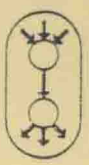
THE 1994 IEEE INTERNATIONAL CONFERENCE ON NEURAL NETWORKS

IEEE WORLD CONGRESS ON COMPUTATIONAL INTELLIGENCE

June 27 - June 29, 1994



Walt Disney World Dolphin Hotel
Orlando, Florida

Volume I
Pages 1-605

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IEEE NEURAL NETWORKS COUNCIL

IEEE

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The 1994 IEEE International Conference on Neural Networks

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Greetings from the General Chairperson,

Does anybody really read these greetings? Let's do a poll. If you read this when you see me at the conference wave at me with your left hand. That is not a usual gesture and I will know that you read this. A student suggested another gesture might be appropriate. The one person that I'm sure that will read this is the next year's general chairperson. (I just read Enrique Ruspini's).

To make sure that you read the whole greeting I will have a second part of the gesture later. The obvious thank-you's are usually included here but you see the names plastered all over this document. In our business we call these the "hidden units". They do all the work, but the output unit (the general chairperson) gives the product of their effort to the rest of the world. A hidden unit that is not listed is Delores Bailey, "Docie". Without her dedication and professionalism, Dennis Ruck and I could not have survived.

I would also like to thank Pat Simpson and his appointed watchdog Dick Klafter for their distrust. What did he say? Yes, I said "distrust". That wasn't a typographical error. Every good scientist questions everything. The Neural Network Council and the IEEE as a whole questioned everything associated with this World Congress. That was good for the World Congress and such scrutiny is what separates us from other organizations.

Lastly, one might ask why a nice guy like me got stuck doing this job. It wasn't the common knowledge that I am Captain Amerika, the famous superhero. Because of the impending conflict with other neural conferences, Pat wanted someone with recent combat experience to head the IEEE International Conference on Neural Networks. There are no lives at stake in this effort but all associated with ICNN have made the same professional commitment we saw in the Gulf. We hope that this conference satisfies your technical needs. After you wave at me to let me know that you read the whole greeting touch your right ear. It is not a Klingon salute but it will do. Did you notice the Mickey in our icon?

Steven K. Rogers (Capt Amerika)
General Chairman, ICNN '94

Dennis W. Ruck
Program Committee Chairman, ICNN '94

A Message from the Program Committee Co-Chairs

It is an honor to have served as the Program Committee Co-chairs. We have striven to produce a program which will be of value to all the participants both authors and attendees. We are excited at the prospect of three concurrent conferences on neural networks, fuzzy logic, and evolutionary computation plus a symposium of computational intelligence. This conference will be long remembered as a great source of information and inspiration.

This conference is very large. We have reviewed almost 1000 papers. Approximately 125 invited papers will be presented in 22 sessions. The remaining 93 oral sessions and 34 poster sessions are contributed papers. We thank all the researchers who submitted their work for publication. The response to our Call For Papers was better than we could have hoped for.

We would like to acknowledge the work of the many people who have made this program what it is. First, thanks to the program committee members who worked hard reviewing this large number of papers in such a short time. The special invited sessions would not have been possible without the efforts of their organizers. We are particularly indebted to the executive committee which consisted of the general conference chair, the program co-chairs, and Drs. Mark Oxley, Kevin Priddy, and Gregory Tarr. Their assistance was invaluable in constructing the program a notoriously NP-complete problem! Finally, my greatest thanks to our administrative assistant Docie Bailey whose long hours and dedication made it all happen.

We hope you enjoy attending the presentations and reading the proceedings as much as we think you will. May we all benefit from the interaction between people and disciplines that this conference (and congress) represents.

Program Committee Co-chairs
1994 IEEE International Conference on Neural Networks

THE 1994 IEEE INTERNATIONAL CONFERENCE ON NEURAL NETWORKS

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June 27 - June 29, 1994

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Message from the President:

On behalf of the IEEE Neural Networks Council (NNC), its member IEEE Societies, and their representatives, I would like to welcome you to the 1994 IEEE World Congress on Computational Intelligence (WCCI). With over 1600 technical papers being presented by authors from around the world and with 43 plenary talks and 18 tutorials from the world's foremost authorities on Computational Intelligence, this meeting will provide you with an opportunity to learn and share in a multi-disciplinary environment of unparalleled quality and diversity.

