviewed papers (including 150 journal publications) in areas of computer vision, multimedia information processing, and intelligent systems. Dr. Wu is an Associate Editor for IEEE Transaction on Neural Networks and Learning Systems and the Journal of Cognitive Computation. Dr. Wu has served on editorial board for the IEEE Transaction on Systems, Man, and Cybernetics and the International Journal of Robotics and Automation. He has been on the Technical Program

Committees and International Advisory Committees for many prestigious conferences.

KEYNOTE VI

Title

From Computational Imaging to Optical Computing: ELMs at the Speed of Light

By Laurent Daudet, Paris Diderot University, France

Abstract

In the recent years, there has been a surge of methods to take advantage of computational methods in order to improve imaging systems. Here, we have investigated how a conceptually simple experiment of imaging with coherent light through a layer of multiply scattering material is indeed close to an idealized physical implementation of compressed sensing. For higher resolution imaging, we have used amplitude-only spatial light modulators for the calibration of the system, which led to the development of new algorithms for phase retrieval, with robustness to strong noise. In reverse, we investigate how this physical system can be used as a computing device that provides a large number of random projections of images that could be later used for classification tasks e.g. physically approximating a given kernel. This can be seen as the first layer of an ELM system, implemented physically at potentially high speed and low energy consumption.

This is a joint work with Francesco Caltagirone, Igor Carron, Angélique Drémeau, Sylvain Gigan, Florent Krzakala, Antoine Liutkus, Boshra Rajaei, and Alaa Saade.

Biography



Laurent Daudet studied at the Ecole Normale Supérieure in Paris, where he graduated in statistical and non-linear physics. In 2000, he received a PhD in mathematical modeling from the Université de Provence, Marseille, France. After a Marie Curie post-doctoral fellowship at Queen Mary University of London, UK, he worked as associate professor at UPMC (Paris 6 University). He is now Professor at Paris Diderot University – Paris 7, with research at the Langevin Institute for Waves and Images. He is « junior fellow » (2010-2015) of the prestigious Institut Universitaire de France, and visiting professor (2012-2016) at the National Institute of Informatics, Tokyo, Japan. He is author or co-author of over 170 publications (journal papers or conference proceedings) on various aspects of signal processing, in particular using sparse representations, applied to audio, acoustics, and optics. He is co-founder of the LightOn project (<http://lighton.io>), to develop new technologies

for energy-efficient optical-based co-processors.

KEYNOTE VII

Title

ELM and Brain Sciences: Into the Deep Mind and Beyond

By Newton Howard, Oxford University, USA

Abstract

To be confirmed

Biography



Newton Howard, a former presidentially appoint officer, is the Director of the Synthetic Intelligence Lab and a resident scientist at the Massachusetts Institute of Technology (MIT). While a graduate member of the Faculty of Mathematical Sciences at the University of Oxford, England, he proposed the Theory of Intention Awareness (IA), which made a significant impact on the design of command and control systems and information exchange systems at tactical operational and strategic levels. He then went on to receive a PhD in Cognitive Informatics and Mathematics from La Sorbonne, France where he was also awarded the Habilitation a Diriger des Recherches for his leading work on the Physics of Cognition (PoC) and its applications to complex medical, economical and security equilibriums.

In 2009 Dr. Howard founded the Mind Machine Project at MIT; an interdisciplinary initiative to reconcile natural intelligence with machine intelligence. In 2011 Dr. Howard established the Brain Sciences Foundation (BSF), a not-for profit, multidisciplinary research foundation dedicated to developing novel paradigms that enable the study of both mind and brain and ultimately the treatment of neurological disorders.

In 2014 Newton received a Doctorate in Neurosurgery from Oxford University from the department of neurosurgery, focused on the early detection of neurodegenerative diseases. Dr. Howard works with multidisciplinary teams of physicists, chemists, biologists, brain scientists, computer scientists, and engineers to reach a deeper understanding of the brain. Dr. Howard's research efforts aim to improve the quality of life for so many who suffer from degenerating conditions currently considered incurable. Advancing the field of brain sciences opens new opportunities for solving brain disorders and finding new means for developing artificial intelligence. Dr. Howard's most recent work focuses on the development of functional brain and neuron interfacing abilities. To better understand the structure and character of this information transfer he concentrated on theoretical mathematical models to represent the exchange of information inside the human brain. This work, called the Fundamental Code Unit (FCU), has proven applicable in the diagnosis and study of brain disorders and has aided in developing and implementing necessary pharmacological and therapeutic tools for physicians. He has also developed individualized strategies to incorporate solutions for psychiatric and brain prosthetics. Through collaborative research efforts with MIT and Oxford University, Dr. Howard has been working on interventions for early detection and novel treatment strategies for neurodegenerative diseases and affective disorders.

