

RFCom 2025

The second international workshop on radio frequency (RF) computing

4 - 8 Nov, Hong Kong, China

<https://xkx-youcha.github.io/RFCom2025/>

Introduction

In recent years, we have witnessed the vigorous development of Internet of Things (IoT) technology and applications, in terms of sensing capabilities, connectivity performance, and data analysis. However, existing IoT technology is still far apart from the vision of ubiquitous sensing and trillion-node scale deployment, mainly due to the limited communication coverage, expensive deployment cost, and heavy power consumption. Radio frequency (RF) signals serve as the medium and carrier for information encoding and transmission from the digital space to the physical world. The ubiquitous RF signals possess rich information representation capabilities. The rapid advancements in communication technology, signal processing techniques, novel metamaterials, and electronic engineering drive the rapid progress of RF-centric IoT systems. The RF-based sensing and networking, including wireless sensing, backscatter communication, reconfigurable intelligence surface (RIS), cross-technology communication, etc., are research hotspots in the field of IoT.

RF computing is a new computing paradigm, which directly utilizes the RF signal as both the information carrier and the computation object within the RF space to achieve signal processing and transformation. For example, the RF computing device can manipulate the RF signal from the properties of amplitude, frequency, phase, propagation direction, and polarization characteristics, to accomplish the information injection, extraction, and modification. Compared with the purely digital computing, the RF computing is well-adapted to the RF signals' analog and continuous physical properties. By omitting or simplifying the frequent analog-to-digital conversion during the information process, the RF computing can significantly reduce power consumption, eliminate computational latency, and enhance computation efficiency. Moreover, the RF computing also expands the design space of IoT systems, making the programmable IoT systems possible.

Objectives: This workshop focuses on the research opportunities of RF computing in the field of IoT, spanning from foundational theories to RF resource management and comprehensive applications. First, we study the theory of RF computing that integrates digital and analog computations, including modeling the RF computing capability of analog devices, designing methods for edge devices with hybrid analog-digital functionalities, and developing signal processing techniques for hybrid analog-digital systems. Second, we investigate methods for generating and discovering RF resources, and customizing RF signals according to the diverse requirements of various IoT applications. Third, we also explore the fusion mechanism of sensing, transmission, and computation based on RF, unifying IoT functionalities into an RF-centric computing framework to optimize the utilization of spectrum and energy resources.

Submission Guidelines

Submissions should be previously unpublished and not currently under review by another conference or journal. Authors must adhere to the provided formatting guidelines, using the LaTeX styles found

"<https://www.acm.org/publications/proceedings-template>", and ensure that papers do not exceed 6 pages in length. It is important to note that ACM uses 9pt fonts in all conference proceedings, and the LaTeX style implicitly defines the font size to be 9pt. The submission system will be open prior to the submission deadline. All submitted papers will be subject to a rigorous double-blind review process, where the identities of the authors are withheld from the reviewers. Consequently, authors' names and affiliations must not appear anywhere in the paper or the PDF file to maintain the integrity of the review process. Accepted papers are required to be presented at the workshop, ensuring a high standard of contribution to the conference proceedings.

Submission Site: <https://rfcom25.hotcrp.com>

Topics

The goals of our workshop are summarized as follows:

- This workshop focuses on the fundamental problems in the area of RF computing. We anticipate exploring and envisioning the extensive research space of RF computing.
- We hope to unlock new capabilities and opportunities for IoT applications based on RF computing, enabling more efficient, flexible, and optimized systems.
- This workshop will bring together researchers and system developers from academia and industry, to share ideas and experiences related to RF computing for IoT.

Topics of interest include, but are not limited to:

- Modeling and computing theories for RF computing
- Low-power wireless protocols and designs for RF computing
- Backscatter communication
- Reconfigurable intelligence surface (RIS)
- Real-time tracking and localization for RF computing
- RF-centric energy harvesting and management methods and systems
- Efficient and low-power RF-based sensing and computing
- Resource-efficient machine learning on RF computing devices
- Crystal-free radio design and calibration techniques on RF computing systems
- Low-power cross-IoT protocols among RF computing devices
- Hardware design for the battery free device based on RF computing
- Hybrid analog and digital optimization based on RF computing
- Efficient signal processing techniques for RF computing systems
- Efficient RF resources generation and discovery methods
- RF signals customization adapted to diverse requirements of various IoT applications
- Fusion mechanism of sensing, transmission, and computation based on RF computing
- Spectrum optimization for RF computing systems
- Miniaturization of RF computing systems
- Performance evaluation and deployment experience of RF computing system

Important Dates

- Paper submission due: September 5th, 2025, 23:59 AOE
- Acceptance notification: October 5th, 2025, 23:59 AOE
- Camera-ready: October 20th, 2025, 23:59 AOE

Organization Committee

Workshop Co-Chairs:

- Yuan He
Tsinghua University
- Wei Wang
Wuhan University
- Haiming Jin
Shanghai Jiao Tong University
- Xiuzhen Guo
Zhejiang University