

LIST OF RESEARCHES

1. OptiFog: A Framework for Acquiring State Information and Predicting Resource Availability for Task Offloading in Cooperative Fog-Networks

June 2024 [IEEE Transactions on Services Computing](#)

- An optimized task offloading framework for time-sensitive computations
- Proposed a framework to determine the resource availability state of the fog network (global state of the system).
- A fog node selection scheme to meet specific latency requirements of a task.
- A continuous time Markov chain (CTMC)-based stochastic model to predict the resource availability status of a fog node.
- A comparative analysis of the proposed *OptiFog* scheme with similar existing schemes in terms of latency, network cost, and percentage of tasks executed at the cloud.
- This framework is for suitable fog node selection and to balance the load of the network.

2. RedgeX : Meta-learning based Optimal Analytical Model for Programmable Edge Intelligence

April 2024 [IEEE WCNC 2024](#)

- We introduce a meta-learning based analytical model generation technique for edge devices. The proposed approach involves making informed decisions by considering the states and resource availability of edge devices. It aims to optimize the selection of code snippets based on these factors. Once the optimal code snippets are identified, an analytical module is generated from them. This generated analytical module is then remotely deployed to the target edge device.
- We introduce a global-status driven model for edge computing and intelligence. Our approach employs an edge controller that regularly gathers status updates from edge devices, ensuring a current and comprehensive overview of resource availability across the network's nodes.

3. Analyzing the Suitability of IEEE 802.11ah for Next Generation Internet of Things: A Comparative Study

February 2024 [Ad Hoc Networks, Elsevier](#)

- Discussed the characteristics of communication technologies, different supported standards, and the essential requisite of an NGI architecture
- We compare the existing state-of-the-art communication standards

- Concerning the PHY and MAC layer features as provided by IEEE 802.11ah, this paper proposes an IEEE 802.11ah-based scalable NGI architecture
- An interfacing protocol between the layers is proposed to provide reliability by considering the optimal configuration parameters
- Compared to the other NGI architectures, this approach considers communication and connectivity solutions with recent features such as programmable, intelligence, and cognitive
- Open research issues, challenges, and future works of the proposed architecture are provided

4.SDN-based Re-configurable Edge Network Architecture for Industrial Internet of Things

2023 ([IEEE Internet of Things Journal](#))

- *REdge*, a programmable edge network to reconfigure different services associated with industrial applications and networks
- Re-configuring tasks and their associated network settings with the aid of SDN controller in Edge networks.
- Employs programmable layers at the edge for re-configuring the sensor/actuator network and applications.
- An interfacing protocol between the layers is proposed to provide reliability by considering the optimal configuration parameters

5.OptFog: Optimized Mobility-Aware Task Offloading and Migration Model for Fog Networks

December 2023 ([IEEE ANTS 2023](#))

- This work involves designing an offloading technique to handle mobility-aware end devices and communication range-limited fog nodes. We achieved significant improvements in minimizing migration latency and overall network usage, demonstrating the effectiveness of proactive migration strategies in fog-assisted networks
- We proposed a migration assistance model named *OptFog* for fog-assisted networks that utilizes machine learning (ML) models to predict mobile device locations and make proactive migration decisions.
- We evaluated three machine learning models - Decision Tree, Random Forest, and *k-NN* - for this purpose.
- We conducted a comparative analysis of *OptFog* and existing schemes in terms of performance metrics such as the number of handoffs, number of migrations, overall network usages, and migration latency.

6. Mobility-aware Task Offloading in Fog-Assisted Networks

December 2022 ([IEEE Globecom 2022](#))

- A mobility-aware task offloading framework that reduces the necessity of task migration as migration incurs additional cost such as network usage, latency, energy, etc.
- The proposed mechanism is simple, effective, and is not constrained by a device's location, thereby lowering the costs associated with mobility.
- Especially, the proposed scheme entirely eliminates the cost induced during migration, since effective task offloading can lessen the necessity to attempt task migrations.

7.L3Fog: Fog Node Selection and Task Offloading Framework for Mobile IoT

June 2022 ([IEEE INFOCOM Workshops 2022](#))

- A task offloading and migration scheme for mobile end users
- Prediction of end-users location is performed using Linear Regression based learning approach
- Target fog node selection is performed by mapping the fog nodes available near the predicted area and best fog node is chosen based on utility function

8. IEEE 802.11ah-Enabled Internet-of-Drone Architecture

March 2022 ([IEEE IoT Magazine](#))


- A network architecture for Internet-of-Drones to connect large number of drones with multi-hop facilities
- An IEEE 802.11ah based IoD architecture for surveillance and remote control
- Predicts the location of a drone and places the required association and channel access configuration to a relay node dynamically

9.ioFog: Prediction-based Fog Computing Architecture for Offline IoT

June 2021 ([IEEE IWCMC 2021](#))

- An offline fog architecture for achieving reliability and low latency in a large backbone network
- The solution uses a Markov chain-based task prediction model to offer dynamic service requirements with minimal dependency on the Internet
- Considers a central Fog Controller (FC) to (i) provide a global status overview and (ii) predict upcoming tasks of Fog Nodes for intelligent offloading decisions

10. Analysis of a Key-Escrow Free Multi-Signature Scheme

August 2017 

- Analyzed an existing key-escrow free multi-signature scheme that is formulated from bilinear pairings and blinding-binding technique.
- It is found that the sequential multi-signature scheme proposed by the authors does not actually follow the characteristics of an ideal sequential multi-signature scheme and thus leads to the inefficiency of the scheme.
- Moreover, the existing parallel multi-signature scheme is not verifiable.
- We modified both schemes and designed an efficient new sequential multi-signature and a parallel multi-signature scheme.

11. ID-SS: A New Identity-Based Short Signature Scheme

July 2018 

- Proposed ID-SS, a short signature scheme based on identity-based cryptography.
- Based on our assumption that the Computational Diffie-Hellman Problem (CDHP) is an ungovernable problem, we found that the proposed scheme is secure.
- Implementation and comparison of the proposed scheme with most related research have achieved satisfactory results.

12. Other projects

- Design, Analysis and Implementation of ID-Based Short Signature Scheme-2018
- Design, Analysis and Implementation of Pure Short Signature Schemes using Bilinear Pairing-2015
- Industrial Training at “Doordarshan Kendra, Guwahati”-2014
- Comparative Analysis of Elliptic Curve Cryptography with RSA”-2014