ELM2015 TECHNICAL PROGRAM

Dec 15 2015, Tuesday

10:30am – 12:30pm	Session TM1: ELM Algorithm (I) Chair: Federica Bisio Venue: Yingbo Hall (映波厅)
10:30am	<i>Efficient Batch Parallel Online Sequential Extreme Learning Machine Algorithm based on MapReduce</i> Shan Huang, Botao Wang, Yuemei Chen, Guoren Wang, and Ge Yu <i>Northeastern University, China</i>
10:50am	<i>Fixed-Point Evaluation of Extreme Learning Machine for Classification</i> Yingnan Xu, Jingfei Jiang, Juping Jiang, Zhiqiang Liu, and Jinwei Xu <i>National University of Defense Technology, China</i>
11:10am	<i>Parallel Multi-Graph Classification Using Extreme Learning Machine and MapReduce</i> Jun Pang ¹ , Yu Gu ¹ , Jia Xu ² , Xiaowang Kong ¹ , and Ge Yu ¹ ¹ <i>Northeastern University, China</i> ² <i>Guangxi University, China</i>
11:30am	<i>Cluster-based Outlier Detection Using Unsupervised Extreme Learning Machines</i> Xite Wang, Derong Shen, Mei Bai, Tiezheng Nie, Yue Kou, and Ge Yu <i>Northeastern University, China</i>
11:50am	<i>Learning with Similarity Functions: a Novel Design for the Extreme Learning Machine</i> Federica Bisio, Paolo Gastaldo, Rodolfo Zunino, Christian Gianoglio, and Edoardo Ragusa <i>University of Genoa, Italy</i>
12:10pm	<i>Optimization Extreme Learning Machine with ν Regularization</i> Ding Xiao-Jian ¹ , Lan Yuan ² , Zhang Zhi-Feng ³ , and Xu Xin ¹ ¹ <i>Science and Technology on Information Systems Engineering Laboratory, China</i> ² <i>Taiyuan University of Technology, China</i> ³ <i>Zhengzhou University of Light Industry, China</i>

10:30am – 12:30pm	Session TM2: ELM Applications (I) Chair: Kezhi Mao Venue: Tingtao Hall (听涛厅)
10:30am	<i>The Distance-based Representative Skyline Calculation using Unsupervised Extreme Learning Machines</i> Mei Bai, Junchang Xin, Guoren Wang, and Xite Wang <i>Northeastern University, China</i>
10:50am	<i>A Semi-Supervised Extreme Learning Machine Framework and Its Application in Antineoplastics Classification Using Near-Infrared Spectroscopy Data</i> Shibo Jing, Tengyang Zhao, and Liming Yang

	<i>China Agricultural University, China</i>
11:10am	<i>Optimization of Outsourcing ELM problems in Cloud Computing from Multi-Parties</i> Jiarun Lin, Tianhang Liu, Zhiping Cai, Xinwang Liu, and Jianping Yin <i>National University of Defense Technology, China</i>
11:30am	<i>H-MRST: A Novel Framework For Support Uncertain Data Range Query Using ELM</i> Bin Wang, Rui Zhu, and Guoren Wang <i>Northeastern University, China</i>
11:50am	<i>Robust Kernel-based Model Reference Adaptive Control for Unstable Aircraft</i> Zhao-Xu Yang, Guang-She Zhao, Rong-Jing Bao, Hai-Jun Rong, and Lei-Tao Gao <i>Xi'an Jiaotong University, China</i>
12:10pm	<i>Partially Connected ELM for Fast and Effective Scene Classification</i> Dongzhe Wang, Rui Zhao, and Kezhi Mao <i>Nanyang Technological University, Singapore</i>

10:30am – 12:30pm	Session TM3: ELM in Big and Large Scale Data Learning Chair: Yuanlong Yu Venue: Ballroom, Level 3
10:30am	<i>Extreme Learning Machine for Large-Scale Graph Classification Based on MapReduce</i> Zhanghui Wang ¹ , Yuhai Zhao ^{1,2} , and Guoren Wang ¹ ¹ <i>Northeastern University, China</i> ² <i>Southeast University, China</i>
10:50am	<i>Heterogeneous Blocked CPU-GPU Accelerate Scheme for Large Scale Extreme Learning Machine</i> Shijie Li, Yong Dou, Qi Lv, Yueqing Wang, and Zhige Xie <i>National University of Defense Technology, China</i>
11:10am	<i>Application of Extreme Learning Machine on Large Scale Traffic Congestion Prediction</i> Xiaojuan Ban ^{1,2} , Chong Guo ¹ , and Guohui Li ³ ¹ <i>University of Science and Technology Beijing, China</i> ² <i>Tianjin University, China</i> ³ <i>Ao Jin Tech Co., Ltd, China</i>
11:30am	<i>An Efficient High-dimensional Big Data Storage Structure Based on US-ELM</i> Linlin Ding ¹ , Yu Liu ¹ , Baoyan Song ¹ , and Junchang Xin ² ¹ <i>Liaoning University, China</i> ² <i>Northeastern University, China</i>
11:50am	<i>Large-Scale Scene Recognition based on Extreme Learning Machines</i> Yuanlong Yu ¹ , Lingying Wu ¹ , Kai Sun ¹ , and Jason Gu ² ¹ <i>Fuzhou University, China</i> ² <i>Dalhousie University, Canada</i>
12:10pm	<i>Two-Layer Extreme Learning Machine for Dimension Reduction</i> Yimin Yang and Q. M. Jonathan Wu <i>University of Windsor, Canada</i>

