1. Record Nr. UNINA9910627266003321

Autore	Widrow Bernard <1929->
Titolo	Cybernetics 2.0 : a general theory of adaptivity and homeostasis in the brain and in the body / / Bernard Widrow
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2023] ©2023
ISBN	9783030981402 9783030981396
Descrizione fisica	1 online resource (322 pages)
Collana	Springer series on bio- and neurosystems ; ; Volume 14
Disciplina	001.53
Soggetti	Cybernetics Cybernetics - Mathematical models Neurotechnology (Bioengineering) - Moral and ethical aspects
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Intro -- Foreword by Nikola Kasabov -- Foreword by Henry Yin -- Foreword by Fredric B. Kraemer -- Preface -- Acknowledgements -- Contents -- About the Author -- Part I Synaptic Learning, Homeostasis, Synaptic Plasticity -- Introduction to Part I -- 1 Introduction -- 1.1 The Beginning -- 1.2 The Neuron -- 1.3 The Synapse -- 1.4 Summary -- 1.5 Questions and Experiments -- References -- 2 Hebbian Learning -- 2.1 Extended Hebbian Rules -- 2.2 Synaptic Signal Transmission -- 2.3 Synaptic Weight Change-Hebbian Rules -- 2.4 Bi and Poo -- 2.5 Results of Bi and Poo Can Be Anticipated -- 2.6 The Spike Timing Hypothesis -- 2.7 Addendum -- 2.8 Summary -- 2.9 Questions and Experiments -- References -- 3 The LMS Algorithm -- 3.1 Introduction -- 3.2 Contribution of Norbert Wiener -- 3.3 The Linear Combiner and the LMS Algorithm -- 3.4 Steepest Descent, A Feedback Algorithm -- 3.5 Summary -- 3.6 Questions and Experiments -- References -- 4 The Hebbian-LMS Algorithm -- 4.1 Introduction -- 4.2 The LMS Algorithm -- 4.3 ADALINE -- 4.4 Bootstrap Learning -- 4.5 Bootstrap Learning with a Sigmoidal Neuron, the Hebbian-LMS Algorithm -- 4.6 Bootstrap Learning with a More ``Biologically Correct'' Sigmoidal Neuron -- 4.7 Hebbian Learning and the Hebbian-LMS Algorithm --

4.8 A More General Learning Algorithm -- 4.9 An Algebraic Description of the Neuron of Fig.4.8 Including the Biases -- 4.10 Nature's Learning Algorithm -- 4.11 Summary -- 4.12 Questions and Experiments -- References -- 5 Inside the Membrane -- The Percent Hebbian-LMS Algorithm -- 5.1 Introduction -- 5.2 The Membrane and the Neuroreceptors -- 5.3 A New Learning Algorithm -- 5.4 Simulation of a Hebbian-LMS Neuron Trained with the % Hebbian-LMS Algorithm -- 5.5 Receptor Traffic -- 5.6 Summary -- 5.7 Questions and Experiments -- Reference -- 6 Synaptic Scaling and Homeostasis -- 6.1 Introduction.
