UNIVERSITY OF ENGINEERING AND MANAGEMENT, KOLKATA

In association with

COMPUTER SOCIETY OF INDIA (CSI)

AND

THE INSTITUTION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERS (IETE)

PRESENTS

2024 SUMMER SCHOOL ON

Exploring Reinforcement, Generative AI, and Deep Learning with Python

Duration: 24th June to 7th July

Days: Monday to Sunday

Time: TBA

Course Fees: INR 3000 + 18% GST

Offered by: IEDC of the Department of CSE (AI & ML)

Instruction Mode: Online

Last Date of Registration: 15th June, 2024

Open Seats: 50

USP of the Course

The "Exploring Reinforcement, Generative, and Deep Learning with Python" course lies in its combination of two cutting-edge fields within artificial intelligence (AI) and its focus on practical implementation using the Python programming language. Here are some key aspects:

I.   Integration of Reinforcement Learning and Deep Learning: Reinforcement learning (RL) and deep learning (DL) are both powerful subfields of AI with distinct approaches. This course offers a unique perspective by integrating these two methodologies, showcasing how they can complement each other in solving complex problems.

II.   Hands-on Approach: The course emphasizes hands-on learning by providing practical exercises, projects, and coding assignments. Students get to work on real-world examples, implementing

algorithms, and experimenting with models, which enhances their understanding and proficiency in both RL and DL techniques.

III. Python as the Programming Language: Python has become the de facto language for AI and machine learning due to its simplicity, versatility, and extensive libraries such as TensorFlow, PyTorch, and OpenAI Gym. By using Python throughout the course, students gain practical skills that are highly relevant to the industry.

IV. Focus on Applications: Instead of solely focusing on theoretical concepts, this course prioritizes the application of RL and DL in various domains such as robotics, gaming, finance, healthcare, and more. Students learn how to leverage these techniques to solve real-world problems and gain insights into their potential applications across industries.

V. Expert Guidance and Resources: The course is led by experienced instructors who are experts in both RL and DL. They provide comprehensive guidance, curated resources, and personalized feedback to help students navigate through complex concepts and ensure their success in mastering these advanced techniques.

VI. Community and Collaboration: The course fosters a collaborative learning environment where students can interact with peers, share insights, and collaborate on projects. This collaborative approach not only enhances the learning experience but also prepares students for teamwork and collaboration in professional settings.

By highlighting these aspects, the course establishes itself as a comprehensive and practical learning experience that equips students with the knowledge, skills, and confidence to excel in the fields of reinforcement and deep learning using Python. Join us this summer and take the first step towards a rewarding career in one of the most in-demand industries of the 21st century.

Prerequisite: Basic Knowledge in Machine Learning, and Python Programming.

Course Summary: Introduction and Course Overview, Foundations of Deep Learning, Advanced Deep Learning Techniques, Reinforcement Learning Fundamentals, Deep Reinforcement Learning, Generative AI/ Learning, and Final Project.

Duration: 24 Hours

Hour 1: Introduction and Course Overview

➢ Digital to Physical Intelligence

Hour 2-4: Foundations of Deep Learning

➢ Neural networks architecture, TensorFlow and Keras introduction
➢ Hands on: Building and training basic neural networks
➢ Hands on: Convolutional Neural Networks (CNNs)
➢ Homework (As per the requirement)

Hour 5-8: Advanced Deep Learning Techniques

- ➢ Recurrent Neural Networks (RNNs) for sequential data
- ➢ Transfer learning
- ➢ Hands on: Fine-tuning pre-trained models
- ➢ Overfitting and regularization methods
- ➢ Homework (As per the requirement)

Hour 9-12: Reinforcement Learning Fundamentals

- ➢ Introduction to reinforcement learning (RL), Markov Decision Processes (MDPs)
- ➢ Dynamic Programming for solving RL problems
- ➢ Hands on: Implementing basic RL algorithms in Python
- ➢ Homework (As per the requirement)

Hour 13-16: Deep Reinforcement Learning

- ➢ Deep Q-Networks (DQN)
- ➢ Policy Gradient Methods (e.g., REINFORCE)
- ➢ Hands on: Implementing DRL algorithms using TensorFlow/Keras
- ➢ Homework (As per the requirement)

Hour 17-23: Generative AI/ Learning

- ➢ Generative Adversarial Networks (GANs) framework
- ➢ Hands on: Implementing basic GANs for industry standard application
- ➢ Conditional GANs and other GAN variations
- ➢ Autoencoders and their applications
- ➢ Introduction to meta-learning and few-shot learning
- ➢ Homework (As per the requirement)

Hour 24: Final Project

- ➢ Hands-on project
- ➢ Q&A and wrap-up

This syllabus provides a structured progression from foundational concepts to advanced topics, ensuring that students gain a comprehensive understanding of reinforcement, generative and deep learning principles and their practical applications using Python.

Eligibility Criteria:

For IEM Students:

- ➢ Must be currently enrolled as a degree-seeking student at IEM, Kolkata (Newtown Sector) or IEM, Kolkata (Saltlake Sector)

For Non-IEM Students:

- ➢ Age Requirement: Applicants must be at least 18 years old by the start of the courses.
- ➢ Educational Qualification: A high secondary degree/diploma degree is mandatory.

- ➢ English Language Proficiency: Must demonstrate proficiency in English as per the specified requirement.
- ➢ Application: Students must complete the Summer Sessions application to gain access to enroll in summer courses.

Please note that eligibility criteria may be subject to updates or changes, and prospective applicants should verify the latest requirements on the official UEM website.