10:30am	Session TM4: ELM and Sparse Representation
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– 12:30pm	Chair: Huaping Liu Venue: Yingchao Hall (迎潮厅)
10:30am	<i>Discriminative Extreme Learning Machine with Supervised Sparsity Preserving for Image Classification</i> Yong Peng ^{1,2} and Bao-Liang Lu ² ¹ Nanjing University of Aeronautics and Astronautics, China ² Shanghai Jiao Tong University, China
10:50am	<i>Sparse Coding Extreme Learning Machine for Classification</i> Zhenzhen Sun and Yuanlong Yu Fuzhou University, China
11:10am	<i>Extreme Learning Machine via Free Sparse Transfer Representation Optimization</i> Xiaodong Li ¹ , Weijie Mao ² , and Wei Jiang ² ¹ Hangzhou Dianzi University, China ² Zhejiang University, China
11:30am	<i>Denoising Deep Extreme Learning Machines for Sparse Representation</i> Xiangyi Cheng ¹ , Huaping Liu ² , Xinying Xu ¹ , and Fuchun Sun ² ¹ Taiyuan University of Technology, China ² Tsinghua University, China
11:50am	<i>A Pruning Ensemble Model of Extreme Learning Machine with $L_{1/2}$ Regularizer</i> Bo He ¹ , Tingting Sun ¹ , Tianhong Yan ² , Yue Shen ¹ , and Rui Nian ¹ ¹ Ocean University of China, China ² China Jiliang University, China
12:10pm	<i>Sparse Extreme Learning Machine for Regression</i> Zuo Bai, Guang-Bin Huang, and Danwei Wang Nanyang Technological University, Singapore

02:00pm – 04:00pm	Session TA1: ELM Algorithms (II) Chair: Yoan Miche Venue: Yingbo Hall (映波厅)
02:00pm	<i>ELM-ML: Study on Multi-Label Classification using Extreme Learning Machine</i> Xia Sun ¹ , Jiarong Wang ² , Changmeng Jiang ¹ , Jingting Xu ¹ , Jun Feng ¹ , Su-Shing Chen ³ , and Feijuan He ⁴ ¹ Northwest University, China ² Chinese Academy of Sciences, China ³ University of Florida, USA ⁴ Xi'an Jiaotong University, China
02:20pm	<i>The Selection of Input Weights of Extreme Learning Machine: A Sample Structure Preserving Point of View</i> Wenhui Wang ¹ and Xueyi Liu ² ¹ Zhejiang University of Water Resources and Electric Power, China ² China Jiliang University, China
02:40pm	<i>KELM : An Improved K-means Clustering Method using Extreme Learning Machine</i> Lijuan Duan ¹ , Bin Yuan ¹ , Song Cui ¹ , Jun Miao ² , and Wentao Zhu ² ¹ Beijing University of Technology, China ² Chinese Academy of Sciences, China

03:00pm	<p><i>ELMVIS+: Improved Nonlinear Visualization Technique using Cosine Distance and Extreme Learning Machines</i></p> <p>Anton Akusok¹, Yoan Miche², Kaj-Mikael Björk³, Rui Nian⁴, and Paula Lauren⁵, and Amaury Lendasse¹</p> <p>¹The University of Iowa, Iowa City, USA ²Nokia Solutions and Networks Group, Finland ³Arcada University of Applied Sciences, Finland ⁴Ocean University of China, China ⁵Oakland University, USA</p>
03:20pm	<p><i>On Mutual Information over non-Euclidean Spaces, Data Mining and Data Privacy Levels</i></p> <p>Yoan Miche¹, Ian Oliver¹, Silke Holtmanns¹, Anton Akusok², Amaury Lendasse², and Kaj-Mikael Björk³</p> <p>¹Nokia Solutions and Networks, Finland ²The University of Iowa, USA ³Arcada University of Applied Sciences, Finland</p>
03:40pm	<p><i>WELM: Extreme Learning Machine with Wavelet Dynamic Co-Movement Analysis in High-Dimensional Time Series</i></p> <p>Heng-Guo Zhang¹, Rui Nian¹, Yan Song¹, Chi-Wei Su¹, Yang Liu¹, Amaury Lendasse^{2,3}</p> <p>¹Ocean University of China, China ²Arcada University of Applied Sciences, Finland ³The University of Iowa, USA</p>

