Machine Learning-Based Methods for Force Mapping With an Optical Fiber Sensing System

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Abstract
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Macro-bend sensors multiplexed in a single optical fiber can allow different systems to operate in quasi-distributed tactile sensing. This work uses a pressure-sensitive platform instrumented with five macro-bend sensors divided into 16 sensing regions. The sensing system was tested with the simultaneous positioning of different loads (0.5 and 2.4 kg) on 2 of the 16 sensing areas. The dataset contains 240 samples related to the randomly chosen load configurations. Each sample is the light transmitted in the 400–850 nm spectral range measured with steps of 0.27 nm. Three classification models were used to obtain the best results for the location of the masses: support vector machine (SVM), deep neural network, and random convolutional Kernel transform, achieving F1-Score above 93% for the SVM model.