National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: Development of Human Gait Recognition Techniques under Covariate Conditions for Surveillance Systems
Speaker	: Sonia Das (Rollno : 513ec1001)
Supervisor	: Sukadev Meher
Venue	: Room No.: EC-303 (Seminar Hall of EC Department)
Date and Time	: 27 May 2025 (4:00 PM)
Abstract	: Gait recognition has emerged as a critical area of research in artificial intelligence and computer vision due to its non-intrusive, contactless, and unobtrusive characteristics. However, recognition performance is often hindered by various covariates such as changes in view angles, clothing, walking speed, carried objects, and individual health conditions. This research presents a unified framework to address these challenges through innovative techniques applied to both vision-based and sensor-based gait recognition systems. For vision-based approaches, a novel feature selection method is introduced, combining outlier detection with structural relationship analysis to identify and preserve discriminative features while filtering out covariate-sensitive information. A frequency-domain-based **Gait Covariate Invariant GAN (GCI-GAN)** is also developed, enhancing robustness by focusing on invariant frequency features and employing attention mechanisms to emphasize relevant gait regions. The method dynamically adjusts identity thresholds based on gait quality assessment, improving both identification and authentication accuracy. To further tackle covariate effects, a **Domain-Invariant Graph Convolutional Network (DiGCN)** is proposed. DiGCN models spatial-temporal dependencies using multi-hop graph transformations and integrates attention to focus on informative body part motions. This structure preserves local features and supports domain-invariant learning through joint optimization of features and graph structure. On the sensor-based side, a **Weighted Multi-scale Deep Ensemble CNN (WMsCNN)** is designed to process gait signals across multiple temporal resolutions efficiently. An adaptive pruning strategy reduces redundancy while retaining essential components. Additionally, a Multi-Kernel Temporal CNN with **Regularized Channel Attention (ReChAtt)** addresses overfitting and enhances generalization. All methods are validated on benchmark gait datasets, demonstrating superior performance and adaptive to covariate variations compared to existing state-of-the-art techniques.