

A Scalable Framework for Sensor Data: Intra-Domain Transfer Learning in Wi-Fi Networks and Air Quality Monitoring

Thursday 4 December 2025 11:10 (12 minutes)

Large building and campus WiFi networks generate a huge amount of data from user activity and device counts. Working with data at this scale creates major challenges, as it becomes computationally expensive and slow to train models. To solve this, we propose using intra-domain transfer learning. Our method involves first training a model on one large, resource-rich WiFi dataset. We then adapt this pre-trained model to work with other, similar datasets, instead of building a new model from scratch each time.

This approach is highly efficient. Our results show that the transferred models perform nearly as accurately as custom-trained ones, but require significantly less time and CPU usage to get up and running. We frame this as a time-series forecasting problem for user counts. Finally, we explore how this method can bridge domains. By successfully transferring models between WiFi data and other sensor systems, like air quality monitors, we demonstrate a path toward creating resource-efficient and rapid-deployment solutions for a wide range of smart building applications.

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Session Classification: AI and air quality data analytics