

# Contents

## Part I Global Scope of Cognitive Neurodynamic Systems

<b>Artificial Cognitive Systems with Active Learning and Situation Awareness Capabilities</b> .....	3
Soo-Young Lee	
<b>Dynamic Neuronal Representation in the Prefrontal Cortex</b> .....	9
Hajime Mushiake, Keisetsu Shima, Kazuhiro Sakamoto, Yuichi Katori, and Kazuyuki Aihara	
<b>Timing at Multiple Scales in Olfactory Perception</b> .....	17
Leslie M. Kay	
<b>Structure, Stability, Dynamics, and Geometry in Brain Networks</b> .....	23
Peter A. Robinson	
<b>Mathematical Theory of Neural Networks: A Personal and Historical Survey</b> .....	31
Shun-ichi Amari	
<b>Memory Information Representation in the Hippocampus</b> .....	37
Minoru Tsukada	

## Part II Neuronal Impulse Patterns, Bifurcations and Model Complexity

<b>Functional Significance of Rall’s Power of Three Halves Law in Cortical Nonpyramidal Cells</b> .....	45
Yoshiyuki Kubota, Masaki Nomura, Fuyuki Karube, and Yasuo Kawaguchi	

<b>A Computational Study of the Role of the Sub-thalamic Nucleus in Behavioral Switching During Saccadic Movements</b> .....	53
Rengaswamy Maithreye and V. Srinivasa Chakravarthy	
<b>Spiking Neural Network Ink Drop Spread, Spike-IDS</b> .....	59
Mohsen Firouzi, Saeed Bagheri Shouraki, and Mohammad Ghomi Rostami	
<b>A Biophysical Model of Neuro-Glial-Vascular Interactions</b> .....	69
Bankim S. Chander and V. Srinivasa Chakravarthy	
<b>Model Complexity in the Study of Neural Network Phenomena</b> .....	77
Claus C. Hilgetag, Marc-Thorsten Hütt, and Changsong Zhou	
<b>From Spiking Neurons to Neural Fields: Bridging the Gap to Achieve Faster Simulations of Neural Systems</b> .....	83
Peter A. Robinson and Jong Won Kim	
<b>Multi-population Network Models of the Cortical Microcircuit</b> .....	91
Tobias C. Potjans and Markus Diesmann	
<b>Attentional Cholinergic Projections May Induce Transitions of Attractor Landscape via Presynaptic Modulations of Connectivity</b> .....	97
Hiroshi Fujii, Takashi Kanamaru, Kazuyuki Aihara, and Ichiro Tsuda	
<b>Forced Wakefulness for Entrainment to Permanent Shift Work: A Computational Study</b> .....	105
Svetlana Postnova and Peter A. Robinson	
<b>Towards a Modeling and Simulation Platform for Multi-level Neuronal Networks</b> .....	113
Yoshiyuki Asai, Hideki Oka, Taishin Nomura, and Hiroaki Kitano	
<b>Part III Mathematical and Statistical Aspects of Neurodynamics</b>	
<b>Robust Computation in Two Dimensional Neural Field</b> .....	123
Yuzuru Sato and Shun-ichi Amari	
<b>Dynamical Synapses Enhance Mobility, Memory and Decoding</b> .....	131
C.C. Alan Fung, K.Y. Michael Wong, and Si Wu	
<b>Input Dependent Variability in a Model of the Striatal Medium Spiny Neuron Network</b> .....	139
Adam Ponzi and Jeff Wickens	
<b>Selection Criteria for Neuromanifolds of Stochastic Dynamics</b> .....	147
Nihat Ay, Guido Montúfar, and Johannes Rauh	