02:00pm – 04:00pm	<p>Session TA2: ELM Applications (II)</p> <p>Chair: Jiuwen Cao</p> <p>Venue: Tingtao Hall (听涛厅)</p>
02:00pm	<p><i>ELM Meets Urban Computing: Ensemble Urban Data For Smart City Applications</i></p> <p>Ningyu Zhang, Huajun Chen, Xi Chen, and Jiaoyan Chen Zhejiang University, Hangzhou, China</p>
02:20pm	<p><i>Local and Global Unsupervised Kernel Extreme Learning Machine and Its Application in Nonlinear Process Fault Detection</i></p> <p>Hanyuan Zhang¹, Xuemin Tian¹, Xiaohui Wang^{1,2}, and Yuping Cao¹</p> <p>¹China University of Petroleum (East China), China ²Qingdao University, China</p>
02:40pm	<p><i>Kernel Based Semi-supervised Extreme Learning Machine and the Application in Traffic Congestion Evaluation</i></p> <p>Qing Shen, Xiaojuan Ban, Chong Guo, and Cong Wang University of Science and Technology Beijing, China</p>
03:00pm	<p><i>The Classification of Imbalanced Large Data Sets Based on MapReduce and Ensemble of ELM Classifiers</i></p> <p>Junhai Zhai^{1,2}, Sufang Zhang³, and Chenxi Wang¹</p> <p>¹Hebei University, China ²Zhejiang Normal University, China ³China Meteorological Administration, China</p>
03:20pm	<p><i>ELM based Representational Learning for Fault Diagnosis of Wind Turbine Equipment</i></p> <p>Zhixin Yang, Xianbo Wang, Pak Kin Wong, and Jianhua Zhong University of Macau, China</p>

03:40pm	<i>Excavation Equipment Recognition based on Improved MFCC Features and ELM Classifier</i> Tuo Zhao, Jiuwen Cao, Wei Wang, Jianzhong Wang, and Ruirong Wang Hangzhou Dianzi University, China
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02:00pm – 04:00pm	Session TA3: ELM in Image Processing Chair: Lei Zhang Venue: Ballroom, Level 3
02:00pm	<i>SVM and ELM: Who Wins? Object Recognition with Deep Convolutional Features from ImageNet</i> Lei Zhang ^{1,2} , David Zhang ² , and Fengchun Tian ¹ ¹ Chongqing University, China ² The Hong Kong Polytechnic University, China
02:20pm	<i>Extreme Learning Machine-Guided Collaborative Coding for Remote Sensing Image Classification</i> Chunwei Yang ^{1,2} , Huaping Liu ² , Shouyi Liao ¹ , and Shicheng Wang ¹ ¹ High-Tech Institute of Xi'an, China ² Tsinghua University, China
02:40pm	<i>Extreme Learning Machine with Gaussian Kernel Based Relevance Feedback Scheme for Image Retrieval</i> Lijuan Duan, Shuai Dong, Song Cui, and Wei Ma Beijing University of Technology, China
03:00pm	<i>Code Generation Technology of Digital Satellite</i> Ren Min, Dong Yunfeng, and Li Chang Beihang University, China
03:20pm	<i>Robust Discriminative Extreme Learning Machine for Relevance Feedback in Image Retrieval</i> Liu Shenglan, Feng Lin, Liu Yang, and Wang Wei Dalian University of Technology, China
03:40pm	<i>Continuous Top-K Remarkable comments Over Textual Streaming Data Using ELM</i> Rui Zhu, Bin Wang, and Guoren Wang Northeastern University, China

02:00pm – 04:00pm	Session TA4: ELM in Biomedical Engineering Chair: Rui Zhang Venue: Yingchao Hall (迎潮厅)
02:00pm	<i>Segmentation of the Left Ventricle in Cardiac MRI Using an ELM Model</i> Yang Luo ^{1,2} , Benqiang Yang ³ , Lisheng Xu ¹ , Liling Hao ¹ , Jun Liu ¹ , Yang Yao ¹ , and Frans van de Vosse ⁴ ¹ Northeastern University, China ² Anshan Normal University, China ³ General Hospital of Shenyang Military, China ⁴ Eindhoven University of Technology, The Netherlands
02:20pm	<i>Distributed Weighted Extreme Learning Machine for Big Imbalanced Data Learning</i> Zhiqiong Wang, Junchang Xin, Shuo Tian, and Ge Yu Northeastern University, China

