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A PREFACE TO THE SPECIAL ISSUE: EMERGING AREAS IN NETWORK AND INTELLIGENCE EMPOWERED COMPUTING

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The past decade has seen networking and intelligent computing converge into a single discipline, where connectivity is no longer a passive substrate but an active, learning system. Ubiquitous IoT devices, cloud–edge continuums, and programmable data planes now generate torrents of telemetry that demand real-time inference, closed-loop control, and autonomy. From 5G/6G network slicing to intent-based and self-organizing networks, the stack is becoming software-defined, data-driven, and increasingly adaptive – setting the stage for AI models that reason over graphs, streams, and spatiotemporal patterns, and for networks that optimize themselves under tight latency, reliability, and energy constraints.

At the same time, new computing paradigms are reshaping what is possible at scale. Foundation models and graph neural networks unlock powerful abstractions for traffic prediction, anomaly detection, and resource allocation; federated and privacy-preserving learning enable collaboration across administrative domains without exposing raw data; and neuromorphic and event-driven processing promise ultra-low-power intelligence at the edge. Digital twins of networks and reinforcement learning for control are moving from lab prototypes to production playbooks, while cloud-native architectures – serverless, microservices, and network function virtualization – offer the flexibility needed to deploy, monitor, and evolve these capabilities safely.

This volume brings together advances across algorithms, systems, and practice. Contributions address trustworthy and responsible AI for networks (robustness, explainability, fairness), secure and resilient infrastructures (zero-trust, post-quantum readiness), and sustainable computing (energy-aware scheduling, carbon-intelligent placement). They showcase programmable fabrics (P4/DPDK, `https://github.com/p4lang/p4-dpdk-target`), telemetry and observability at scale, distributed optimization for multi-agent coordination, and end-to-end co-design of models with hardware and protocols. By highlighting open challenges – data quality, standardization, reproducibility, and real-world evaluation – we aim to catalyze interdisciplinary collaboration that turns intelligent networking from a promising frontier into dependable, equitable infrastructure.

This Special Issue solicited 9 papers centering on the topics related to network and intelligence computing. Briefly we would like to introduce the works presented in these papers. In [1], Qi et al. devised an innovative route planning approach for sharing taxi and bus information, enabling passengers to seamlessly transition between the two modes and arrive at their destinations within designated timeframes. Si et al. [2] introduced a data-driven Bayesian Network model, which incorporates D-S evidence theory to integrate prior knowledge for the purpose of fraud risk analysis, taking into account the ability of Bayesian Network to model probabilistic dependencies and causal relationships among variables. The business processes in the information system are complex and diverse, and a single machine learning method often relies excessively on the noise or specific patterns in the training data. Dealing with this challenge, Tian et al. [3] introduced a two-layer machine learning framework using stacking technology – Serial Stacking Framework. The proposed framework carries out random grouping sampling with placement, trains the multi-objective regression model, and applies multiple machine learning models to predict in series. Service description suffers from short texts and contains few repeated words, which brings challenges to generate high-quality service function vector (SFV) in service clustering. To tackle this challenge, Qi et al. [4] proposed some work on semantic enhancement and heterogeneous correlation guided Web Service Clustering. A high-performance contrastive learning framework is employed to generate SFVs. In [5], Cheng et al. focused on the analysis of rolling bearing vibration signal, presenting a comprehensive investigation into vibration signal analysis and fault signal feature extraction methods. Information security is an important issue in the design and development of information systems. As a well-known information security policy, Chinese Wall policy concerns the conflict of interest among sensitive information items. Tu et al. [6] utilized Petri nets with data (PD-nets) to model and verify this policy. Specifically, this work proposes PD-nets for Chinese Wall policy to depict the control-flows, dataflows and data operations of information systems and introduces configurations and reachability graphs to describe the running states. In [7], Yuan et al. targeted at the challenge of maintaining stable and orderly intelligent autonomous driving behavior in a closing scene and formulated an aggregation degree-based Cooperative Model for Autonomous Vehicle Groups in a closing scene. Wang et al. [8] combined Petri nets and machine learning in tackling depression

issues. Finally, Xie and Feng [9] came up with a learning path recommendation method based on learner profiles, tackling the issues facing traditional e-learning systems related to information overload and fragmented resources.

We hope that the perspectives presented in this Special Issue would be of a great interest to the readers. We also expect the readers to contribute to this exciting and fast-growing research area.

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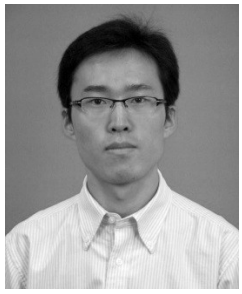

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