Learning Inertial-based Activity Recognition with Transformers

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Activity recognition problems such as human activity recognition (HAR) and smartphone location recognition (SLR) were shown to improve the accuracy of different navigation tasks, which rely solely on inertial sensors. Current learning-based approaches for activity recognition from inertial data employ convolutional neural networks (CNNs) or long short term memory (LSTM) architectures. Recently, Transformers were shown to outperform these architectures for sequence analysis tasks. Here, we test the potential advantage of attention and Transformers for aggregating IMU signals. Inspired by Transformer models for natural language processing (NLP) tasks, such as sentence classification, we present a general Transformer-based framework for learning inertial-based activity recognition problems (Fig. 1). We evaluate our approach on different user activity scenarios with varying difficulty using several datasets, collected by a total of 91 users with over 27 hours of recorded data. Our proposed architecture consistently achieves better accuracy and generalizes better across all examined datasets and scenarios.

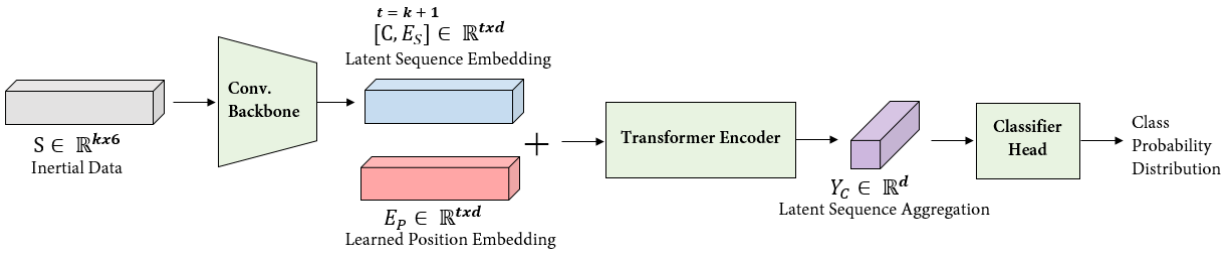

Fig. 1: Our proposed framework for inertial-based activity recognition with Transformers.

References

[1] Shavit, Yoli, and Itzik Klein. Boosting Inertial-Based Human Activity Recognition with Transformers. IEEE Access 9 (2021): 53540-53547.