

PhD studentships in Collaborative Edge Computing

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As a newer concept than mobile cloud computing, edge computing supports the data processing and decision making at the network edge to reduce data transmission and latency. The proliferation of devices and data in Internet of Things (IoT) has motivated the use of edge computing for emerging applications like future factory, smart grid, and autonomous driving. To support these applications which need collaborations among components distributed in different geographical areas, collaborative edge computing has emerged as a new computing paradigm where the edges of multiple stakeholders are interconnected to facilitate the exchange of data and collaborations among the edge nodes.

A collaborative edge system has a hierarchical structure including a network of edge nodes and massive mobile end devices at the bottom layer. The related research in edge computing includes the architecture design, data or cache management, and application system design such as the media streaming. In this project, we focus on the following two research problems.

Task Partition and Migration

This problem is about how to process the application tasks over collaborative edge devices for achieving high performance in terms of execution time and reliability. The tasks are released by the end devices and then processed cooperatively by the end and edge nodes. Furthermore, during execution, the tasks can migrate among the edge nodes when the end devices move and/or edge nodes fail. We will study the problem of cooperative task partition and task migration.

Trust management

In collaborative edge computing, the end and edge nodes need to work together to process the tasks. So they must trust each other. Trust should be modelled as a decision process based on subjective and objective properties of both the trustor and trustee, measured by suitable parameters applicable to the chosen collaboration context. However there remains a lack of a well-defined trust management framework for applications based on collaborative edge computing.

In this project, we will develop a set of algorithms to partition, dispatch and schedule the tasks among end devices and the edge nodes. We will also develop trust management schemes covering trust models, trust decay and maturity, trust recommendations, and trust evaluation for collaborative edge computing system.

The supervisory team has research experience on relevant research problems (see the References). So the student will be able to work on this project with strong support.

References

- [1] Adewuyi, A. A., **Cheng, H.**, et al, SC-TRUST: A Dynamic Model for Trustworthy Service Composition in the Internet of Things, accepted by *IEEE Internet of Things Journal*, 26 July 2021.
- [2] Adewuyi, A. A., **Cheng, H.**, et al, CTRUST: A Dynamic Trust Model for Collaborative Applications in the Internet of Things, *IEEE Internet of Things Journal*, 6, 3, p. 5432 - 5445, June 2019.

[3] Yang, L., Cao, J., **Cheng, H.** & Ji, Y., Multi-user Computation Partitioning for Latency Sensitive Mobile Cloud Applications, *IEEE Transactions on Computers*, 64, 8, p. 2253-2266, 10 Jul 2015.

The studentship is **£xx,xxx** per annum for three years to start ASAP.

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