Critically evaluate the rationale behind the Internet of Things (IOT), in the context of the article by Huxley et al (2020), highlighting the opportunities, limitations, risks and challenges associated with such a large-scale process of data collection.

Internet of Things (IoT) in Public Transportation

Introduction

The Internet of Things (IoT) refers to any electronic device which has internet connectivity capabilities to send or receive data (Huxley et al, 2020). The vast majority of individuals use at least one IoT device on a daily basis, and they can range from miniscule air quality sensors to sizeable robotic systems. IoT devices possess the capacity to collect huge volumes of data in real time.

IoT in Transportation

Within the transportation industry, IoT devices are used to obtain data which, after collection and analysis, provides transport operators with valuable information to determine vehicle maintenance schedules and route optimisation for better reliability and punctuality. Devices can monitor the condition and performance of vehicles over time; the data of which can be used to train machine learning (ML) models and implement a predictive maintenance system, preventing breakdowns and reducing the financial burden of extensive repairs.

Additionally, occupancy sensors installed within public transport vehicles monitor capacity levels in real time. Paired with sensors which record traffic conditions and the location of vehicles, operators use this data to design routes, and allocate the optimal number of vehicles and staff per route (Mazur, 2024).

Limitations and Risks of IoT

As the size and scope of IoT increases in line with the growing demands of data, more IoT devices such as sensors will be used to match this. More devices will result in more difficulty when troubleshooting issues that arise, making it harder to diagnose specific issues with data collection (Rahmani, Bayramov and Kiani Kalejahi, 2022).

The sizeable volume of data that IoT collects makes robust security protocols a necessity. Certain preventative measures can be implemented to reduce the impact of a data breach, such as anonymising data to preserve confidentiality, however these protocols should be at the forefront of any widescale adoption of IoT as a means of collecting data.

Conclusion

Despite the opportunities associated with using IoT to improve the quality of public services provided to citizens, data scientists should balance these opportunities against the risks and drawbacks of the technology to reliably use this technology as a data collection method.

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