

International Joint Conference on Neural Networks (IJCNN) 2015

Killarney, Ireland (Cill Airne, Éire)
July 12 – July 17, 2015

Organized and Sponsored by INNS and IEEE-CIS



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1 Welcome Messages

1.1 Welcome Message from the General Chair and Program Chair of IJCNN 2015



De-Shuang Huang
General Chair



Yoonsuck Choe
Program Chair

On behalf of the Program Committee and Organizing Committee, we would like to warmly welcome you to the 2015 International Joint Conference on Neural Networks (IJCNN 2015) in beautiful Killarney, Ireland.

This conference continues the tradition of joint sponsorship of IJCNN by the International Neural Network Society (INNS) and the IEEE Computational Intelligence Society (IEEE-CIS). We would like to thank the leadership of two organizations, and particularly the Presidents, Ali Minai and Xin Yao, for making this possible.

For IJCNN 2015 we received 834 submissions from 66 countries, 32 of which were later withdrawn. Of these, 550 papers (65.9%) were accepted. The conference features 319 oral presentations, 231 poster presentations, and 9 plenary or invited talks. The program also features 20 tutorials, 5 post-conference workshops, 16 special sessions, and 4 competitions.

The plenary talks by Lee Giles, Marios Polycarpou, Vincenzo Piuri, Barak Pearlmutter, Steve Furber, and Giacomo Rizzolatti as well as three invited speeches by Vladimir Cherkassky, Anders Sandberg, Cesare Alippi reflect the broad themes of neuroscience and engineering applications, and go beyond traditional neural networks into areas like behavioral economics, bio-molecules, robotics, and control, etc. This year's conference has an especially strong set of presentations in the areas of big data and deep learning.

To organize a conference such as this was very demanding in terms of organizational effort, coordination and positive spirit. We would like to thank most of all the members of the Conference Executive Committee, the two Technical Program Co-Chairs, Haibo He and Asim Roy whose dedication made the organization of the conference possible. Special thanks go to Publicity Co-Chairs, Bill Howell, Yun Raymond Fu and Giacomo Boracchi, Tutorials Chair, Martin McGinnity, Publication Chair, Amir Hussain, Plenary Chair, Carlo Francesco Morabito, Web Reviews Chair, Tomasz Cholewo, and Webmaster, Jaerock Kwon. We would also like to thank our Special Session Co-Chairs, Mike Gashler and Jose Garcia-Rodriguez, Competitions Chair, Abir Hussain, Workshops Chair, Pierre-Yves Oudeyer, Awards Chair, Plamen Angelov, Panels Chair, Juyang Weng, Local Arrangements Co-Chairs, Marion McAfee and Kang Li, and Registration Chair, Khan Iftekharuddin. We also thank all other members of the Organizing Committee for their great help, all of whom put in a special effort towards the meeting's success.

We are particularly grateful to all members of the Program Committee and all reviewers who deserve great appreciation for providing discerning and timely reviews of over 830 submissions. In particular, we would like to thank all the authors for contributing their papers. Without the high-quality submissions from the authors, the success of the conference would not have been possible. We are also very grateful for the support we have received from many members of the INNS Board of Governors, and especially for sage advice from Ali Minai, Danil Prokhorov, and Dave Casasent of INNS leadership. Finally, we would also like to thank the organizational team at INNS Central Office led by Marianne Van Wagner and Alison Watson, without whose work the meeting would have been infinitely harder to organize.

As in past years, INNS and IEEE-CIS have provided support for many students to attend the conference. We hope that IJCNN will continue to serve as a place where young researchers can find both knowledge and inspiration.

Finally, we would like to thank the following sponsors for their generous support: Gold sponsors Fáilte Ireland National Tourism Development Authority (www.failtreireland.ie) and Meet in Ireland (meetinireland.com); and Bronze sponsors Budapest Semester in Cognitive Science, Brain-Mind Institute, and Springer.

We wish you a wonderful, productive, and pleasant IJCNN 2015.

De-Shuang Huang	Yoonsuck Choe
Tongji University, China	Texas A&M University, USA
General Chair, IJCNN 2015	Program Chair, IJCNN 2015

1.2 Welcome Message from the President of INNS



Ali Minai
INNS President

As President of the International Neural Network Society (INNS), it is a great pleasure and an honor for me to welcome you to the 2015 International Joint Conference on Neural Networks (IJCNN 2015) in beautiful Killarney, Ireland. This conference epitomizes the interdisciplinary nature of the field of neural networks, featuring presentations across a broad set of areas, including neuroengineering, distributed intelligence, computational neuroscience, cognitive modeling, bioinformatics, robotics, and many others. It also features a larger than usual set of plenary and invited talks by distinguished researchers who are shaping these fields. Another important feature of the conference is that it provides a forum where young, aspiring researchers from around the world can meet each other and interact with the leading practitioners in their fields, possibly establishing fruitful new collaborations for the future. All these aspects reflect the International Neural Network Society's fundamental commitment to fostering interdisciplinary research and scientific collaboration.

