The \*\*nobility\*\* and \*\*dataset\*\* of the third paper, "Outdoor Fingerprinting Localization Using Sigfox," can be summarized as follows:

### Nobility of the Paper:

1. \*\*Advancing Outdoor Localization\*\*: The paper extends fingerprinting techniques, which are widely used in indoor environments, to outdoor settings using Sigfox, a low-power wide-area network (LPWAN) technology. This is notable because outdoor localization typically relies on more power-intensive technologies like GPS.

2. \*\*Energy Efficiency\*\*: By leveraging Sigfox for localization, the paper addresses the challenge of reducing power consumption for IoT devices. Sigfox offers a more energy-efficient solution for localization compared to traditional methods like GPS.

3. \*\*Extensive Analysis\*\*: The research evaluates 31 different distance functions and four representations of RSS (Received Signal Strength) data, providing a comprehensive analysis of the factors affecting the accuracy of outdoor localization.

4. \*\*Real-World Application\*\*: The study uses a real Sigfox dataset collected from the city center of Antwerp, Belgium, making the findings highly relevant for real-world urban deployments of IoT devices.

### Dataset:

The dataset used in this paper consists of \*\*14,378 Sigfox messages\*\* collected in the city center of Antwerp, Belgium. Key features include:

1. \*\*Data Collection\*\*: The dataset was collected using Sigfox devices mounted on 20 cars of the Belgian postal services, which traveled throughout the city center. Each device transmitted GPS coordinates and RSSI values from nearby Sigfox base stations every 12 minutes.

2. \*\*Structure\*\*: The dataset includes columns representing the Sigfox base stations and the corresponding RSSI values. If a base station did not receive a message, an out-of-range value of -200 dBm was recorded. Additionally, the dataset contains GPS coordinates for the location of the transmitting device.

3. \*\*Training and Testing\*\*: The dataset was divided into a training set (70%), evaluation set (15%), and test set (15%). This allowed the authors to test different fingerprinting algorithms and distance functions for optimal localization accuracy.

The paper's \*\*nobility\*\* lies in its contribution to enhancing the accuracy and energy efficiency of outdoor IoT localization using Sigfox, while the \*\*dataset\*\* provides a real-world basis for evaluating and refining the proposed methods.