National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Non-linear Energy Operator and Multisynchrosqueezing Transform aided Multi-stage Anxiety Detection from ECG Signals.
Speaker	: Dr. Saptarshi Chatterjee
Supervisor	: Dr. Saptarshi Chatterjee
Venue	: EC303, Seminar Room
Date and Time	: 03 Sep 2025 (05.15PM)
Abstract	: This paper presents a distinctive and robust framework for the automatic diagnosis of anxiety levels from single-channel ECG signals acquired using wearable ECG sensors, for accurate mental health monitoring and timely interventions. This work reports on a nonlinear energy operator-based R-peak detection technique with timefrequency analysis via the Iterative Multisynchrosqueezing Transform (I-MSST). R-peak detection provides precise extraction of heart rate variability (HRV) features, whereas the I-MSST offers an energy-focused time-frequency representation that depicts subtle, nonstationary features of the ECG signal at various anxiety states. Handcrafted features, combining statistical, entropy-based, and fractal features, are extracted and used to categorize four distinctive levels as normal controlled subject, light, moderate, and severe anxiety. The accuracy of 98.36% is achieved for both the XGBoost and random forest (RF) Classifiers.