6.2 Synaptic Scaling -- 6.3 Comparison of Synaptic Scaling with % Hebbian-LMS -- 6.4 Papers of Turrigiano and Stellwagen and Malenka on Synaptic Scaling -- 6.5 Selected Quotes From The Turrigiano Paper -- 6.6 Advantages of the % Hebbian-LMS Hypothesis over the Synaptic … -- 6.7 Memory Traces -- 6.8 Summary -- 6.9 Questions and Experiments -- References -- 7 Synaptic Plasticity -- 7.1 Introduction -- 7.2 Hebbian Learning, Synaptic Plasticity, Homeostasis -- 7.3 Hebbian Learning Rules -- 7.4 Summary -- 7.5 Questions and Experiments -- References -- Part II Addiction and Mood Disorders -- Introduction to Part II -- 8 Addiction -- 8.1 Introduction -- 8.2 Neurotransmitters -- 8.3 Drugs -- 8.4 % Hebbian-LMS and Addiction -- 8.5 Overshoot and Addiction -- 8.6 Habituation -- 8.7 Graphical Interpretations -- 8.8 Opioid Detox -- 8.9 Summary -- 8.10 Questions and Experiments -- References -- 9 Pain and Pleasure -- 9.1 Introduction -- 9.2 Transient Pain and Euphoria -- 9.3 Conclusion: Addiction and Pain-Pleasure/Pleasure-Pain -- 9.4 Summary -- 9.5 Questions and Experiments -- Reference -- 10 Anxiety, Depression, Bipolar Disorder, Schizophrenia and Parkinson's Disease -- 10.1 Introduction -- 10.2 Anxiety -- 10.3 Depression -- 10.4 Bipolar Disorder -- 10.5 Schizophrenia -- 10.6 Parkinson's Disease -- 10.7 Summary -- 10.8 Questions and Experiments -- Reference -- Part III Regulation and Control of Physiological Variables and Body Organs -- Introduction to Part III -- 11 Blood Salinity Regulation, the ADH System -- 11.1 Introduction -- 11.2 Parts of the Blood Salinity Regulation System -- 11.3 Hypothalamus, Posterior Pituitary, and ADH -- 11.4 The Feedback Loop -- 11.5 A Brief Discussion of Classic Feedback Control Theory -- 11.6 Blood Salinity Control: Homeostasis and Negative Feedback -- 11.7 Abnormal Function: Diabetes Insipidus -- 11.8 Summary.
11.9 Questions and Experiments -- 12 The Aldosterone System, Blood Volume Regulation, and Homeostasis -- 12.1 Introduction -- 12.2 The Aldosterone System -- 12.3 System Components -- 12.4 Homeostasis Everywhere -- 12.5 Summary -- 12.6 Questions and Experiments -- 13 The ADH System and the Aldosterone System Combined -- 13.1 The Aldosterone System -- 13.2 The ADH System -- 13.3 ADH and Aldosterone Systems Together -- 13.4 Homeostasis -- 13.5 Disturbance Mitigation -- 13.6 Overall Kidney Function -- 13.7 Renin-Angiotensin-Aldosterone System (RAS System) -- 13.8 Summary -- 13.9 Questions and Experiments -- 14 Heart Rate and Blood Pressure Regulation -- 14.1 Introduction -- 14.2 Autonomic Nervous System -- 14.3 Autonomic Ganglia -- 14.4 The SA Node -- 14.5 Innervation of the SA Node by the Autonomic Nerves -- 14.6 % Hebbian-LMS Control -- 14.7 Vascular Resistance -- 14.8 Resting Conditions -- 14.9 Dynamic Conditions -- 14.10 The % Hebbian-LMS Algorithm Doing High-Pass Filtering? -- 14.11 Summary -- 14.12 Questions and Experiments -- 15 Regulation of Blood Glucose Level -- 15.1 Glucose -- 15.2 Insulin and Insulin Receptors -- 15.3 The Pancreas and the Liver -- 15.4 The Resting State -- 15.5 Mitigation of Transient Effects

by Overall Negative Feedback -- 15.6 Summary -- 15.7 Postscript: Diabetes Mellitus -- 15.8 Research Questions -- 16 Thermoregulation-Control of Body Regulation/Bernie's Oscillation -- 16.1 Introduction -- 16.2 The Cooling System -- 16.3 Autonomic System -- 16.4 Feedback in the Cooling System -- 16.5 The Heating System -- 16.6 Heating or Cooling -- 16.7 Nature's Thermostat/Bernie's Oscillation -- 16.8 The Heating System, On and Off -- 16.9 The Cooling System, On and Off -- 16.10 Control of the Thyroid and Capillaries -- 16.11 The Synaptic Weights Adapt -- 16.12 Temperature Extremes -- 16.13 Three Scenarios.
