From Information Freshness to Semantics of Information and Goal-oriented Communications

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Abstract—This tutorial will identify and discuss technical challenges and recent results related to task-oriented and semantics-aware communications for future wireless networks. The tutorial is mainly divided into two parts. In the first part, we will provide the motivation and discuss the current approaches towards semantics-aware goal-oriented communications, such as earlier studies that consider the age and value of information. Then, we will consider the topic beyond the age of information. We will present results on autonomous maintenance in real-time remote tracking and actuation, industrial IoT, semantic source coding, and autonomous systems. We will summarize the tutorial by providing a future outlook of task-oriented and semantics-aware communication and networks.