भारतीय प्रौद्योगिकी संस्थान तिरुपति
TIRUPATI

**INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI**
भारतीय प्रौद्योगिकी संस्थान तिरुपति
Yerpedu-Venkatagiri Road, Yerpedu Post, Tirupati District, Andhra Pradesh - 517 619

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| 1. | Title of the course | Machine Learning for Signal Inference Laboratory |
| 2. | Course number | EE568P |
| 3. | Structure of credits (L-T-P-C) | 0-0-3-2 |
| 4. | New course/modification to | New |
| 5. | To be offered by | Electrical Engineering |
| 6. | Proposed by | Gorti R K S S Manyam |
| 7. | Prerequisite | CoT |
| 8. | **Course Objective(s):** To introduce practical implementations of basic signal inference, machine learning and machine learning-based signal inference methods. | |
| 9. | **Course Content:** Signal representation in the time domain: histogram, linear prediction coefficients (LPC); Signal representation in the frequency domain: one-dimensional and two-dimensional short time fourier transform (STFT), mel-frequency cepstral coefficients (MFCC) for audio/speech signals; Shape/view/intensity invariant feature extraction: edge representation, histogram of orientation gradients (HoG) for images, LPC/MFCC for audio signals; Building machine learning models: learning a neuron for binary classification, building a neural network (NN) model for multiclass classification and training with mean square error (MSE) loss for regression and cross-entropy (CE) loss for classification, understanding of hyperparameter tuning and cross-validation experiments; Signal inference with machine learning: developing an NN model for speaker recognition and digit classification tasks; Development of a convolution neural network (CNN) for image segmentation and denoising tasks. | |
| 10. | **Textbook(s):**<br>1. Deller J R, Hansen J H L and Proakis J G, Discrete-Time Processing of Speech Signals, IEEE Press (2000).<br>2. Duda R O, Hart P E and Stork D G, Pattern Classification, 2nd Edition, John Wiley and Sons Inc. (2007). | |
| 11. | **Reference(s):**<br>1. Gonzalez R C, Woods R E and Eddins S L, Digital Image Processing using MATLAB, 2nd Edition, McGraw Hill Education (2017).<br>2. Solem J E, Programming Computer Vision with Python: Tools and Algorithms for Analyzing Images, O'Reilly Media (2012).<br>3. Manaswi N K, Deep Learning with Applications using Python: Chatbots and Face, Object, and Speech Recognition with TensorFlow and Keras, Apress (2018). | |