<b>A Manipulative Approach to Neural Dynamics by Combined TMS-EEG .....</b>	<b>155</b>
Keiichi Kitajo, Yumi Nakagawa, Yutaka Uno, Ryohei Miyota, Masanori Shimono, Kentaro Yamanaka, and Yoko Yamaguchi	
<b>Long-Tailed Statistics of Corticocortical EPSPs: Origin and Computational Role of Noise in Cortical Circuits .....</b>	<b>161</b>
Jun-nosuke Teramae, Yasuhiro Tsubo, and Tomoki Fukai	
<b>On a Theory of Precise Neural Control in a Noisy System .....</b>	<b>169</b>
Wenlian Lu, Shun-ichi Amari, Jianfeng Feng, and David Waxman	
<b>Real-Time Wireless Sonification of Brain Signals .....</b>	<b>175</b>
Mohamed Elgendi, Brice Rebsamen, Andrzej Cichocki, Francois Vialatte, and Justin Dauwels	
 <b>Part IV   Spatiotemporal Network Dynamics and Biological Timing</b>	
<b>Oscillator Cell Networks in the Hypothalamic Suprachiasmatic Nucleus, the Mammalian Circadian Clock .....</b>	<b>185</b>
Sato Honma, Daisuke Ono, and Ken-ichi Honma	
<b>Oscillator Network Modeling of Circadian Rhythm in the Suprachiasmatic Nucleus .....</b>	<b>191</b>
Isao Tokuda, Hirokazu Fukuda, and Naoto Hayasaka	
<b>In Vivo Monitoring of Circadian Output in <i>Clock</i> Mutant Mice .....</b>	<b>199</b>
Wataru Nakamura	
<b>Modular Organization Enables Both Self-Organized Criticality and Oscillations in Neural Systems .....</b>	<b>207</b>
Shengjun Wang, Claus C. Hilgetag, and Changsong Zhou	
<b>Traveling Waves in Locally Connected Chaotic Neural Networks and Their Phenomenological Modeling .....</b>	<b>213</b>
Makito Oku and Kazuyuki Aihara	
<b>Spatial Filtering by a Two-Dimensional Interconnected Network with Spike Timing Dependent Synaptic Plasticity Depending on Its Temporal Properties .....</b>	<b>221</b>
Kazuhisa Fujita	
<b>Neural Model for Hierarchical Processing of Auditory Information in Mammal's Cortex .....</b>	<b>227</b>
Yusuke Hara and Yoshiki Kashimori	
<b>Modeling Dynamics of the Human Limbic System .....</b>	<b>233</b>
Mark H. Myers and Robert Kozma	

## **Part V Dynamic Patterns of Neural Activity in Human Information Processing**

<b>Infant's Primitive Walking Reflex from the Perspective of Learning in the Uterus</b> .....	243
Hiroki Mori and Yasuo Kuniyoshi	
<b>Socially Developmental Robot based on Self-Induced Contingency with Multi Latencies</b> .....	251
Hidenobu Sumioka, Yuichiro Yoshikawa, Masanori Morizono, and Minoru Asada	
<b>On the Brain's Dynamical Complexity: Coupling and Causal Influences Across Spatiotemporal Scales</b> .....	259
Emmanuelle Tognoli and J.A. Scott Kelso	
<b>Formulating a Cognitive Branching Task by MTRNN: A Robotic Neuroscience Experiments to Simulate the PFC and Its Neighboring Regions</b> .....	267
Fady Alnajjar, Yuichi Yamashita, and Jun Tani	
<b>Neurodynamical Account for Altered Awareness of Action in Schizophrenia: A Synthetic Neuro-Robotic Study</b> .....	275
Yuichi Yamashita and Jun Tani	
<b>Self-Organizing Dynamic Neural Fields</b> .....	281
Nicolas P. Rougier and Georgios Is. Detorakis	
<b>Spontaneous EEG Activity and Biases in Perception of Supra-Threshold Stimuli</b> .....	289
Andrey R. Nikolaev, Sergei Gepshtein, and Cees van Leeuwen	
<b>Functional Roles of Corticofugal Plasticity in Detecting a Moving Target in Bat's Auditory System</b> .....	297
Yoshitaka Muto, Yoshihiro Nagase, and Yoshiki Kashimori	
<b>The Origin of the Spatial Pattern of Amplitudes in Trial-Averaged MEG</b> .....	303
David M. Alexander, Peter Jurica, Andrey R. Nikolaev, Mikhail Zvyagintsev, Klaus Mathiak, and Cees van Leeuwen	
<b>Rhythm Matters: A Case in Attentional Blink</b> .....	311
Chie Nakatani and Cees van Leeuwen	
<b>Complex Network Topology and Dynamics in Networks Supporting Precisely-Timed Activity Patterns</b> .....	317
Chris Trengove, Cees van Leeuwen, and Markus Diesmann	

