


Abstract

Analysis of Textile Electrode Fabrication for Digestive Health Using Explainable Artificial Intelligence [†]

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Abstract: In recent days, a digestive abnormality is common due to modern life-style and food habits followed. For every ten adults in the world, four suffer from functional gastrointestinal (GI) disorders of varying severity. Further, this is demonstrated by a study of more than 73,000 people across 33 countries. Also, the subjects who have undergone surgery/medication may feel healthy and they cannot feel or realize the internal health disorders, resulting in severe consequences. In this regard, an electrogastrogram (EGG) has gained more significance since it is non-invasive and involves an easy process for screening digestive abnormalities. EGGs are electrical signals, which have strong association with digestion. Also, the EGG can be recorded using non-invasive/surface electrodes. In this work, two different conductive textile materials, namely stainless-steel fibers and Copper–Nickel-plated nylon, are utilised to fabricate non-invasive electrodes. Further, the developed electrodes are placed on the abdomen over the stomach and the EGG signals are acquired from healthy individuals. Also, various time and frequency domain features are extracted from two different EGG signals acquired using developed electrodes with different materials and are analysed. Additionally, the XAI, namely Shapley Additive Explanation (SHAP), technique is utilised to analyse and test the efficacy of the developed textile-based electrodes and to select the best electrode for EGG signal acquisition. This work appears to be highly significant since the developed electrode selected using the XAI tool shall possess a wide scope in wearable applications.

Keywords: conductive thread; digestive health; electrogastrograms; explainable artificial intelligence; textile electrodes; wearable device



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