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Integrating Anthropometric and Pressure Time-Series Data to predict Passenger Discomfort

Passenger discomfort during flight is greatly influenced by seat interface pressure whose effect varies with time of exposure and passenger anthropometric characteristics.
Existing studies have largely explored static relationships between anthropometric features, seat-interface pressure, and discomfort perception without leveraging these findings for building predictive systems for passenger discomfort and failing to account for the temporal dynamics of pressure exposure.
To address this limitation, our study proposes a predictive framework for discomfort based on Time Series Classification (TSC) algorithms and fusion strategies to combine temporal pressure data with static passenger anthropometric features (gender, age, height, weight, BMI).
Ten multivariate TSC algorithms have been evaluated under three different strategies for fusing anthropometric data with time series inputs: (1) embedding static features as additional artificial timesteps; (2) extracting statistical features from the temporal data, so that the extracted features can be directly combined with static features at the final transformation stage; (3) replicating static features across all timesteps (i.e., repeated static approach), allowing them to be treated as parallel channels during sequence processing.
The performance of the predictive strategies under comparison has been evaluated using a real dataset containing seat pressure time series and subjective discomfort ratings collected during 123 laboratory test sessions. Experimental results highlight the relevance of integrating passenger anthropometric features to temporal seat pressure for enhancing seat discomfort prediction. The repeated static approach leads to significant improvements in predictive performance across all TSC algorithms increasing accuracy up to 32%.

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Special/ Invited session

Classification

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