## **Part VI Toward Understanding of Intelligence: Collaboration Between Neuroscience and Robotics**

<b>Neural Synchrony for Expert Memory in Shogi (Japanese Chess) Players .....</b>	<b>325</b>
Hironori Nakatani and Yoko Yamaguchi	
<b>Neuronal Synchrony During the Planning and Execution Period in the Prefrontal Cortex.....</b>	<b>331</b>
Kazuhiro Sakamoto, Katsutoshi Yamamoto, Naohiro Saito, Kazuyuki Aihara, Jun Tanji, and Hajime Mushiake	
<b>A Constructive Approach for Investigating the Emergence of Role Division in Social Interactions .....</b>	<b>339</b>
Kenichi Minoya, Takaya Arita, and Takashi Omori	
<b>Estimating Similarity Judgment Processes Based on Neural Activities Measured by Near-Infrared Spectroscopy (NIRS) .....</b>	<b>347</b>
Yoshihiko Suzuki and Shohei Hidaka	
<b>Autonomous Robot with Internal Topological Representation .....</b>	<b>355</b>
Pitoyo Hartono and Thomas Trappenberg	
<b>SUDOKU Puzzle: The Neurodynamics of Intelligence to Choose the Right Solution from Many Possible Options in a Hypothetical Reasoning .....</b>	<b>363</b>
Hiroaki Wagatsuma	

## **Part VII Dynamic Brain Forum**

<b>Heterogeneity-Induced Pulse Generators .....</b>	<b>371</b>
Yasumasa Nishiura, Takashi Teramoto, and Masaaki Yadome	
<b>Balancing Robustness with Plasticity Through Evolution and Learning ..</b>	<b>379</b>
Kunihiko Kaneko	
<b>Influence of the Endogenous Acetylcholine on STDP Induction .....</b>	<b>387</b>
Takeshi Aihara, Eriko Sugisaki, Yasuhiro Fukushima, and Minoru Tsukada	
<b>Transition Dynamics in Spatial Choice .....</b>	<b>393</b>
Hiroshi Nishida, Muneyoshi Takahashi, Jin Kinoshita, and Johan Lauwereyns	
<b>Perseveration of Response Sequences as a Mechanism Underlying 3,4-Methylenedioxymethamphetamine (MDMA or ‘Ecstasy’) Induced Memory Impairments .....</b>	<b>401</b>
David N. Harper	

<b>Multiple Neural Circuits in Value-Based Decision-Making</b> .....	409
Masamichi Sakagami	
<b>Towards Understanding of Neural Dynamics in Communicating Brains</b> .....	415
Ichiro Tsuda	
<b>The Organization of Neuronal Discharge on Timescales of Milliseconds and Seconds Is Related to the Spatial Response Properties of Hippocampal Neurons</b> .....	421
Eduard Kelemen and André A. Fenton	
<b>An Animal Model of Decision Making: Vicarious Trial-and- Error in Tasks Requiring Memory for Visual Associations or Spatial Locations</b> .....	429
Paul A. Dudchenko, David Bett, Elizabeth Allison, Karola Kaefer, and Emma R. Wood	
<b>Correlated Brain Activations During Formation of Memory for Future Plans</b> .....	437
Jiro Okuda, Maki Suzuki, and Toshikatsu Fujii	
<b>Cognitive Modeling of Human-Robot Interaction Estimating Other's Internal State</b> .....	443
Takashi Omori, Ayami Yokoyama, Kasumi Abe, and Takayuki Nagai	
<b>Symbol Communication Systems Integrate Implicit Information in Coordination Tasks</b> .....	453
Takeshi Konno, Junya Morita, and Takashi Hashimoto	
<b>Intermittent Brain Motor Control Observed in Continuous Tracking Task</b> .....	461
Yutaka Sakaguchi	
<b>Molecular and Neural Mechanisms for Behavioral Choice Between Two Conflicting Alternatives in <i>C. elegans</i></b> .....	469
Takeshi Ishihara	
<b>Modulating the Phase Coherence of Neuronal Population Oscillations in the Gamma Band</b> .....	475
B. Sancristóbal, R. Vicente, A.J. Pons, G. Pipa, and J. Garcia-Ojalvo	
<b>The Phase Space of Lateral Thought</b> .....	483
Eleonora Russo and Alessandro Treves	
<b>Learning and Decisions as Functional States of Cortical Circuits</b> .....	491
José M. Delgado-García, Raudel Sánchez-Campusano, and Agnès Gruart	

