WP2.3.AI-assisted networking

Semantics-aware sensing, communication and computing optimization for 6G networks

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Motivation

Intelligence is one of the key features that distinguishes 6G from 5G. More specifically, 6G networks are envisioned to incorporate artificial intelligence (AI) in their operation in three ways: (i) for network management, (ii) modern applications, and (iii) AI as a service.

To realize this vision, vast amounts of data must be sensed, collected, transmitted, computed, stored, and secured, all of which demand substantial resources, push network limitations, and introduce significant redundancy.

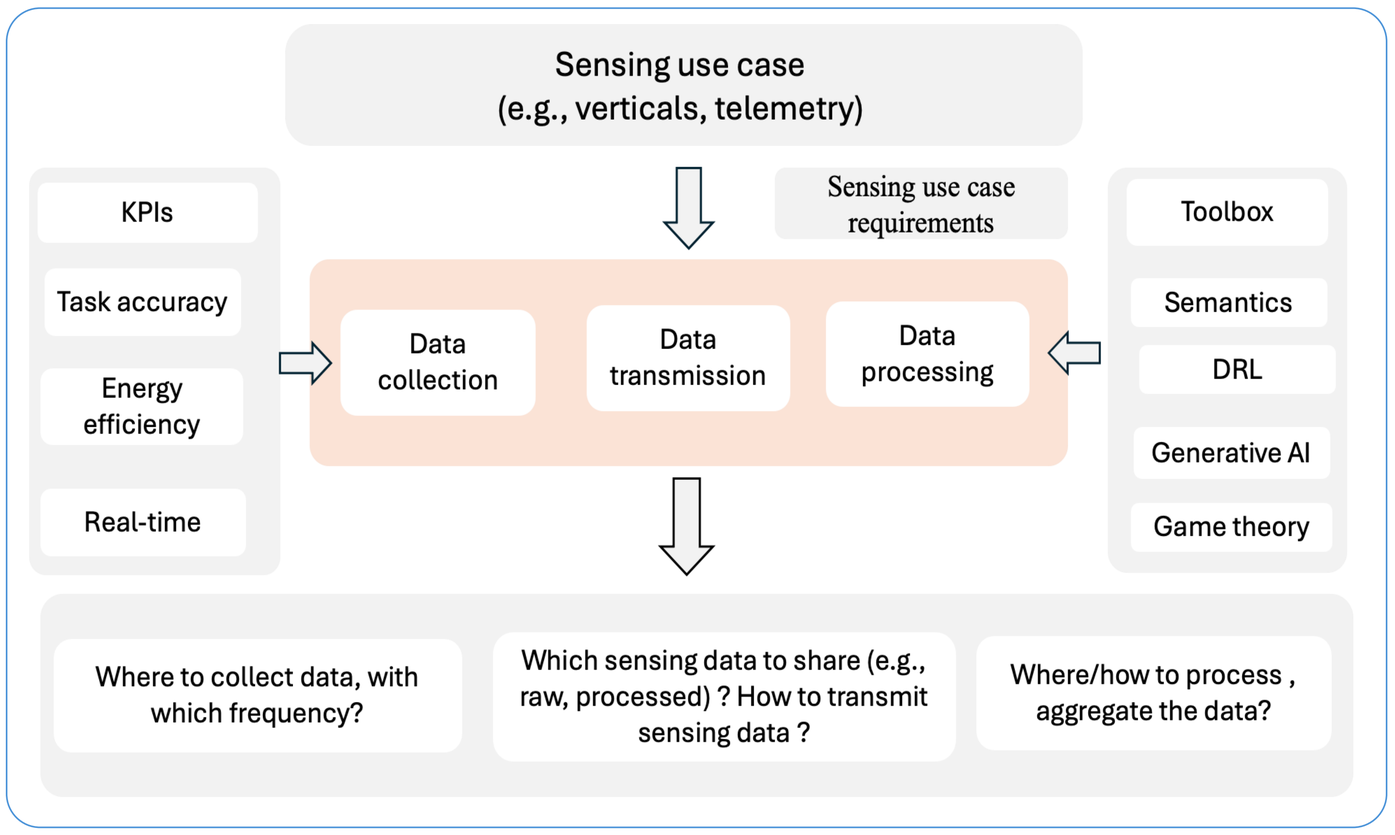

Figure 1: Intelligent sensing, communication and computing (ISCC) system.

Research Goal

To design intelligent sensing, communication and computing (ISCC) optimization strategies that are

- semantics-aware,
- energy-efficient,
- capable of adapting to network conditions

while meeting the requirements of 6G verticals, e.g., smart mobility and network telemetry.

Research Questions

Q1: How can semantics be integrated into ISCC resource optimization to minimize energy consumption while ensuring application-specific accuracy?

Q2. How can we make the solution adaptable to different device capabilities and network conditions for a specific application?

Q3: How can the proposed semantics-aware ISCC be extended to support multiple applications simultaneously?

Approach

- Incorporating semantics to reduce the sensory data volume and capture the insights between sensory data, service needs, and network resources.
- Combining semantics with deep reinforcement learning (DRL) for a 6G network to intelligently manage network resources and adapt to dynamic conditions.
- Introducing semantics-aware end-to-end (E2E) network slicing, which dynamically allocates tailored resources from source to destination, ensuring optimal performance for each application.

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