02:40pm	<i>NMR Image Segmentation based on Unsupervised Extreme Learning Machine</i> Junchang Xin, Zhongyang Wang, Shuo Tian, and Zhiqiong Wang Northeastern University, China
03:00pm	<i>Feature Extraction of Motor Imagery EEG based on Extreme Learning Machine Auto-Encoder</i> LijuanDuan, Yanhui Xu, Song Cui ,Juncheng Chen, and MenghuBao Beijing University of Technology, China
03:20pm	<i>RNA Secondary Structure Prediction using Extreme Learning Machine with Clustering Under Sampling Technique</i> Tianhang Liu, Jiarun Lin, Chengkun Wu, and Jianping Yin National University of Defense Technology, China
03:40pm	<i>Application of extreme learning machine to epileptic seizure detection based on lagged Poincare plots</i> Jiangling Song and Rui Zhang Northwest University, China

04:20pm – 06:00pm	Session TA5: ELM Algorithms (III) Chair: Xinwang Liu Venue: Yingbo Hall (映波厅)
04:20pm	<i>Improvement of ELM Algorithm for Multi-Object Identification in Gesture Interaction</i> Liang Diao ¹ , Ligu Shuai ¹ , Huiling Chen ¹ , and Weihang Zhu ² ¹ Southeast University, China ² Lamar University, USA
04:40pm	<i>A Semi-Supervised Low Rank Kernel Learning Algorithm via Extreme Learning Machine</i> Bing Liu, Mingming Liu, Chen Zhang, and Weidong Wang China University of Mining and Technology, China
05:00pm	<i>Class-Constrained Extreme Learning Machine</i> Xiao Liu ^{1,2} , Jun Miao ² , Laiyun Qing ² , and Baoxiang Cao ¹ ¹ Qufu Normal University, China ² Chinese Academy of Sciences, China
05:20pm	<i>Distributed Extreme Learning Machine with Alternating Direction Method of Multiplier</i> Minnan Luo, Lingling Zhang, Qinghua Zheng, and Jun Liu Xi'an Jiaotong University, China.
05:40pm	<i>Subspace Ensemble Classification for High Dimensional Missing Data</i> Hang Gao, Xinwang Liu, and Yuxing Peng National University of Defense Technology, China

04:20pm – 06:00pm	Session TA6: ELM Applications (III) Chair: Meng-Hiot Lim Venue: Tingtao Hall (听涛厅)
04:20pm	<i>Encrypted Image Classification based on Multilayer Extreme Learning Machine</i> Weiru Wang, Chi-Man Vong, Yilong Yang, and Pak-Kin Wong University of Macau, China

04:40pm	<p>Rational and Self-Adaptive Evolutionary Extreme Learning Machine for Electricity Price Forecast</p> <p>Chixin Xiao^{1,2}, Zhaoyang Dong³, Yan Xu², Ke Meng², Xun Zhou², and XinZhang³ ¹University of Newcastle, Australia ²Xiangtan University, China ³University of Sydney, Australia</p>
05:00pm	<p>Multi-Modal Deep Extreme Learning Machine for Robotic Grasping Recognition</p> <p>Jie Wei¹, Huaping Liu², Gaowei Yan¹, and Fuchun Sun² ¹Taiyuan University of Technology, China ²Tsinghua University, China</p>
05:20pm	<p>Wind Power Ramp Events Classification using Extreme Learning Machines</p> <p>Sujay Choubey¹, Anubhav Barsaiyan¹, Nitin Anand Shrivastava¹, Bijaya Ketan Panigrahi¹, and Meng-Hiot Lim² ¹Indian Institute of Technology, India ²Nanyang Technological University, Singapore</p>
05:40pm	<p>Data Driven Map Matching of the Vehicle Tracks</p> <p>Gang Wu and Huiqin Li Northeastern University, China</p>

04:20pm – 06:00pm	<p>Session TA7: ELM in Feature Extraction and Applications Chair: Kar-Ann Toh Venue: Ballroom, Level 3</p>
04:20pm	<p>Feature Weighting Using Evolutionary Extreme Learning Machine for Nearest-neighbor Classification</p> <p>Yanpeng Qu, Nana Zhang and Anshdeng Deng Dalian Maritime University, China</p>
04:40pm	<p>Graph Classification based on Sparse Graph Feature Selection and Extreme Learning Machine</p> <p>Yajun Yu, Zhisong Pan and Guyu Hu PLA University of Science and Technology, China</p>
05:00pm	<p>An Enhanced Extreme Learning Machine for Efficient Small Sample Classification</p> <p>Ying Yin, Yuhai Zhao, Ming Li, and Bin Zhang Northeastern University, China</p>
05:20pm	<p>Contractive ML-ELM for Invariance Robust Feature Extraction</p> <p>Xibin Jia and Hua Du Beijing University of Technology, China</p>
05:40pm	<p>Hardware Architecture for Large Parallel Array of Random Feature Extractors for Image Recognition</p> <p>Aakash Patil, Shen Shanlan, Enyi Yao, and Arindam Basu Nanyang Technological University, Singapore</p>

