The Role of Freshness and Semantic Measures in the Transmission of Information for Next Generation Networks

Call for papers

To support the fast growth of IoT and cyber physical systems, as well as the advent of 6G, there is a need for communication and networking models that enable more efficient modes for machine-type communications. This calls for a departure from the assumptions of classical communication theoretic problem formulations as well as the traditional network layers. Recent research has shown, for example, the benefit of combining the process of data generation (sampling) and transport, by a departure from the classical model of exogenous data arrivals. Moreover, the value of joint source and channel coding with application-layer distortion criteria (e.g. how effectively a certain image is reproduced at the destination) has been demonstrated. This new communication paradigm is referred to as goal or task oriented communication, or in a broader sense, is part of the emerging area of semantic communications.

Over the past decade, there have been a number of approaches towards novel performance metrics, starting from measures of timeliness such as the Age of Information (AoI), Query Age of Information (QAoI), to those that capture goal oriented nature, tracking or control performance such as Quality of Information (QoI), Value of Information (VoI) and Age of Incorrect Information (AoII), moving toward to more sophisticated end-to-end distortion metrics (e.g. MSE), ML performance, or human perception of the reproduced data, and the application of finite-blocklength information theory in the context of the remote monitoring of stochastic processes, and real-time control.

We invite original papers that contribute to the fundamentals, as well as the applications of semantic metrics, and protocols that use them, in IoT or automation scenarios.
Topics of interest include, but are not limited to,

- Timing-accuracy tradeoffs in communication models
- Fundamental limits of timeliness in the finite blocklength regime
- Information freshness in random access
- Novel models and formulations of semantic communication
- Information-theoretic limits of rate-distortion-perception trade-off
- Joint source-channel coding for goal-oriented communications
- Data freshness for inference, estimation, and control
- Information-theoretic analysis of data freshness
- Random access and gossiping for freshness in dense networks
- Timeliness in computation and learning
- Coding for timely computation and control
- Timing aspects in consensus and distributed computation
- Novel approaches at the transport layer and above for data freshness
- Resource allocation and management with semantic objectives

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Important Dates:
Manuscript Due: February 2, 2023
First Review: May 4, 2023
Second Review: June 29, 2023
Acceptance Notification: July 20, 2023
Final Manuscripts to Publisher: August 8, 2023
Expected Publication Date: September 1, 2023

Submission Guidelines: The papers will be peer-reviewed according to standard IT Society peer review procedures. The reviewers will be selected from established researchers working in the areas covered by the submitted papers, including, but not limited to, the Age of Information, Communications for Networked Control Systems and stochastic control, Finite Blocklength Information Theory.Prospective authors should prepare their papers following regular submission guidelines of the IEEE Journal on Selected Areas in Information Theory (see https://www.itsoc.org/jsait/author-information).

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