In 1987 the IEEE sponsored the First IEEE International Conference on Neural Networks (ICNN). In 1992, the IEEE NNC sponsored the First IEEE International Conference on Fuzzy Systems (FUZZ-IEEE). This year, the IEEE NNC is proud to sponsor the First IEEE International Conference on Evolutionary Computation (ICEC). This meeting, like the first two, will be offered annually and will represent the three major fields of evolutionary computation: genetic algorithms, evolutionary programming, and evolutionary strategies.

Since 1987, the boundaries between fuzzy systems, evolutionary computation, and neural networks have begun to blur. Various combinations of these technologies have produced systems more capable than any single technique could provide. At the same time, the amount of funding available to attend meetings has reduced dramatically, causing researchers and engineers to carefully choose how they spend their remaining budgets.

In response to these changes, the IEEE NNC has created the WCCI — the combined presence of the ICNN, FUZZ-IEEE, and ICEC at one location for one registration fee. Every three years a WCCI will be held, with the next one scheduled for 1997 in San Diego CA. On the years between the WCCI, the meetings will be held independently. In 1995, Perth, Australia will be the site for the ICNN and the ICEC, and Yokohama, Japan will host the FUZZ-IEEE. In 1996, the ICNN will be located in Washington, D.C. and the FUZZ-IEEE will be in New Orleans, LA.

I would like to personally thank several individuals who have spent many late hours and long weekends organizing and conducting this meeting and its related events. First and foremost, I would like to thank Dr. Charles J. Robinson, the WCCI Director General, for forming and leading his world-class team of volunteers. I would also like to thank the WCCI Organizing Committee — Dr. Robert J. Marks II, Dr. Russell C. Eberhart, Dr. Swamy Laxminarayan, Dr. Ratan K. Guha, and Ms. Karen Haines; the conference chairs — Dr. Piero P. Bonissone, Dr. Steven K. Rogers, and Dr. Zbigniew Michalewicz; the Symposium Coordinators — Dr. Jacek M. Zurada and Dr. Toshio Fukuda; and Meeting Management. Finally, I would like to thank Dr. Richard D. Klafter for his able assistance with the budget.

In closing, it is my intent to have the IEEE NNC serve the IEEE membership to the best of its ability. Currently the IEEE NNC provides conferences, educational video tapes, periodicals, books, standards, awards, regional interest organization, distinguished lecturers, and fellow nominations. If you see areas where the IEEE NNC can be of greater service, please let me know. I hope your week at the WCCI is enjoyable and profitable.

Patrick K. Simpson
ORINCON Corporation
President, IEEE Neural Networks Council

Greetings from the Director General

On behalf of its various committees and volunteers, I welcome you to the first World Congress on Computational Intelligence. This unique Congress brings together for the first time the various disciplines that collectively comprise "Computational Intelligence:" Neural Networks, Fuzzy Systems and Logic, and Evolutionary Computation, each with their own conference embedded within the Congress.

The technical programs that these Conferences have prepared are world-class. The Congress venue, the Walt Disney World Hotel, is an exceptional hotel. We also throw-in (pun intended!) the excitement of World Cup soccer in Orlando. We have planned a World-Class World Congress at the Walt Disney World Dolphin during World Cup week!

Organizing a World Congress, especially the first of a series, is a daunting task. As with any endeavor like this, we must acknowledge the tremendous amount of effort that was extended by the volunteers that serve on the committees of the Congress and the three Conferences. I especially need to thank the members of the Congress Executive Committee for working so professionally with me on this project, and for supporting the concept of a special symposium.

The capstone of this Congress is our special symposium "Computational Intelligence: Imitating Life." We have set aside a major portion of each morning for this symposium, and offer it to our registrants as part of the Congress package. We do so to fulfill an IEEE mission to educate and keep our members abreast of current technology. By offering a public lecture on each of the three themes of the Conference, we also invite the public to participate and be educated in what we do. The 43 papers in this symposium are contained in a special book provided to the Congress registrants.

We have also assembled an outstanding tutorial program to further enhance our educational mission. Our registrants will be introduced to the latest concepts in one or more of 18 different areas of computational intelligence.

Finally, I must acknowledge the support of the IEEE Neural Networks Council and the Orlando Section of the IEEE, the sponsors of this project; and the very professional help provided by Meeting Management, with whom we contracted to run this Congress. We thank the Whitaker Foundation for its partial support of the Symposium.

Please enjoy the Congress, meet old and new friends, visit the exhibits and posters, and take advantage of the many things to see and do in and near Orlando.

Charles J. Robinson, D.Sc., P.E.
Director General, IEEE WCCI 1994

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