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Algorithm for Inferring User Activities from IoT Network Traffic

Recently, the surge in Internet-of-things (IoT) device deployment within smart homes has led to a large need for understanding user activities through the vast data generated by these devices. While studies have explored individual device behaviors and network traffic patterns, there remains a gap in leveraging this data collectively to infer and monitor user activities crucial for home safety and assisted living. For example, existing technologies have focused on individual device behaviors but lack the capability to holistically comprehend correlated events across multiple devices to infer user activities accurately. Understanding sequences of IoT device events triggered by user activities is essential, given the challenges posed by missing or out-of-order events due to device malfunctions and network latencies. This knowledge gap hampers effective home safety monitoring and creates a need for innovative systems capable of extracting meaningful insights from the diverse IoT network traffic.

Researchers at Arizona State University have developed an algorithm, IoTMosaic, that infers user activities from IoT network traffic in a smart home environment. IoTMosaic tackles the complexities of diverse IoT device interactions by first profiling user activities through sequences of IoT device events. By extracting sequences of IoT device events from network traffic, IoT creates distinct signatures for various activities. IoTMosaic also offers approximate matching algorithms that accommodate missing events and deliver precise inferences, creating a reliable system to understand user activities in smart home environments. To resolve any conflicts caused by multiple matches of different user activities which share overlapping device events, IoTMosaic employs a trimming algorithm. IoTMosaic's advantage lies in its ability to derive insights from collective IoT device interactions, enhancing home safety and assisted living monitoring capabilities beyond the limitations of existing solutions.

IoTMosaic was tested in a real-world smart home environment consisting of heterogeneous IoT devices with various functions in a two-bedroom apartment. The algorithm inferred 21 user activities with high accuracy, precision, and recall from the thousands of user activities collected during a two-month long period.

Related publication: [IoTMosaic: Inferring User Activities from IoT Network Traffic in Smart Homes](#)

Potential Applications:

- Smart Home Technology
- Security and Surveillance (e.g., home safety monitoring)
- Healthcare and Elderly Care (e.g., assisted living care)

Benefits and Advantages:

- Enhancing Home Safety
- Empowering Assisted Living
- Optimizing IoT Device Synergy