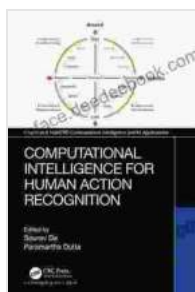


Computational Intelligence for Human Action Recognition: Techniques and Applications

Human action recognition (HAR) is a challenging task in computer vision, with applications in various domains such as video surveillance, human-computer interaction, and sports analysis. Computational intelligence (CI) techniques, including machine learning and deep learning, have shown promising results in HAR due to their ability to learn complex patterns from data. This article provides a comprehensive overview of CI techniques for HAR, discussing the latest advances, challenges, and future directions.



Computational Intelligence for Human Action Recognition (Chapman & Hall/CRC Computational Intelligence and Its Applications) by Sourav De

★★★★☆ 4.6 out of 5

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Techniques

CI techniques for HAR can be broadly categorized into two main approaches:

- **Traditional machine learning:** These methods, such as support vector machines (SVMs), random forests, and decision trees, rely on handcrafted features extracted from the input data. They are typically

fast and computationally efficient, but their performance can be limited by the quality of the features.

- **Deep learning:** Deep learning models, such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and transformers, learn features directly from the raw input data. They have achieved state-of-the-art results in HAR due to their ability to capture complex spatial and temporal patterns.

Applications

CI techniques for HAR have a wide range of applications, including:

- **Video surveillance:** Detecting and classifying human actions in video sequences for security and monitoring purposes.
- **Human-computer interaction:** Enabling natural and intuitive interaction between humans and computers through gesture and body language recognition.
- **Sports analysis:** Quantifying and evaluating athlete performance by analyzing video footage of their movements.
- **Healthcare:** Monitoring and assessing human movement for medical diagnosis and rehabilitation.

Challenges

Despite the significant progress in CI for HAR, several challenges remain to be addressed:

- **Data variability:** Human actions can vary significantly in appearance, context, and background, making it difficult for models to generalize

and perform well across different datasets.

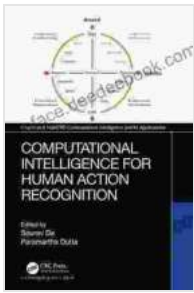
- **Real-time processing:** Many HAR applications require real-time or near-real-time processing, which can be challenging for computationally intensive models.
- **Cross-view and multi-view recognition:** HAR systems need to be able to recognize actions from different viewpoints and under different lighting conditions.

Future Directions

The field of CI for HAR is rapidly evolving, with several promising research directions for future exploration:

- **Multimodal HAR:** Combining data from multiple sensors, such as RGB cameras, depth cameras, and inertial sensors, to improve HAR accuracy and robustness.
- **Unsupervised and semi-supervised learning:** Developing HAR models that can learn from unlabeled or partially labeled data, reducing the need for manual annotation.
- **Explainable AI:** Making HAR models more interpretable and explainable, allowing users to understand the basis for their decisions.

CI techniques have revolutionized HAR, enabling the development of powerful and versatile systems that can recognize human actions from complex and challenging data. As research continues in this field, we can expect further advancements in accuracy, efficiency, and applicability, opening up new possibilities for a wide range of applications.



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