<b>Causal Effects for Prediction and Deliberative Decision Making of Embodied Systems</b> .....	499
Nihat Ay and Keyan Zahedi	
 <b>Part VIII Widespread of Cognitive Neurodynamics Modeling</b>	
<b>Ongoing Global Phase Pattern and Visual Signal Detection</b> .....	509
Daisuke Shimaoka, Keiichi Kitajo, Kunihiro Kaneko, and Yoko Yamaguchi	
<b>Model on Visualization and Analysis for Peripheral Drift Illusion</b> .....	515
Keiichiro Inagaki and Shiro Usui	
<b>Differentiation Through Symbolic Communication</b> .....	523
Takuma Torii and Takashi Hashimoto	
<b>Theoretical Analysis of Phase Resetting on Matsuoka Oscillators</b> .....	531
Kazuki Nakada, Yasuomi D. Sato, and Kiyotoshi Matsuoka	
<b>“Memories as Bifurcations”: A Simple Model</b> .....	537
Tomoki Kurikawa and Kunihiro Kaneko	
<b>Biologically Inspired Closed-Loop Model of Precision Grip Lifting Task</b> .....	543
Ankur Gupta, Manikanta Avinash, Deepa Kandaswamy, Muthu Kumar, Suresh Devasahayam, K. Srinivasa Babu, and V. Srinivasa Chakravarthy	
<b>A Communicative Model: Can We Interpret Neural Dynamics of Understanding?</b> .....	551
Yongtao Li and Ichiro Tsuda	
<b>Mechanisms for Generating Intermittency During Manual Tracking Task</b> .....	559
Tetsumasa Asano, Jun Izawa, and Yutaka Sakaguchi	
<b>Multi-dynamics Learning Algorithm Based on SOM<sup>2</sup></b> .....	567
Satoshi Matsushita, Takashi Ohkubo, and Tetsuo Furukawa	
<b>Saccade Dynamics in Error Trials During Visual Search</b> .....	575
Atsushi Fujimoto, Satoshi Nishida, and Tadashi Ogawa	
<b>Design and Dynamics of Active-Touch Sensory Model</b> .....	583
Tatsuo Yanagita	
<b>Human Object Recognition Based on Internal Models of the Human Hand</b> .....	591
Masazumi Katayama and Tatsuya Kurisu	

<b>Estimation of Children's Interest Dynamics While Communicating with Robots</b> .....	599
Takayuki Shimotomai, Kasumi Abe, Ayami Yokoyama, Takayuki Nagai, and Takashi Omori	
<b>Robotic Motion Coach: Effect of Motion Emphasis and Verbal Expression for Imitation Learning</b> .....	607
Tetsunari Inamura and Keisuke Okuno	
<b>Synthetic Approach to Understanding Meta-level Cognition of Predictability in Generating Cooperative Behavior</b> .....	615
Jun Namikawa, Ryunosuke Nishimoto, Hiroaki Arie, and Jun Tani	
<b>Neural Correlates of Cognitive Dissonance and Decision Conflict</b> .....	623
Keise Izuma, Madoka Matsumoto, Kou Murayama, Kazuyuki Samejima, Sadato Norihiro, and Kenji Matsumoto	
<b>Cantor Coding of Song Sequence in the Bengalese Finch HVC</b> .....	629
Jun Nishikawa and Kazuo Okanoya	
<b>Inhibitory Network Dependency in Cantor Coding</b> .....	635
Yasuhiro Fukushima, Yoshikazu Isomura, Yutaka Yamaguti, Shigeru Kuroda, Ichiro Tsuda, and Minoru Tsukada	
<b>Sequential Memory Retention by Stabilization of Cell Assemblies</b> .....	641
Timothee Leleu and Kazuyuki Aihara	
<b>Statistical Estimation of Non-uniform Distribution of Dendritic Membrane Properties</b> .....	649
Toshiaki Omori, Toru Aonishi, and Masato Okada	
<b>Context-Dependent Call Variation in the Male Bengalese Finch</b> .....	657
Midori Osada and Tetsu Okumura	
<b>Capturing the Global Behavior of Dynamical Systems with Conley-Morse Graphs</b> .....	665
Zin Arai, Hiroshi Kokubu, and Ippei Obayashi	
<b>A Heuristic Model of Intra-brain Communications Using Chaos in Artificial Neuron Systems</b> .....	673
Yu Arai, Ryota Mori, Fuyuki Aoto, and Shigetoshi Nara	
<b>Transitory Memory Retrieval in the Neural Networks Composed of Pinsky-Rinzel Model Neurons</b> .....	683
Hiromichi Tsukada, Yutaka Yamaguti, Hiroshi Fujii, and Ichiro Tsuda	



