A Bibliography of the Intersection of
Genetic Search and Artificial Neural Networks

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1. Introduction

This is a fairly informal bibliography of work relating artificial neural networks (ANNs) and genetic search. It is a collection of books, papers, presentations, and reports which I've come across in the course of pursuing my interest in using genetic search techniques for the design of ANNs and in operating the neuro-evolution electronic mailing list (more information on neuro-evolution below). The bibliography contains no references which I feel relate solely to ANNs or GAs (genetic algorithms).

I am making this bibliography available as an aid and service to those interested in this subject. I appreciate any and all help you can give me towards correcting any mistakes that may be present and in providing additional references. Please keep in mind that I am familiar with the ANN literature but less familiar with the genetic search literature.

2. Organization of References

Although no synopsis of each work is included, I have attempted to group references into sensible categories. Work I have not read and of who's category placement I am unsure has been placed in the category "other". Work with which I am familiar but doesn't fit well into any of the categories I've defined has been placed in the category "miscellaneous".

2.1. Genetic Search for Network Design

My primary interest and the reason I've compiled this bibliography is in using genetic search techniques for the design of ANNs. This is a new research area; only recently has work been begun on these problems [Dre87, DrK87, Dre89, Dre90a, Dre90b, HSG89a, HSG89b, HSG90, MTH89, MSA88a, MSA88b, MuK89a, MuK89b, SCE90, Tod88, WSB89, Wil85, Wil90]. Additionally, a NIPS 1989 unpublished workshop entitled "Neural Networks and Genetic Algorithms" included discussion of issues relating to using genetic search for ANN design.

2.2. Possible Analogs of Developmental Biology

One of the possible ways to reduce the computational cost of using genetic search techniques for the design of ANNs is to reduce the size of the search space by reducing the size of the genetic code. One approach to doing this is to employ analogs of developmental biology. Researchers have touched on this topic in various fashions [Ben88, Gie88, GWV88, Ker88a, Ker88b, MjS86, RaW89, Sel85, Utt55, Wil87]. Others

have developed ANN models that include network architecture modification as a part of the overall network model. These include both additive techniques [FaL90, GWG89, HoU89, Wai89] and subtractive techniques [BMW88, CDS90, CDH90, Fah89, Hin87, Kee86, Kru89, MoS89, RHW86, Rum88, WiL88].

2.3. Learning Interactions

The idea that learning by individuals and learning by populations interact has been around for some time [Bal96, Wad42]. This idea has recently resurfaced and is beginning to be explored in the GA/ANN communities [Bel89, HiN86, Smi87].

2.4. Using GAs to Train ANNs

Researchers have demonstrated the feasibility of using GAs to set the weights of feed forward networks [MoD89, Whi88, Whi89, WSB89, WhH89a, WhH89b, WhS89, Whi89]. Generally the computational cost of using GA's to set the weights has contrasted well with that of using back-propagation. Dan Offutt (University of Michigan) has (informally, on the neuro-evolution mailing list) reported success in using GAs to set the weights of feed forward networks having ten or twelve layers, a task with which back-propagation would presumably have difficulty.

2.5. Connections with Classifier Systems

Several people have explored some of the parallels that exist between classifier systems and ANNs [BeG89a, BeG89b, CMS, Dav89].

2.6. Artificial Life Connections

Artificial life, which in my opinion is currently becoming a field unto itself, also sometimes brings the topics of evolution and ANNs together [Dew85, Dre87, DrK87, Dre89, Dre90a, Dre90b, Joh88, Lan89, Rin86, Rin].

2.7. Miscellaneous

Here are several works that don't seem to fit neatly into any of the categories I've arranged [Ack87, CaD89, CaD90, DoD87, KoH88, SoS88]. I also include this bibliography here [Rud90].

2.8. Other

Finally, there are several works that I've not attempted to categorize because I've not read them, or perhaps have briefly looked at them but wasn't able to see a ready category [BeK87, Cas89, Fen86, HaW84, HaW86, Oos89, WaH85].

3. Neuro-Evolution Mailing List

I operate a mailing list for those interested in the various aspects of using genetic search for the design of ANNs and related topics. Mail to internet address neuro-evolution-request@cse.ogi.edu for administrivia, answers to questions, or to have your name added to (or removed from) the neuro-evolution list.

4. Acknowledgements

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