This conference also continues a successful tradition of collaboration between the INNS and the IEEE Computational Intelligence Society (IEEE-CIS) in their joint organization of IJCNN. Over a period of more than a quarter century, this collaboration has made IJCNN the premiere international conference for researchers in neural networks and related fields. We look forward to continuing this collaboration in Vancouver next year, and for years thereafter.

Over the last year, INNS has made significant strides in outreach to members, co-sponsoring conferences across the world, and promoting the activities of special interest groups. In perhaps its most ambitious new initiative in many years, INNS is organizing the first INNS Conference on Big Data in San Francisco this year (August 8–10, 2015), which will feature outstanding speakers and workshops in this critical area. The Society is also planning to pursue other ways to bring greater value to its members. An important part of this effort is a planned initiative to promote greater diversity within the Society and within the neural networks community in general.

Every year, INNS presents awards to researchers who have distinguished themselves through their contributions to the field of neural computation and its applications. This year, I am proud to announce the following recipients:

- **Hebb Award** recognizing achievement in biological learning: **Michael Hasselmo**
- **Gabor Award** recognizing achievement in engineering applications: **Donald Wunsch**
- **INNS Young Investigator Award**: **Huanhuan Chen**

At a time when a deeper understanding of the brain is being recognized across the world as one of the major “grand challenge” problems for science, researchers in neural networks and related fields represent an indispensable resource. From our position at the intersection of biology and technology, our efforts in understanding the neural basis of cognition, explaining the processes underlying mental illness, elucidating the mechanics of human creativity, helping to build smart prosthetics for the disabled, and creating truly intelligent machines hold the promise of changing the world for the better. The science and technology of the brain has never been more important, or more productive, as the presentations at this conference show.

I want to acknowledge the immense effort put in by the IJCNN'2015 Organizing Committee, led by General Chair De-Shuang Huang and Program Chair Yoonsuck Choe – ably helped by the Technical Co-Chairs, Asim Roy and Haibo He, and all the other chairs and liaisons. Their efforts have made this an exciting conference, with the largest number of attendees of any previous stand-alone IJCNN meeting. And finally, I would like to thank all the participants of IJCNN'2015 for contributing to this great meeting in many different ways. Welcome to Killarney!

Ali Minai
President of INNS

1.3 Welcome Message from the President of IEEE-CIS



Xin Yao

IEEE-CIS President

As the President of the IEEE Computational Intelligence Society (CIS), I am delighted to welcome you all to IJCNN'15 in Killarney, Ireland! CIS has been a partner with INNS in running IJCNN each year for more than two decades. The two organisations have collaborated harmoniously and worked closely together to bring IJCNN to the international communities. INNS is leading the organisation of IJCNN'15 and the next year's IJCNN'16 will be led by IEEE CIS as part of the WCCI'2016 in Vancouver, Canada (www.wcci2016.org).

Neural networks have come a long way as a thriving research field. In late 1980s, more papers presented at the neural network conferences were related to training algorithms and some applications in pattern classification. Now the field has grown significantly in both depth and breadth. It has served as a breeding ground for many fast-developing areas, including deep learning and big data analytics. The field has fused with many other fields, such as fuzzy systems, evolutionary computation, computational neuroscience, etc., to form a much broader field of computational intelligence. The old IEEE Transactions on Neural Networks was renamed to IEEE Transactions on Neural Networks and Learning Systems (TNNLS) a few years ago to reflect the development of the field of neural networks and the growing emphasis on learning systems.

Glancing through the programme of IJCNN'15, one can find a very interesting range of topics related to neural networks, from statistical machine learning to computational neuroscience, and from intelligent transport systems to smart industry. The IJCNN'15 programme is a real feast to anyone's brain. I hope every participant will find the conference as exciting as I feel. I actually have a hard time in planning which sessions I should attend, because there are so many interesting sessions (including tutorials) that I want to attend but cannot due to time clashes. I wish I could develop an artificial neural network system, which would attend the session I miss for me and then summarise the key ideas and results back to me after the session.

I recently wrote my President's Message in the May issue of IEEE Computational Intelligence Magazine, questioning the scientific base of ranking conferences in some countries. For me personally, attending a conference is far more than just publishing a paper. It is the whole experience of attending the conference, listening to people describing their work, debating ideas, and interacting with colleagues, that make a conference a conference, not just an outlet for publications. Don't we all have the experience that a new research interest or idea was sparked by some casual conversations at a conference? How could we rank that scientifically?

Wish you all have a wonderful conference experience at IJCNN'15!

Xin Yao

President

IEEE Computational Intelligence Society

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