**Foundation for Scientific Research & Technological Innovation (FSRTI)**

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**Title: Advanced Machine Learning**

If you want to break into cutting-edge technologies, this course will help you do so. Machine learning has made dramatic improvements in the past few years. Machine Learning (ML) has evolved to mimic the pattern-matching that human brains perform. Today, algorithms teach computers to recognize features of an object of real-world entities. Algorithms for teaching a machine to complete tasks and classify like a human date back several decades. The difference between now and when the models were first invented is that the more information is fed into the algorithms, the more accurate they become. The past few decades have seen massive scalability of data and information, allowing for much more accurate predictions than were ever possible in the long history of machine learning. However, ML can be an incredibly beneficial techniques to uncover hidden insights and predict future trends.

This course is part of the upcoming Advanced Machine Learning and you will learn advanced techniques and will explore the major technology trends for real-world problems. You understand the key parameters in a neural network’s architecture, and you will know the implementation of an efficient neural networks. You will know the Simulation of the CNN Dynamics and Nonlinear Dynamics and Complete Stability. Lastly, thiscourse will teach you best practices for using TensorFlow, a popular open-source framework for machine learning.

**COURSE CONTENT**

**Module-1: Introduction to Neural Networks – Foundations and Models**

Learn the fundamentals concepts of neural networks and understand the various parameters in a neural network’s architecture. You will know how set up a machine learning problem with a neural network.

**Module-2: Convolutional Neural Networks with Python**

Learn about fundamental of convolution neural networks and understand the architecture of convolutional neural networks (CNNs). You will experience on implementation a CNN in Tensorflow.

**Module-3: Advanced Machine Learning with TensorFlow**

Learn about the advanced machine learning algorithms with Google Cloud Platform using Tensorflow.

**Module-4: Cellular Neural Networks(CNN): Characteristics, Analysis and Simulation of Dynamics**

Learn the basic characteristics and analysis of simple CNN, integration of the standard CNN, software simulation, analog CNN implementations, scaling the signals and discrete-time CNN.

**Module-5: Nonlinear Dynamics and Complete Stability**

Learn about the oscillatory CNN with only two cells, a chaotic CNN with only two cellsand one sinusoidal input, stability of some sign antisymmetric CNNs.

**Entry level minimum requirements: Knowledge of the content of the first Course in**  Machine Learning.

**Suggested Reading Material:**

1. An introduction to neural networks.Anderson, James A. MIT press, 1995.
2. Cellular neural networks and visual computing: foundations and applications. Chua, Leon O., and Tamas Roska. Cambridge university press, 2002.
3. Deep Learning with TensorFlow: Explore neural networks and build intelligent systems with Python. Zaccone, Giancarlo, and Md Rezaul Karim. Packt Publishing Ltd, 2018.
4. Practical Convolutional Neural Networks: Implement Advanced Deep Learning Models Using Python. Sewak, Mohit, Md Rezaul Karim, and Pradeep Pujari, Packt Publishing Ltd, 2018.
5. Python Deep Learning: Exploring deep learning techniques and neural network architectures with Pytorch, Keras, and TensorFlow. Vasilev, Ivan, Daniel Slater, GianmarioSpacagna, Peter Roelants, and Valentino Zocca. Packt Publishing Ltd, 2019.
6. Hands-on Convolutional Neural Networks with TensorFlow: Solve Computer Vision Problems with Modeling in TensorFlow and Python. Zafar, Iffat, GiounonaTzanidou, Richard Burton, Nimesh Patel, and Leonardo Araujo. Packt Publishing Ltd, 2018.
7. Learning OpenCV: Computer vision with the OpenCV library. Bradski, Gary, and Adrian Kaehler. " O'Reilly Media, Inc.", 2008.
8. Learning OpenCV 3 Computer Vision with Python. Minichino, Joe, and Joseph Howse. Packt Publishing Ltd, 2015.

**Instruction Duration : 3 hrs /Week**

**Total Duration : 16 weeks**

**Fee Chargeable : INR 10000 for students from India US$ 200 for students of other countries**