16.13.1 Going from Indoors to Hot Outdoors -- 16.13.2 Going from Hot Outdoors to Indoors -- 16.13.3 Going from Warm Indoors to Cold Outdoors -- 16.14 Summary -- 16.15 Questions and Experiments -- Part III Reflections On -- Part IV Virus, Cancer, and Chronic Inflammation -- Introduction to Part IV -- 17 Viral Infection -- 17.1 Introduction -- 17.2 Reduction in Number of ACE2 Receptors -- 17.3 Training the Epithelial Cells and Their Receptors -- 17.4 Receptor Blocking -- 17.5 Nasal and Oral ACE2 Inhalers -- 17.6 Other Viruses -- 17.7 Post Script -- 17.8 Summary -- 17.9 Questions and Research -- 18 Cancer -- 18.1 Introduction -- 18.2 Melanoma -- 18.3 Prostate Cancer -- 18.4 Breast Cancer -- 18.5 Lung Cancer -- 18.6 Summary -- 18.7 Questions and Experiments -- 19 Chronic Inflammation -- 19.1 Introduction -- 19.2 Inflammation in the Immune System -- 19.3 Aging Myeloid Cells -- 19.4 Glucose and Myeloid Cell Metabolism -- 19.5 Rejuvenation -- 19.6 Homeostasis and Aging of Myeloid Cells -- 19.7 Summary -- References -- Part V Computer Simulations -- 20 Hebbian-LMS Neural Networks, Clustering -- 20.1 Introduction -- 20.2 Clustering -- 20.3 Input Data Synthesized -- 20.4 A Clustering Experiment -- 20.5 A Clustering Network -- 20.6 Experiments Done by Abhipray Sahoo -- 20.6.1 Version A: Random Cluster Centroids -- 20.6.2 Version B: English Letters -- 20.7 Deja Vu? -- 20.8 Summary -- Reference -- 21 Cognitive Memory -- 21.1 Introduction -- 21.2 The Design of a Cognitive Memory -- 21.3 Summary -- Reference -- Part VI Growth of Plants -- Introduction to Part VI -- 22 Trees -- 22.1 Introduction -- 22.2 Roots -- 22.3 Summary -- 22.4 Questions and Experiments -- Reference -- Part VII Norbert Wiener -- Introduction to Part VII -- 23 Wiener Filters and Adaptive Filters -- 23.1 Introduction -- 23.2 The Wiener Filter -- 23.3 Adaptive Filters -- 23.4 Summary. 23.5 Questions and Experiments -- References -- 24 Norbert Wiener Stories -- 24.1 Introduction -- 24.2 Professor Wiener at MIT -- 24.3 The Absent-Minded Professor -- 24.4 The Quiz -- 24.5 The IBM Typewriter -- 24.6 Wiener at the Smith House -- 24.7 Norbert Wiener on Harry Truman -- 24.8 Wiener (and I) at the 1960 IFAC World Congress in Moscow -- 24.9 Summary -- Part VIII Conclusion -- 25 Famous People Stories -- 25.1 Introduction -- 25.2 Ken Olsen -- 25.3 Dudley Buck and the Cryotron -- 25.4 Marvin Minsky -- 25.5 Claude Shannon -- 25.6 Frank Rosenblatt and the Perceptron -- 25.7 Bill Shockley -- 25.8 Arthur Samuel -- 25.9 Sukhanova Conference, John McCarthy, Karl Steinbuch -- 25.10 First Snowbird Neural Network Workshop, John Hopfield, David Rumelhart -- 25.11 Lotfi Zadeh -- 25.12 Richard Feynman -- 25.13 Senator Henry Jackson, Admiral Hyman Rickover -- 25.14 Edward Teller -- 25.15 Women -- 25.16 Summary -- Reference -- 26 Ancient History -- 26.1 Introduction -- 26.2 Learning Experiments with ADALINE -- 26.3 The Memistor -- 26.4 MADALINE -- 26.5 Post Script -- 26.6 Personal Ancient History -- 26.7 Summary -- References.