INTRODUCTION TO NEURAL NETWORKS

SECOND EDITION

SEPTEMBER 1991





DISTRIBUTED OUTSIDE THE USA/CANADA BY: ELSEVIER ADVANCED TECHNOLOGY MAYFIELD HOUSE 256 BANBURY ROAD OXFORD 0X2 7DH UNITED KINGDOM

INTRODUCTION TO NEURAL NETWORKS

SECOND EDITION

SEPTEMBER 1991







DISTRIBUTED OUTSIDE THE USA/CANADA BY: ELSEVIER ADVANCED TECHNOLOGY MAYFIELD HOUSE 256 BANBURY ROAD OXFORD OX2 7DH UNITED KINGDOM

© Copyright 1991 Architecture Technology Corporation. All rights reserved. No part of this publication may be reproduced, photocopied, stored on a retrieval system, or transmitted without the express prior written consent of the publisher.

DISCLAIMER

Architecture Technology Corporation makes no representations or warranties with respect to the Contents hereof and specifically disclaims any implied warranties of merchantability of fitness for any particular purpose.

Further, reasonable care has been taken to ensure the accuracy of this report, but errors and omissions could have occurred. Architecture Technology assumes no responsibility for any incidental or consequential damages caused thereby.

Further, Architecture Technology Corporation reserves the right to revise this guide and to make changes from time to time in the content thereof without obligation to notify any person or organization of such revision or changes.

This disclaimer applies to all parts of this document.

Table of Contents

1. Overview	1
11 Introduction	1
12 Neurobiology	1
13 Mathematical Theory	1
14 Theoretical Foundations of Neural Networks	2
15 A Biological Inspiration	2
16 Artificial Neurons	2
17 How a Neural Network Learns	3
18 Layering of Neural Networks	4
2. Neural Networks and Other Information Processing Approaches	7
21 Overview of Brain Physiology	9
22 Recent Results in Neurobiology	11
22.1 Neurons	11
22.2 Synapses	11
23 Map Representations	12
24 Self-Organization	12
25 Network Circuitry	12
26 Network Dynamics	13
27 Learning	13
28 Attention	13
29 Organizing Principles	13
3. Tasks Neural Networks Perform and Representative Models	15
31 Introduction	15
32 Tasks That Neural Networks Perform	15
33 Illustrative Neural Network Models	17
34 Available implementation Tools	20
35 A Simulated World	21
36 Typical Application: The Kanji Character Recognizer	22
37 Typical Application: Multi-layer Perceptron Vowel Classifier	23