IEEE Transactions on Computational Social Systems

Special Issue: Human-Centric and Social Data–Driven Next-Generation Mobile Communication Networks

Background and motivation:

With the continuous evolution of mobile communication technologies, modern wireless networks have achieved unprecedented levels of performance in terms of capacity, latency, coverage, and flexibility. The development of 5G and beyond, together with emerging technologies such as integrated sensing and communication (ISAC), intelligent reflecting surfaces (IRS), and UAV-assisted base stations, has significantly enhanced the ability of mobile networks to operate in complex and dynamic environments.

These technologies address practical challenges faced by conventional static network infrastructures, including limited situational awareness, inflexible deployment, and the difficulty of adapting to time-varying demands. ISAC enables communication systems to perceive environmental and contextual information, IRS improves coverage and spectral efficiency, and UAV-assisted networks provide on-demand and cost-effective connectivity in areas where fixed infrastructure is inefficient or unavailable.

However, technological capabilities alone do not guarantee effective network operation. Real-world communication systems must serve human users, social activities, and collective behaviors. Network demand is strongly influenced by human mobility flows, population density, crowd dynamics, temporal social patterns, and event-driven activities. While many recent studies focus on advanced optimization of wireless systems, most still emphasize network-centric objectives and overlook the integration of social data into sensing, deployment, and decision-making processes.

This gap motivates the need for socially aware and human-centric mobile communication networks. In such systems, various forms of social data including mobility traces, transportation patterns, crowd-level indicators, human interaction behaviors, and activity-driven dynamics are incorporated as key inputs for the design and operation of next-generation wireless systems.

Scope and significance:

This special issue focuses on the integration of social data and next-generation mobile communication technologies, aiming to explore how human mobility, crowd dynamics, activity patterns, and social contexts can be systematically incorporated into mobile network design and operation.

The scope covers a wide range of technologies including 5G and 6G systems, ISAC, IRS-assisted architectures, and UAV-enabled communication networks, along with modeling and analysis techniques from computational social systems. Typical scenarios include rural and suburban connectivity, intelligent transportation environments, smart cities, large-scale public events, and emergency or disaster-response communications.

In sparsely populated rural or highway transportation environments, deploying dense fixed base stations may result in excessive cost and low utilization. UAV-assisted base stations offer flexible alternatives, but their deployment depends heavily on social data such as traffic flow, human mobility distribution, and temporal patterns. Similar challenges arise in urban environments where social events, crowd dynamics, and environmental conditions must be jointly considered to balance coverage performance, energy efficiency, deployment cost, and service reliability.

By addressing these issues, this special issue aims to advance socially aware mobile communication systems and promote interdisciplinary collaboration across wireless communications,

computational modeling, and social data analytics. Topics of interest include socially driven modeling, human mobility and behavioral prediction, event-driven adaptive networks, and learning-based decision-making using multimodal social data:

- Social data–driven modeling and optimization for 5G/6G mobile networks
- Human mobility and crowd dynamics modeling for wireless network planning
- ISAC-enabled sensing of social behaviors and environment-aware communications
- IRS-assisted and socially-aware wireless network architectures
- UAV-enabled mobile communication networks driven by human mobility and events
- Event-driven and context-aware network adaptation using social data
- Computational social modeling for traffic prediction and resource allocation
- Learning-based approaches integrating social behavior and communication systems
- Human-centric and socially-aware network management and control
- Privacy-aware and ethical considerations in social data–driven networks

Timeliness:

The proposed special issue is timely due to the rapid deployment of next-generation wireless technologies and the increasing availability of large-scale social and mobility data. Advances in ISAC, UAV-enabled communications, intelligent network control, and edge intelligence now enable real-time sensing and adaptive decision-making. Meanwhile, smart cities, transportation systems, and public services generate continuous streams of social data containing mobility traces, crowd-density indicators, transportation patterns, and human activity signals.

Recent 6G research initiatives emphasize human-centric and context-aware performance indicators, making the integration of social data into communication systems a necessary direction rather than an optional enhancement. In addition, emerging applications such as autonomous mobility, city-scale digital twins, and crowd-aware safety management require the combined use of social sensing and communication infrastructures.

These technological and societal trends create an urgent need for new models and frameworks that explicitly incorporate social dynamics into mobile communication systems. This special issue provides a timely platform to present recent progress, highlight open challenges, and define future research directions.

Relevance to the IEEE TCSS:

This special issue aligns closely with the scope of IEEE Transactions on Computational Social Systems because it emphasizes the computational modeling and integration of social data with large-scale engineering systems. By viewing mobile communication networks as adaptive infrastructures influenced by human behavior and social dynamics, the special issue highlights the role of computational methods in bridging social systems with communication technologies.

The focus on human mobility modeling, crowd-behavior prediction, event-driven adaptation, agent-based or data-driven social simulations, and socially informed resource allocation reflects the core mission of TCSS. The special issue aims to connect wireless system design with social-environmental contexts and contribute to interdisciplinary research on social data analysis, intelligent system behavior, and the co-evolution of human activity and network infrastructures.

Tentative schedule

Manuscript submission deadline: December 15, 2026

Authors' revision notification date: February 15, 2027

Revised manuscript submission deadline: March 31, 2027
Final decision notification date: May 15, 2027
Publication date: September 2027

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One Page Call for Paper

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Next-generation wireless networks are rapidly evolving with technologies such as 5G and 6G, integrated sensing and communication (ISAC), intelligent reflecting surfaces (IRS), and UAV-assisted base stations. These advancements enhance network flexibility and sensing capabilities, yet real-world network performance fundamentally depends on human mobility, crowd behavior, and social activity patterns.

This Special Issue aims to explore socially aware wireless communication systems where social data including mobility traces, human activity patterns, crowd dynamics, transportation flows, and event-driven behaviors provide essential context for the design and operation of modern mobile networks. By integrating computational social modeling with communication technologies, this issue seeks interdisciplinary contributions that link human behavior, data-driven intelligence, and next-generation wireless infrastructures. Topics include, but are not limited to:

- Social data driven modeling and optimization for 5G and 6G networks
- Human mobility and crowd dynamics analysis for network planning
- ISAC enabled sensing for social-behavior and context inference
- IRS assisted and socially aware wireless architectures
- UAV enabled mobile communication networks influenced by human mobility and events
- Event driven and context aware network adaptation
- Computational social modeling for traffic prediction and resource allocation
- Learning based decision-making integrating social behavior and communication systems
- Human-centric and socially aware network management
- Privacy, ethics, and responsible use of social data in wireless systems

Important Dates

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