

# **Human Motion Pattern Recognition Based on Nano-sensor and Deep Learning.**

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# Introduction

## **Importance of Human Motion Recognition:**

- Discuss the pivotal role of human motion pattern recognition in healthcare, security, and virtual reality.
- Emphasize the growing need for accurate recognition as technology advances.

## **Technology Enablers: Nano-sensors and Deep Learning:**

- Highlight MEMS Nano-sensors as precision enablers for capturing human motion data.
- Explain how deep learning provides a robust framework for processing complex patterns.

## **Promise of Amalgamation:**

- Express the potential of combining Nano-sensors and deep learning for highly accurate motion pattern recognition.

# Problem Statement

O1

## Inherent Accuracy Challenges:

- Delve into the complexities of human motion and the challenges in achieving high accuracy in recognition algorithms.
- Discuss the profound repercussions of inaccurate data on subsequent pattern recognition.

O2

## Importance of Noise Reduction:

- Explain the impact of noise in collected motion data and its significance in enhancing the robustness of recognition algorithms.

O3

## Significance of Addressing Challenges:

- Stress the importance of understanding and addressing these challenges for advancing the accuracy and reliability of motion recognition systems.

# Methodology

## Role of MEMS Nano-sensors:

- Explore how MEMS Nano-sensors, with angular velocity and acceleration sensors, provide real-time, wearable solutions for capturing precise human motion data.
- Highlight the optimal location of these sensors on the waist for capturing a comprehensive range of motion patterns.

## Feature Extraction Process:

- Explain the intricate feature extraction process, isolating key aspects such as mean value, skewness, peak value, variance, and interquartile spacing.
- Emphasize how these features serve as distinctive inputs for the subsequent deep learning model.

## Deep LSTM Recognition Model:

- Discuss the construction of the deep Long Short-Term Memory (LSTM) recognition model, designed to process and analyze the fused features.
- Highlight the suitability of LSTM for human motion pattern recognition due to its ability to retain and learn patterns over extended sequences.

# Algorithm Performance

## Results

### Impressive Accuracy Metrics:

- Showcase the algorithm's 97% accuracy in human motion data acquisition and an average accuracy of 94.8% in recognizing various motion patterns.
- Emphasize the instrumental role of high accuracy in ensuring the reliability of results in real-world applications.

### Additional Metrics:

Explore recall at 89.7%, an F1 score of 0.88, and a swift recognition time of 63ms as additional metrics highlighting the robustness and efficiency of the algorithm.

# Applications

## 1. Versatility in Multi-Target Tracking and Attitude Estimation:

- Highlight how the algorithm extends its utility beyond pattern recognition, finding applications in multi-target tracking and attitude estimation.
- Emphasize versatility as a key strength, making it applicable to a spectrum of scenarios.

## 2. Broader Relevance in Motion Recognition:

- Discuss the algorithm's broader relevance in motion recognition across diverse real-world scenarios, from healthcare to security.

# Existing Gaps

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## Acknowledgment of Existing Gaps:

- Acknowledge the existing gaps in current understanding of human motion pattern recognition.
- Highlight the importance of identifying these gaps as the first step toward continuous improvement.

## Strategies for Dealing with Challenges:

- Discuss ongoing strategies to overcome challenges, especially in handling small datasets and reducing computational complexity.
  - Emphasize the commitment to addressing these challenges, underscoring dedication to continuous improvement.
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# Future Research

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## 1. Call for Further Research:

- Issue a strong call to action for future research endeavors in the field of human motion pattern recognition.
- Highlight the importance of expanding testing to include additional types of motion patterns for a comprehensive understanding.

## 2. Enhancing Practical Application:

- Outline strategies for enhancing the practical application performance of the algorithm.
- Encourage researchers to contribute to the ongoing evolution of motion pattern recognition.

# Conclusion

## Findings Recap:

- Succinctly summarize the key findings, including the algorithm's successes and potential implications in the broader context of motion pattern recognition.
- Emphasize that the journey doesn't end here but transforms into new avenues of discovery and refinement.

THANK  
YOU