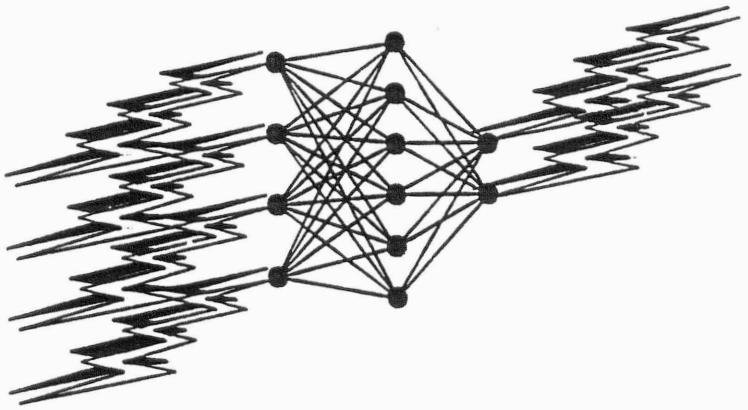
PROCEEDINGS OF THE FIRST
INTERNATIONAL FORUM ON

APPLICATIONS OF NEURAL NETWORKS TO POWER SYSTEMS



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SEATTLE, WASHINGTON
JULY 23-26,1991

91TH0374-9

A BRIEF HISTORY OF NEURAL NETWORKS

There is often a comparison made between artificial neural networks and their biological counterpart. Indeed, the reference to our circuitry as a neural network is due to the pioneering of the field by scientists interested in the biological neuron. The undisputed success of biological neural networks remains highly motivating to those involved in artificial neural network research, not unlike the motivation of the flying bird was to the Wright brothers.

There is some shared terminology between the artificial and biological neural network. The links between neurons can be referred to as synapses or, more simply, interconnects. The neurons have also been referred to as nodes or, more recently, neurodes. The first serious mathematical treatment of neural networks is usually attributed to McCulloch and Pitts [5]. There was a flurry of activity in neural network research in engineering circles in the fifties and early sixties. The end of this phase was marked by the publication of the negative critique *Perceptrons* [6]. The spark of interest in engineering circles was rekindled in the early 1980's with the exuberant promotion of neural networks by Hopfield [7].

We cannot, in this brief preface, do justice to the recent rich history of artificial neural networks. Besides, it has already been done admirably elsewhere. The reader is referred specifically to the anthology of Anderson and Rosenfeld [8] where the development of artificial neural networks is presented as a delightful mix of commentary and classic paper reprint. Exhaustive bibliographies are also available [9-10].

POWER SYSTEM APPLICATIONS

To date, proposed NN applications to power systems can be categorized under three main areas: regression, classification and combinatorial optimization. Applications involving regression include transient stability analysis, load forecasting, synchronous machine modeling, contingency screening and harmonic evaluation. Applications involving classification include harmonic load identification, alarm processing, static security assessment and dynamic security assessment. The area of combinatorial optimization includes topological observability, unit commitment and capacitor control.

In the ten sections of this volume, researchers presented their thoughts and ideas on how to utilize rapidly growing neural network technology in power systems applications. The ten sections are

1. Electric Load Forecasting
2. Power System Security Assessment and Control
3. Power System Transients, Faults and Protection
4. Power System Stability and Control
5. Identification and State Estimation
6. Power Quality
7. Power System Operation and Planning
8. Advances in NN Technology
9. Economic Dispatch, Unit Commitment and VAR Control
10. Power System Monitoring, Observability and Diagnosis

ACKNOWLEDGEMENTS

The papers in this volume are selected to be presented at the ***First International Forum on Applications of Neural Networks to Power Systems***, Seattle, Washington, July 23-26, 1991. The dedication and contribution of the authors is gratefully acknowledged.

The Forum is sponsored by the *National Science Foundation of the United States, Puget Sound Power and Light Company, the Electric Power Research Institute* (EPRI) and IEEE. The support of each of these organizations is much appreciated.

Our current plans are to continue the Forum as a biannual event. The second Forum is tentatively being planned for 1993 in Japan.

Last but not least, the dedication of the organizing committee, co-chaired by C.C. Liu from the University of Washington and Simon H. Cheng from Puget Power, is the cornerstone of the organizational success of this Forum. The quality of the contributions is credited to the hard work of the technical committee members and the reviewers who thoroughly refereed all submitted manuscripts.

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