Research topics for graduate students for 2024

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Department of Mechanical Engineering

Acceptable course(s)

- Master's Degree
- Doctoral Degree

Research Topics

The focus of the research is to use advanced technologies such as wearable sensors, AI, VR and computer vision for sports and rehabilitation analysis. The goal is to develop practical solutions that enhance physical training, rehabilitation, and senior health.



1. AI-Based Visualization for Sports and Rehabilitation

This research develops AI-based tools to analyze sports and rehabilitation exercises with inertial measurement units and force plates. The goal is to provide real-time feedback and performance insights to optimize training and recovery.

2. Dynamic Difficulty Adjustment in VR for Rehabilitation

This study uses VR for rehabilitation, incorporating dynamic difficulty adjustment to adjust exercises to individual needs. The goal is to improve patient engagement and recovery through immersive and adaptive VR experiences.

3. Pose Estimation Using Computer Vision for Elderly Care

This research uses pose estimation from RGB cameras to assess body kinematics to monitor and improve the wellbeing of elderly. The goal is to track and evaluate movement patterns to develop systems that detect changes, thus supporting more effective care strategies.

Articles Related to Research Topics

 [1] Kamikokuryo, K., Haga, T., Venture, G., Hernandez, V., 2022. Adversarial Autoencoder and Multi-Armed Bandit for Dynamic Difficulty Adjustment in Immersive Virtual Reality for Rehabilitation: Application to Hand Movement. Sensors 22, 4499 - https://doi.org/10.3390/s22124499

[2] Hernandez, V., Dadkhah, D., Babakeshizadeh, V., Kulić, D., 2021. Lower body kinematics estimation from wearable sensors for walking and running: A deep learning approach. Gait & Posture 83, 185–193 - https://doi.org/10.1016/j.gaitpost.2020.10.026

[3] Hernandez, V., Kulić, D., Venture, G., 2020. Adversarial autoencoder for visualization and classification of human activity: Application to a low-cost commercial force plate. Journal of Biomechanics 103 - https://doi.org/10.1016/j.jbiomech.2020.109684

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