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1. Summary

1.1 Motivation

Campus bullying is a prevalent issue with serious consequences for victims' mental and physical well-being. However, fear often prevents victims from reporting these incidents, leading to the need for effective automatic detection methods.

1.2 Contribution

This report explores a novel method for automatically detecting physical bullying using sensor data collected from smartphones. This approach offers a convenient and potentially impactful solution to address the challenges associated with manual reporting.

1.3 Methodology

The study involved the following steps:

1. Data collection: Sensor data from five typical bullying actions and six typical non-bullying actions was collected using smartphones.
2. Feature extraction: 57-dimensional features, including statistical features in the time and frequency domains, were extracted from the collected data.
3. Feature selection: The relief-f algorithm was employed to select the most relevant features, reducing the dimensionality to 24.
4. Dimensionality reduction: Principal component analysis (PCA) further reduced the dimensionality to four key features.
5. Classification: A k-nearest neighbors (k-NN) classifier was trained to distinguish between bullying and non-bullying actions based on the extracted features.

1.4 Conclusion

The k-NN classifier achieved an impressive average accuracy exceeding 80%, demonstrating the effectiveness of the proposed method. The high recognition accuracy for both bullying (84.13%) and non-bullying (76.92%) actions further strengthens the potential of this approach for real-world applications.

2. Limitations

The study acknowledges limitations such as:

- Sample size: The relatively small sample size of 299 participants warrants further validation with larger datasets.
- Focus on physical bullying: Future research should explore the applicability of the method to other forms of bullying.

3. Synthesis

This research presents a promising solution for automatically detecting physical bullying on school campuses. By leveraging smartphone sensors and machine learning techniques, this approach offers a non-intrusive and potentially scalable solution to address this critical issue. Further research addressing the identified limitations and exploring integration with existing reporting systems will be crucial for maximizing the impact of this technology in combating campus bullying.