



Global Initiative of Academic Networks
course on



ARTIFICIAL INTELLIGENCE: LOGIC, PLANNING AND LEARNING FOR CONTROLLER DESIGN

22nd March to 02nd April 2022

at

PDPM Indian Institute of Information Technology, Design and Manufacturing, Jabalpur, MP, India

About GIAN

“Global Initiative of Academic Networks (GIAN)” is a scheme initiated by Govt. of India in Higher Education aimed at tapping the talent pool of scientists and entrepreneurs, internationally to encourage their engagement with the institutes of Higher Education in India to augment the country's existing academic resources, accelerate the pace of quality reform, and elevate India's scientific and technological capacity to global excellence. Under the GIAN program lecture courses by internationally renowned experts are being organised to garner the best international experience into our systems of education, enable interaction of students and faculty with the best academic and industry experts from all over the world and share their experiences and expertise to motivate people to work on Indian problems.

About PDPM IIITDM Jabalpur

IIITDM Jabalpur was established in 2005 with a focus on education and research in IT enabled Design and Manufacturing. Identified as an Institute of National Importance by the Govt. of India, PDPM IIITDM Jabalpur has been playing a vital role in producing quality human resources for contribution in India's mission of inclusive and sustainable growth. The Institute offers undergraduate, postgraduate and PhD programmes in Computer Science and Engineering, Electronics and Communication Engineering, Mechanical Engineering, Smart Manufacturing, Design and PhD programmes in Mathematics and Physics. The Institute campus is being developed on 250 acres of lush green land close to Dumna Airport, Jabalpur. The Institute is 10 kms from the main railway station and 5.5 kms from Dumna airport, Jabalpur.

Course Overview

Objective:

The course aims at introducing emerging methods in AI planning and learning to synthesize controllers for discrete-event dynamical systems. These methods are based on various concepts, models and tools from computer science and control theory such as predicate and temporal logic, automata theory, Petri nets, transition systems, and formal verification. The course will cover the following topics.

- A brief introduction to AI logic, automata theory and formal languages.
- Synthesis of planning controllers using temporal logic specifications, mu-calculus, and transition system models.
- Control algorithms based on mu-calculus and Buchi automata. Dealing with the complexity. Pre- and postconditions in AI planning using synchronized automata and Petri nets with predicates on shared variables.
- Generation of optimal paths by Mixed-Integer Linear Programming (MILP) with logical models evaluated by satisfiability solvers.
- Systems with uncertain dynamic models, Reinforcement Learning (RL), A new relation between temporal logic specifications and RL. Efficient combinations of physical models and learning procedures with focus on the deviation between a physical model and the physical reality.
- Applications of the AI algorithms in planning, routing, and scheduling for robot cells, autonomous driving, traffic control and emergency departments in hospitals.

Who can attend:

- Faculty members, engineers, software developers, and researchers from electrical engineering, computer science and relevant engineering domains, service and government/non-government organizations including R&D laboratories.
- Students at all levels (Senior BTech/MSc/MTech/PhD)

Prerequisite:

- Basic understanding of a higher-level programming language such as Python and/or familiarity with MATLAB. At least one year's experience in coding in a high-level language/MATLAB.
- Basic understanding of the issues in designing efficient algorithms for problem solving.

Faculty



Prof. Bengt Lennartson
Chalmers University of Technology
Göteborg, Sweden

Prof. Bengt Lennartson (Fellow, IEEE) Head of Division of Systems and Control, Electrical Engineering has been a Professor of the Chair of Automation with the Department of Electrical Engineering, Chalmers University of Technology. He has (co)authored two books and more than 300 peer-reviewed articles in international journals and conferences. His main areas of interest include discrete-event and hybrid systems, especially for manufacturing applications and robust feedback control.

<https://www.chalmers.se/en/staff/Pages/bengt-lennartson.aspx>

Prof. Aparajita Ojha is a professor of Computer Science and Engineering at PDPM Indian Institute of Information Technology, Design and Manufacturing, Jabalpur, India where she has also served as the Director from Feb 2009 to Feb. 2015. Prof. Ojha has published more than 70 articles in AI and Machine learning, steganography, path planning for robotics, spline approximation and finite element methods.



Prof. Aparajita Ojha
PDPM-IIITDM, Jabalpur, India



Dr. Sraban Kumar Mohanty
PDPM-IIITDM, Jabalpur, India

Dr. Sraban Kumar Mohanty is an Assistant Professor of Computer Science (CSE) and Engineering at PDPM Indian Institute of Information Technology, Design and Manufacturing Jabalpur, India. He received his Ph.D. degree in CSE from Indian Institute of Technology Guwahati, Assam, India in 2010. His current research focuses on designing of efficient data clustering algorithms for diversified data sets.

Course Coordinators:

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Registration Steps:

1. Register online at: <http://gian.iitkgp.ac.in/GREGN/index>
2. The registration fee can be paid through NEFT/RTGS:

Account Name: PROJECT ACCOUNT PDPM IIITDM JABALPUR
Account No. 50210022387
Bank IFS Code: IDIB000M694
Bank MICR Code: 482019014
Bank Name: Indian Bank
Branch Name: Mehgawan, IIITDM, Campus Branch, Jabalpur

3. Please add the online transaction number in the following Google form:
<https://forms.gle/JTuGgrd7wgB3BBR68>

Registration Fee:

- Industry/ Research Organizations: INR 4000
- Academic Institutions (Faculty and Research Scholars): INR 1000
- Students: INR 500
- Participants from SAARC and least developed countries: INR 1000 and from other countries : US \$100

**Last date
of online
registration:**

**March 15,
2022**