04:20pm – 06:00pm	<p>Session TA8: ELM in Sequential and Multi-Label Learning Chair: Meng Joo Er Venue: Yingchao Hall (迎潮厅)</p>
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04:20pm	<i>Two-Stage Hybrid Extreme Learning Machine for Sequential Imbalanced Data</i> Wentao Mao, Jinwan Wang, Ling He, and Yangyang Tian <i>Henan Normal University, China</i>
04:40pm	<i>Timeliness Online Regularized Extreme Learning Machine</i> Xiong Luo, Xiaona Yang, Changwei Jiang, and Xiaojuan Ban <i>University of Science and Technology Beijing, China</i>
05:00pm	<i>Kernel Online Sequential ELM Algorithm with Sliding Window Subject to Time-Sensitive Data</i> Haigang Zhang, Sen Zhang, and Yixin Yin <i>University of Science and Technology Beijing, China</i>
05:20pm	<i>Multi-Instance Multi-label learning by Extreme Learning Machine</i> Chenguang Li, Ying Yin, Yuhai Zhao, Guang Chen, and Libo Qin <i>Northeastern University, China</i>
05:40pm	<i>A High Speed Multi-label Classifier based on Extreme Learning Machines</i> Meng Joo Er ^{1,2} , Rajasekar Venkatesan ¹ , and Ning Wang ² ¹ <i>Nanyang Technological University, Singapore</i> ² <i>Dalian Maritime University, China</i>

Dec 16 2015, Wednesday

10:50am – 12:30pm	Session WM1: ELM Theory Chair: Amaury Lendasse Venue: Yingbo Hall (映波厅)
10:50am	<i>On The Construction of Extreme Learning Machine for One Class Classifier</i> Chandan Gautam and Aruna Tiwari <i>Indian Institute of Technology, India</i>
11:10am	<i>A Theoretical Study on Reasoning of Extreme Learning Machine for Classification</i> Pak Kin Wong, Xiang Hui Gao, Ka In Wong, and Chi Man Vong <i>University of Macau, China</i>
11:30am	<i>Correlation between Extreme Learning Machine and Entorhinal Hippocampal System</i> Lijuan Su, Min Yao, Nenggan Zheng, and Zhaohui Wu <i>Zhejiang University, China</i>
11:50am	<i>Dynamic Adjustment of Hidden Layer Structure for Convex Incremental Extreme Learning Machine</i> Yongjiao Sun, Yuangen Chen, Ye Yuan, and Guoren Wang <i>Northeastern University, China</i>
12:10pm	<i>Probabilistic Methods for Multiclass Classification Problems</i> Andrey Gritsenko ^{1,3} , Emil Eirola ² , Daniel Schupp ³ , Edward Ratner ³ , and Amaury Lendasse ^{1,2} ¹ <i>The University of Iowa, USA</i> ² <i>Arcada University of Applied Sciences, Finland</i> ³ <i>Lyrical Labs LLC, USA</i>

10:50am – 12:30pm	Session WM2: ELM in Identification and Detection Chair: Zhixin Yang Venue: Tingtao Hall (听涛厅)
10:50am	<i>Channel Estimation Based on Extreme Learning Machine for High Speed Environments</i> Fang Dong ¹ , Junbiao Liu ¹ , Liang He ² , Xiaohui Hu ¹ , and Hong Liu ¹ ¹ Zhejiang University, China ² Tsinghua University, China
11:10am	<i>MIMO Modeling Based on Extreme Learning Machine</i> Junbiao Liu ¹ , Fang Dong ¹ , Jiuwen Cao ² , and Xinyu Jin ¹ ¹ Zhejiang University, China ² Hangzhou Dianzi University, China
11:30am	<i>Adaptive Input Shaping for Flexible Systems using an Extreme Learning Machine Algorithm Identification</i> Jun Hu and Zhongyi Chu Beihang University, China
11:50am	<i>WOS-ELM-Based Double Redundancy Fault Diagnosis and Reconstruction for Aircraft Engine Sensor</i> Yi-Gang Sun, Jing-Ya Liu, and Zhen Zhao Civil Aviation University of China, Tianjin
12:10pm	<i>Real-Time Driver Fatigue Detection Based on ELM</i> Hengyu Liu, Tiancheng Zhang, HaibinXie, Hongbiao Chen, and Fangfang Li Northeastern University, China

10:50am – 12:30pm	Session WM3: ELM in Web Applications Chair: Zhaoxia Wang Venue: Ballroom, Level 3
10:50am	<i>Extreme Learning Machine for Multi-Class Sentiment Classification of Tweets</i> Zhaoxia Wang ¹ and Yogesh Parth ² ¹ Institute of High Performance Computing, Singapore ² Indian Institute of Space Science and Technology, India
11:10am	<i>Record Linkage for Event Identification in XML Feeds Stream Using ELM</i> Xin Bi, Xiangguo Zhao, Wenhui Ma, Zhen Zhang, and Heng Zhan Northeastern University, China
11:30am	<i>Sentiment Analysis of Chinese Micro Blog based on DNN and ELM and Vector Space Model</i> Huilin Liu, Chun Feng Jiang, and Shan Li Northeastern University, China
11:50am	<i>Self Forward and Information Dissemination Prediction Research in SINA Microblog Using ELM</i> Huilin Liu and Yao Li Northeastern University, China

