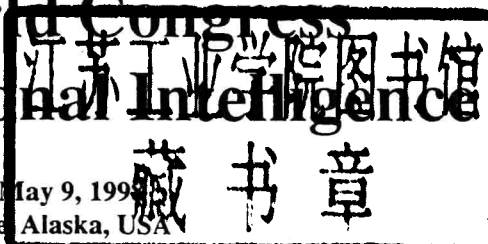

The 1998 IEEE International Joint Conference on Neural Networks Proceedings

IEEE World Congress on Computational Intelligence

May 4 - May 9, 1998
Anchorage, Alaska, USA



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The 1998 IEEE International Joint Conference on Neural Networks Proceedings

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Greetings from the General Chair

Dear WCCI 98 Attendee:

I am extremely proud to have this opportunity to welcome you to the second IEEE World Congress on Computational Intelligence (WCCI). The first WCCI was held in Orlando, Florida in 1994. I was President of the IEEE Neural Networks Council at that time, a position that offered me the opportunity to see first-hand how exciting a meeting like this can be. Experts from within the Evolutionary Computation, Fuzzy System, and Neural Network community were sharing ideas, results, and common interests for over a week. It invigorated many scientists and engineers, including myself.

Now, four years later, we find ourselves trying to repeat that excitement here in Anchorage, Alaska. For many reasons, this meeting is a special event. First, this is the first major IEEE meeting to ever be held in Anchorage. We hope there are many more. Tell your IEEE leaders to consider Anchorage for future meetings so that you can come back and visit us again. Second, this meeting heralds the return of the International Joint Conference on Neural Networks (IJCNN). In the late 1980's and early 1990's, the International Joint Conference on Neural Network Society and the IEEE Neural Network Council held many jointly sponsored meetings. In 1994, these meetings were held separately. We are now back together again, and it is my personal opinion this is what is best for the field.

Finally, I have asked the leaders in all three disciplines to offer their perspective on what are the "Grand Challenges" of Computational Intelligence. Each of the ten plenary speakers have been asked to spend some time on this topic, and there are several panel sessions dedicated to this subject. It is my hope that we will all walk away with a set of new challenges clearly defined and the motivation to accept those challenges.

In closing, I hope you all enjoy your time in Alaska. Above all, I hope you leave WCCI 98 with many wonderful, lasting memories.

Patrick K. Simpson
General Chair, WCCI 98



Message from Technical Program Co-Chairs of IJCNN 98

On behalf of the Technical Program Committee, we are pleased to present the Technical Program for the IJCNN 98. After several years in which the IEEE Neural Networks Council and the International Neural Net Society held separate meetings, this conference is again a joint meeting sponsored by these two organizations, which accounts for the "J" in the IJCNN. The technical program is the result of much effort on the part of many individuals who willingly donated their time to assure that the final product is of the highest quality.

Almost 600 papers were submitted, some from every continent except Antarctica, for possible inclusion in the program. In order to ensure the quality of the program, each paper was reviewed by two separate reviewers, each of whom assigned a score from zero to four to the paper. The scores were then averaged. The Organizing Committee ranked the papers in each category of interest and then generated the various sessions based on these rankings. Over fifty reviewers were involved in this review process. We take this opportunity to thank each and every one of them for the many hours that they volunteered to this review process. Their contribution to this conference was indispensable. We hope that they will serve as an example to everyone in this community of researchers to volunteer their services for subsequent conferences. Most of the submitted papers were of excellent quality and are found in these proceedings. A total of 45 oral sessions plus 5 mixed sessions, including about 350 papers, will be presented at the IJCNN portion of the conference. There are also two invited sessions and two panels included in the program. Another 175 papers will be presented in poster sessions which have the distinct advantage of allowing the conference attendees to meet the authors personally and to discuss their papers in depth. All of the papers, both oral and poster, are of the highest quality and are included in the printed conference record. We take this opportunity to thank all of the individuals who contributed to this program, including authors, the reviewers, the Organizing Committee, and, especially, Allen Stubberud's assistant, Linda Legh, who worked all of the details in cataloging papers and getting papers to and from reviewers and Karen Haines, who produced order out of chaos.

Judy Dayhoff

University of Maryland, College Park

Allen Stubberud

University of California, Irvine



A Message from the IEEE Neural Networks Council President

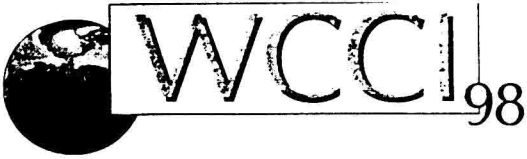
Dear Attendees:

On behalf of the IEEE Neural Networks Council it is my pleasure to add my welcome to you for our 1998 WCCI. Times are changing, and so is technology. The papers at this meeting reflect the latest developments in the most exciting fields of science and engineering. Many people have worked long and hard to make this conference professionally rewarding and socially pleasant. None have labored as hard as program co-chairs Pat Simpson and Karen Haines. When you see them here, please thank them for all of us. Countless others too numerous to mention have also spent a great deal of time on the program. But I would be remiss not to acknowledge: Jim Keller (FUZZ-IEEE), Allen Stubberud (IJCNN) and Dave Fogel (ICEC), who handled all the papers, reviews, organization, and other details that must be attended to behind the scenes with courage and grace. Thank them too.

As with all conferences, there have been, and will be, a few glitches, burps and oopses. So what? Don't let little things distract from your enjoyment of the conference, its people, its contents, and its location. Get out and see Alaska, solve some differential equations, go fishing, write a program, smoke a nice Cohiba, ride a motorcycle to the Arctic circle, whatever — in other words; do all the stuff that counts to you here at WCCI. Enjoy it!

Jim Bezdek

President of the IEEE Neural Networks Council



Letter from the 1998 INNS President

Dear IJCNN 98 Participants,

On behalf of the International Neural Network Society I am pleased to lend our organization's support to IJCNN98 and welcome you to the conference in Anchorage. It is fitting that Alaska, the site of mountainous vistas, multinational exploratory adventures, and gold and oil rushes, should be the site of the annual repeat of one of the great intellectual adventures of modern times the quest for understanding intelligent systems and human and animal minds. Since this IJCNN is part of the WCCI that takes place only every four years and covers a wider range of topics and technologies, here is the potential for an even more exciting exchange of ideas. Also, we hope that it heralds a new wave of high-level collaboration between INNS and IEEE, and encourage you also to attend the INNS-organized IJCNN 99 in Washington next year.

Daniel S. Levine President (for 1998),
International Neural Network Society

The 1998 IEEE International Joint Conference on Neural Networks

**William Egan Civic & Convention Center
Anchorage, Alaska
May 4 - 9, 1998**

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