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Sommario/riassunto

Spiking neural P systems represent a significant advancement in the field of membrane computing, drawing inspiration from the communication patterns observed in neurons. Since their inception in 2006, these distributed and parallel neural-like computing models have gained popularity and emerged as important tools within the membrane computing area. As a key branch of the third generation of artificial neural networks, a fascinating research area of artificial intelligence, spiking neural P systems offer a captivating blend of theoretical elegance and practical utility. Their efficiency, Turing completeness, and real-life application characteristics, including interpretability and suitability for large-scale problems, have positioned them at the forefront of contemporary research in membrane computing and artificial intelligence. This state-of-the-art reference work is organized into three parts comprising twelve chapters. It thoroughly investigates the theoretical foundations, real-life applications, and implementations of spiking neural P systems. From fundamental principles to computational power and complexity, the theoretical aspects are explored, laying the groundwork for understanding their practical applications. Real-life applications span a diverse range of domains, including complex optimization, classification, fault diagnosis, medical image processing, information fusion, cryptography, and robot control. Additionally, the book discusses several software and hardware implementations that provide valuable insights into the practical deployment of spiking neural P systems. As the rapid development of spiking neural P systems continues to unfold, there is an increasing demand for a systematic and comprehensive summary of their capabilities and applications. This work serves as an invaluable resource for researchers, scholars, and practitioners interested in the theoretical underpinnings, algorithms, and practical implementation of artificial intelligence and membrane computing.