<b>Dynamic Information Processing in the Frontal Association Areas of Monkeys During Hypothesis Testing Behavior .....</b>	<b>691</b>
Norihiko Kawaguchi, Kazuhiro Sakamoto, Yoshito Furusawa, Naohiro Saito, Jun Tanji, and Hajime Mushiake	
<b>Simple Dynamical Models to Understand the Mechanisms of Drug Addiction .....</b>	<b>699</b>
Takashi Tateno	
<b>Toward an Animal Model of Spatial Hemineglect: Preliminary Investigation .....</b>	<b>711</b>
Masatoshi Yoshida	
<b>Prestimulus Neural Oscillations Contribute to Recollection and Familiarity .....</b>	<b>717</b>
Florence Kleberg, Keiichi Kitajo, Masahiro Kawasaki, and Yoko Yamaguchi	
<b>Contribution of the Cholinergic Innervation to Early Memory Development in the Neonate Para-Hippocampal System .....</b>	<b>727</b>
Alexandre Pitti and Yasuo Kuniyoshi	
<b>Unintentional Synchronization of Behavior in Japanese Monkeys .....</b>	<b>745</b>
Yasuo Nagasaka, Zenas C. Chao, Naomi Hasegawa, Tomonori Notoya, and Naotaka Fujii	
<b>Effects of Medial Amygdala Lesions upon Social Behaviour in Mice .....</b>	<b>753</b>
Yu Wang, Yuki Takayanagi, and Tatsushi Onaka	
<b>Theta-Burst Stimulation Induces Long-Term Potentiation During Beta Oscillation, but Not During Epileptic Discharges, in Rat Hippocampal Slices .....</b>	<b>759</b>
Motoshi Nishimura and Kiyohisa Natsume	
<b>Integration of Hetero Inputs to Guinea Pig Auditory Cortex Established by Fear Conditioning .....</b>	<b>765</b>
Yoshinori Ide, Muneyoshi Takahashi, Johan Lauwereyns, Minoru Tsukada, and Takeshi Aihara	
<b>The Theta Cycle and Spike Timing During Fixation in Rat Hippocampal CA1 .....</b>	<b>773</b>
Muneyoshi Takahashi, Yoshio Sakurai, Yoshikazu Isomura, Minoru Tsukada, and Johan Lauwereyns	
<b>Reactivation Hypothesis in Episodic Memory: From the Findings of Neuroimaging Studies .....</b>	<b>781</b>
Aya Ueno, Jiro Okuda, and Toshikatsu Fujii	

<b>Model-Based Analysis of Functional Connectivity During Associative Learning in Schizophrenia</b> .....	787
Mihály Bányai, Vaibhav Diwadkar, and Péter Érdi	
<b>Neuronal Activity in the Prefrontal Cortex During Performance of a Dual Task Consisting of a Main- and An Interrupting-Task</b> .....	795
Atsushi Miyazaki, Toshi Nakajima, Keisetsu Shima, and Hajime Mushiake	
<b>Functional Analysis of the Hippocampus Using Opto-fMRI</b> .....	803
Yoshihumi Abe, Masaki Sekino, Yugo Fukazawa, Hiromu Yawo, Hiroyuki Ohsaki, and Tatsuhiko Hisatsune	
<b>Modulation of Cortico–Hippocampal EEG Synchronization with Visual Flicker: A Theoretical Study</b> .....	809
Naoyuki Sato	
<b>Transition of Firing Patterns in a CA1 Pyramidal Neuron Model</b> .....	817
Dan Ma, Shenquan Liu, and Lei Wang	
<b>The Effects of Leakage Conductance on Firing Properties in a Compartment Neuron Model</b> .....	825
Lei Wang and Shenquan Liu	
<b>Numerical Analysis of Parkinson’s Disease in a Basal Ganglia Network Model</b> .....	833
Xiaofeng Xie, Shenquan Liu, Xuemiao Pan, and Lei Wang	
<b>Erratum</b> .....	E1
<b>Index</b> .....	843

Advances in Cognitive Neurodynamics (III)  
Proceedings of the Third International Conference on  
Cognitive Neurodynamics - 2011  
Yamaguchi, Y. (Ed.)  
2013, XVI, 846 p. 402 illus., Hardcover  
ISBN: 978-94-007-4791-3