Neural Network Control of Nonlinear Discrete Time Systems: Automation and Beyond

In the стремительно развивающемся мире, where automation and autonomy play an increasingly crucial role, the ability to effectively control complex nonlinear systems is of paramount importance. Neural networks, with their remarkable capabilities in pattern recognition and learning, offer a powerful tool for tackling this challenge.
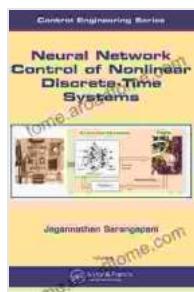
Neural Network Control of Nonlinear Discrete-Time Systems (Automation and Control Engineering Book 21) by Jagannathan Sarangapani

★★★★☆ 4.2 out of 5

Language	: English
File size	: 12514 KB
Screen Reader	: Supported
Print length	: 622 pages

This comprehensive guidebook delves into the fascinating intersection of neural network control and nonlinear discrete time systems. It provides a thorough foundation in the underlying theory, explores cutting-edge techniques, and showcases real-world applications across various domains.

Neural Networks and Nonlinear Discrete Time Systems

Neural networks are a class of machine learning algorithms inspired by the human brain. They consist of interconnected nodes, or neurons, that can

process and learn from data. This inherent ability to adapt and generalize makes neural networks well-suited for controlling complex systems with nonlinearities and uncertainties.

Nonlinear discrete time systems are systems whose behavior changes over time and exhibits nonlinearities, such as saturation, dead zones, and hysteresis. These systems are prevalent in various engineering applications, including robotics, power systems, and manufacturing processes.

Neural Network Control Techniques

This guidebook covers a wide range of neural network control techniques tailored for nonlinear discrete time systems. These techniques include:

- Adaptive Control: Neural networks can be used to adjust control parameters in real-time, adapting to changing system dynamics and disturbances.

- Predictive Control: Neural networks can predict future system behavior, enabling the design of controllers that optimize performance over a prediction horizon.

- Reinforcement Learning: Neural networks can learn control policies through trial and error, without requiring explicit system models.

- Deep Reinforcement Learning: This advanced technique leverages deep neural networks to handle complex control tasks with high-dimensional state spaces.

Real-World Applications

The power of neural network control extends beyond theoretical concepts. This guidebook showcases numerous real-world applications, including:

- Autonomous Robotics: Neural networks enable robots to navigate and interact with their environment, making them more versatile and capable.

- Power System Control: Neural networks help stabilize power grids, ensuring reliable and efficient electricity distribution.

- Manufacturing Process Control: Neural networks optimize production processes, reducing waste and improving product quality.

- Medical Device Control: Neural networks enhance the precision and effectiveness of medical devices, such as pacemakers and insulin pumps.

Future Research Directions

The field of neural network control is rapidly evolving, with ongoing research exploring new frontiers. This guidebook highlights promising future research directions, including:

- Robust Control: Developing neural network control techniques that are resilient to uncertainties and disturbances.

- Safety-Critical Control: Ensuring the safety and reliability of neural network control systems in critical applications.

- Edge Computing: Deploying neural network control algorithms on resource-constrained devices, such as drones and self-driving cars.

- Explainable AI: Developing neural network control systems that can explain their decisions and actions, fostering trust and acceptance.

Neural Network Control of Nonlinear Discrete Time Systems: Automation and Beyond is an essential resource for researchers, engineers, and practitioners seeking to harness the power of neural networks for controlling complex systems. This comprehensive guidebook provides a deep understanding of the underlying theory, cutting-edge techniques, and real-world applications, equipping readers with the knowledge and tools to push the boundaries of automation and beyond.

Free Download your copy today and unlock the transformative potential of neural network control!
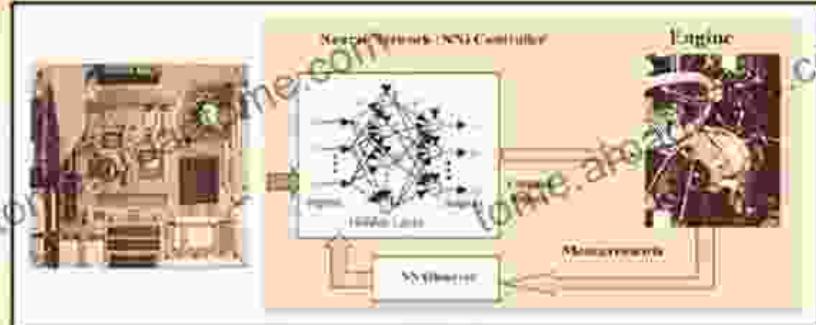
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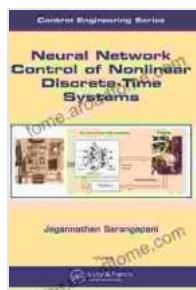
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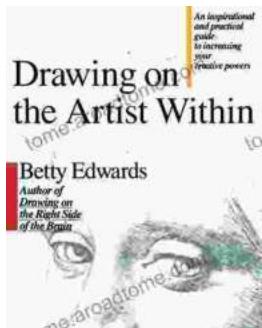
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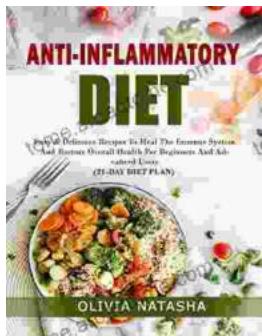
Easy Delicious Recipes To Heal The Immune System And Restore Overall Health For A Thriving, Energetic Life

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