12:10pm	<p><i>Extreme Learning Machine based Point-of-Interest Recommendation in Location-based Social Networks</i></p> <p>Mo Chen, Feng Li, Ge Yu, and Dan Yang Northeastern University, China</p>
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10:50am – 12:30pm	<p>Session WM4: ELM in Facial and Emotion Classification Chair: Erik Cambria Venue: Yingchao Hall (迎潮厅)</p>
10:50am	<p><i>Multimodal Fusion using Kernel-based ELM for Video Emotion Recognition</i></p> <p>LijuanDuan, Hui Ge, Zhen Yang, and Juncheng Chen Beijing University of Technology, China</p>
11:10am	<p><i>Automated Human Facial Expression Recognition Using Extreme Learning Machines</i></p> <p>Abhilasha Ravichander, Supriya Vijay, Varshini Ramaseshan, and S. Natarajan P.E.S Institute of Technology, India</p>
11:30am	<p><i>Facial Expression Recognition Based on Ensemble Extreme Learning Machine with Eye Movements Information</i></p> <p>Bo Lu¹, Xiaodong Duan¹, and Ye Yuan² ¹Dalian Nationalities University, China ²Northeastern University, China</p>
11:50am	<p><i>Multiple Kernel Learning for Multimodal Emotion and Sentiment Analysis</i></p> <p>Soujanya Poria¹, Erik Cambria¹, Amir Hussain², and Newton Howard³ ¹Nanyang Technological University, Singapore ²University of Stirling, UK ³Massachusetts Institute of Technology, USA</p>
12:10pm	<p><i>A Randomly Weighted Gabor Network for Visual-Thermal Infrared Face Recognition</i></p> <p>Beom-Seok Oh^{1,2}, Kangrok Oh¹, Andrew Beng Jin Teoh¹, Zhiping Lin², and Kar-Ann Toh¹ ¹Yonsei University, Republic of Korea ²Nanyang Technological University, Singapore</p>

2:00pm – 3:20pm	<p>Session WA1: ELM in Prediction and Forecasting Chair: Zhiping Lin Venue: Yingbo Hall (映波厅)</p>
2:00pm	<p><i>Time Series Prediction Based on Online Sequential Improved Error Minimized Extreme Learning Machine</i></p> <p>Jiao Xue, Zeshen Liu, Yong Gong, and Zhisong Pan PLA University of Science and Technology, China</p>
2:16pm	<p><i>Routing Tree Maintenance based on Trajectory Prediction in Mobile Sensor Networks</i></p> <p>Junchang Xin, Teng Li, Pei Wang, and Zhiqiong Wang Northeastern University, China</p>
2:32pm	<p><i>A Kernel Extreme Learning Machine Algorithm Based on Improved Particle Swam Optimization</i></p> <p>Huijuan Lu¹, Bangjun Du¹, Jinyong Liu², and Haixia Xia³</p>

	<p>¹China Jiliang University, China</p> <p>²Ctrip Travel Network, China</p> <p>³Zhejiang Sci-Tech University, China</p>
2:48pm	<p><i>Evaluating Confidence Intervals for ELM Predictions</i></p> <p>Anton Akusok¹, Yoan Miche^{2,3}, Kaj-Mikael Björk⁴, Rui Nian⁵, Paula Lauren⁶, and Amaury Lendasse¹</p> <p>¹The University of Iowa, USA</p> <p>²Nokia Solutions and Networks Group, Finland</p> <p>³Aalto University School of Science, Finland</p> <p>⁴Arcada University of Applied Sciences, Finland</p> <p>⁵Ocean University of China, China</p> <p>⁶Oakland University, USA</p>
3:04pm	<p><i>Extreme Learning Machine Based Mutual Information Estimation with an Application in Time-Series Change-Points Detection</i></p> <p>Beom-Seok Oh¹, Lei Sun¹, Chung Soo Ahn², Yong Kiang Yeo¹, Yan Yang¹, Liu Nan², and Zhiping Lin¹</p> <p>¹Nanyang Technological University, Singapore</p> <p>²Singapore General Hospital, Singapore</p>

