

A Deep Learning Model for Natural Language Querying in Cyber-Physical Systems*

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Abstract. As a result of technological advancements, the number of IoT devices and services is rapidly increasing. Due to the increasing complexity of IoT devices and the various ways they can operate and communicate, finding a specific device can be challenging because of the complex tasks they can perform. To help find devices in a timely and efficient manner, in environments where the user may not know what devices are available or how to access them, we propose a recommender system using deep learning for matching user queries in the form of a natural language sentence with Web of Things (WoT) devices or services. The Transformer, a recent attention-based algorithm that gets superior results for natural language problems, is used for the deep learning model. Our study shows that the Transformer can be a recommendation tool for finding relevant WoT devices in Cyber-Physical Systems (CPSs). With hashing as an encoding technique, the proposed model returns the relevant devices with a high grade of confidence. After experimentation, the proposed model is validated by comparing it with our current search system, and the results are discussed. The work can potentially impact real-world application scenarios when many different devices are involved.

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