Guest Editorial

THIS special issue was commissioned by the IEEE Neural Networks Council (NNC) about 18 months ago in conjunction with their sponsorship of the First IEEE International Conference on Fuzzy Systems (FUZZ-IEEE'92), which was held in San Diego on March 8–12, 1992. Thus, it seems appropriate at this point to first thank the NNC (in particular, Russ Eberhart, Bob Marks, Pat Simpson, and Mike Roth) for their interest, enthusiasm, and support. The issue contains 10 full papers and eight brief papers. Talks on all of these papers were presented at the conference in San Diego, but by explicit design and arrangement, none were published in the proceedings, even in abbreviated form (the program of the conference gave this issue as a reference for these talks). Every paper in this issue thus had the benefit of full and complete refereeing. I mention this simply to point out that these are indeed archival papers, even though they were associated with and derived from the FUZZ-IEEE'92 conference. Thanks are due, of course, to the many referees who helped critique the papers for this issue.

There has been, in the last five years, a large and energetic upswing in research efforts aimed at synthesizing fuzzy logic with computational neural networks (CNN's). There are several reasons for this. First, the enormous success of commercial applications which are at least partially dependent on fuzzy technologies, fielded (in the main) by Japanese companies, has led to a surge of curiosity about the utility of fuzzy logic for scientific and engineering applications. Second, the marriage of fuzzy logic with CNN's has a sound technical basis, because these two approaches generally attack the design of "intelligent" systems from quite different angles. CNN's are essentially low-level, computational algorithms that (sometimes) offer good performance in dealing with sensor data used in pattern recognition and control. On the other hand, fuzzy logic was introduced in 1965 by Lotfi Zadeh as a means for representing, manipulating, and utilizing data and information that possess nonstatistical uncertainty. Thus, fuzzy methods often deal with issues such as reasoning on a higher (semantic or linguistic) level than CNN's. Consequently, the two technologies often complement each other, CNN's supplying the brute force necessary to accommodate and interpret large amounts of sensor data, and fuzzy logic providing a structural framework that utilizes and exploits these low-level results. Third, there seem to be many ways to use either technology as a "tool" within the framework of a model based on the other. For example, the CNN is well known for its ability to represent functions. The basis of every fuzzy model is the membership function. So, a natural application of CNN's in fuzzy models is to provide good approximations to the membership functions, which are essential to the success of any fuzzy approach.

Broadly speaking, then, we may characterize efforts at merging these two technologies as (i) fuzzification of conventional CNN architectures and models and (ii) the use of CNN's as tools in fuzzy models. In view of recent developments, the IEEE in general and the NNC in particular should be congratulated on their vision for recognizing the timeliness of a special issue containing papers on fuzzy set methods, CNN methods, and the integration of the two. The NNC felt that this issue would be a useful way to introduce readers of the TRANSACTIONS ON NEURAL NETWORKS to some of the many currents of cross-fertilization between the two fields that are presently afoot. Indeed this issue will reach readers of the TRANSACTIONS just a few months before the inauguration of another flagship journal sponsored by the NNC, the IEEE TRANSACTIONS ON FUZZY SYSTEMS, which is scheduled to begin in January 1993. Readers interested in this journal may consult the call for papers about it at the back of this issue.

As to the papers themselves, it is not my intention to account for their contents in this introduction. Several remarks on the overall nature and scope of the issue, however, may be useful to subscribers of the TRANSACTIONS ON NEURAL NETWORKS. There were about 80 papers submitted for this issue, and I tried to constrain the selection to the topics mentioned in the thematic title: *Fuzzy Logic and Neural Networks in Pattern Recognition and Control.* Almost all of the papers contained herein possess contents as advertised. In particular, the full papers are (roughly) grouped into three areas: the first five deal with pattern recognition; the sixth and seventh address the use of CNN's in fuzzy control; and the eighth through the tenth all deal with the use of CNN's in the context of evidence aggregation and approximate reasoning. I think the 10 full papers cover a very representative range of activities on the topics of the issue, both in terms of theory versus applications and across a number of disciplines affected by CNN's and fuzzy logic in both pattern recognition and control. The eight brief papers are a bit more diverse. The first four are oriented toward pattern recognition (classification or clustering); Horikawa's paper fits well with the last group in the set of full papers; and the last three each address a topic that bears on CNN's or fuzzy logic or both, in slightly different contexts. All in all, I am quite satisfied with both the quality and the topical coverage afforded by the articles in this issue. I hope the readers of this journal will concur.

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Guest Editor

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