2:00pm – 3:20pm	<p>Session WA2: ELM in Industrial Applications</p> <p>Chair: Sandra Seijo</p> <p>Venue: Tingtao Hall (听涛厅)</p>
2:00pm	<p><i>Feature Selection and Modelling of a Steam Turbine from a Combined Heat and Power Plant Using ELM</i></p> <p>Sandra Seijo¹, Victoria Martínez¹, Inés del Campo¹, Javier Echanobe¹, and Javier García-Sedano²</p> <p>¹University of the Basque Country, Spain</p> <p>²Optimitive, Spain</p>
2:16pm	<p><i>An Adaptive Online Sequential Extreme Learning Machine for Real-Time Tidal Level Prediction</i></p> <p>Jianchuan Yin, Lianbo Li, Yuchi Cao, and Jian Zhao</p> <p>Dalian Maritime University, China</p>
2:32pm	<p><i>Prediction of Pulp Concentration Using Extreme Learning Machine</i></p> <p>Changwei Jiang¹, Xiong Luo¹, Xiaona Yang¹, Huan Wang^{1,2}, and Dezheng Zhang¹</p> <p>¹University of Science and Technology Beijing, China</p> <p>²Ansteel Mining, China</p>
2:48pm	<p><i>The Granule-Based Interval Forecast for Wind Speed</i></p> <p>Songjian Chai¹, Youwei Jia¹, Zhao Xu¹, and Zhaoyang Dong²</p> <p>¹The Hong Kong Polytechnic University, China</p> <p>²The University of Sydney, Australia</p>
3:04pm	<p><i>Prediction of Blast Furnace Gas Utilization Rate based on Improved Extreme Learning Machine</i></p> <p>Yanjiao Li, Sen Zhang, Yixin Yin, and Jie Zhang</p> <p>University of Science and Technology Beijing, China</p>

2:00pm	<p>Session WA3: ELM in Tracking and Localization</p>
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– 3:20pm	Chair: Shifei Ding Venue: Ballroom, Level 3
2:00pm	<i>Random Neural Q-learning for Obstacle Avoidance of a Mobile Robot in Unknown Environment</i> Jing Yang and Hai-Jun Rong <i>Xi'an Jiaotong University, China</i>
2:16pm	<i>Equality Constrained-Optimization-Based Semi-Supervised ELM for Modeling Signal Strength Temporal Variation in Indoor Location Estimation</i> Felis Dwiyasa ¹ , Meng-Hiot Lim ¹ , Yew-Soon Ong ¹ , and Bijaya Panigrahi ² ¹ <i>Nanyang Technological University, Singapore</i> ² <i>Indian Institute of Technology, India</i>
2:32pm	<i>A New Target Tracking Method based on OSELM</i> Jing Zhang, Lin Feng, and Laihang Yu <i>Dalian University of Technology, China</i>
2:48pm	<i>Effective Visual Tracking by Pairwise Metric Learning</i> Baoxian Wang ¹ , Chenwei Deng ¹ , Weisi Lin ² , Guang-Bin Huang ² , and Baojun Zhao ^{1,3} ¹ <i>Beijing Institute of Technology, China</i> ² <i>Nanyang Technological University, Singapore</i> ³ <i>Beijing Key Laboratory of Embedded Real-time Information Processing Technology, China</i>
3:04pm	<i>The SVM-ELM Model based on Particle Swarm Optimization</i> Shifei Ding ^{1,2} and Miaomiao Wang ¹ ¹ <i>China University of Mining and Technology, China</i> ² <i>Chinese Academy of Sciences, China</i>

2:00pm – 3:20pm	Session WA4: ELM in Image and Text Processing Chair: Zhu Liang Yu Venue: Yingchao Hall (迎潮厅)
2:00pm	<i>Multi-Layer Online Sequential Extreme Learning Machine for Image Classification</i> Bilal Mirza, Stanley Kok and Fei Dong <i>Singapore University of Technology & Design, Singapore</i>
2:16pm	<i>Multi-label Text Categorization Using L₂₁-Norm Minimization Extreme Learning Machine</i> Mingchu Jiang, Na Li, and Zhisong Pan <i>PLA University of Science and Technology, China</i>
2:32pm	<i>Annotating Location Semantic Tags in LBSN Using Extreme Learning Machine</i> Xiangguo Zhao, Zhen Zhang, Xin Bi, Xin Yu, and Jingtao Long <i>Northeastern University, China</i>
2:48pm	<i>Image Super-Resolution by PSOSN of Local Receptive Fields Based Extreme Learning Machine</i> Yan Song ¹ , Bo He ¹ , Yue Shen ¹ , Rui Nian ¹ , and Tianhong Yan ² ¹ <i>Ocean University of China, China</i> ² <i>China Jiliang University, China</i>
3:04pm	<i>Extreme Learning Machine with Local Receptive Fields for Texture Classification</i>

	Jinghong Huang ¹ , Zhu Liang Yu ¹ , Zhaoquan Cai ² , Wei Gao ¹ , Qianyun Du ¹ , Zhiyin Cai ¹ , and Zhenghui Gu ¹
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