

Industry 5.0 / Society 5.0: Vision and Roadmap for Developing AI for Collective Decision Making

Overview

About a decade ago, Industry 4.0 manifested a transition to a new era in manufacturing through integration and combining ERP and MES systems, big data and analytics, robotics, cloud computing and others. Since that time, Industry 4.0 remains to be a flagship in determining the main global trends in the development of manufacturing systems.

However, the landscape of modern IT paradigms and information technologies accelerated by novel AI applications is changing rapidly towards Industry 5.0 focused on the digitalization of knowledge, developing digital colonies and eco-systems of smart services, forming autonomous digital twins of enterprises with the use of ontologies and multi-agent technologies. The key issue for developing such systems become automation of collective decision-making in self-organized systems and formation of swarm, collective and emergent intelligence.

The proposed course will be focused on designing digital ecosystems of smart services for adaptive resource management for different applications, including smart manufacturing, smart transport, smart supply chains, etc. As an example we will consider mobile resources such as trucks, mobile teams of gas and water-supply technicians, electricians, carriers and some other.

This course is intended, on the one hand, to familiarize students with these new initiatives, concepts, products and technologies and, on the other hand, to put their hands on the ground and experiment to define ontology and design multi-agent systems for implementing a small project of resource management with p2p negotiations of smart services.

The course will run under a project-based learning (PBL) methodology. The students will be divided into teams of three or four, each with a specific and very limited project to develop. At the end of the course each team should have 1) defined ontology for a specific resource management problem; 2) designed multi-agent solution functionality, including agent logic and protocols of agents' negotiations; and 3) make simulations using available software tools.

Dates	December 11-16, 2023. The number of participants for the course will be limited to fifty.
Modules	<i>Module 1: Vision and Roadmap of Industry 5.0 / Society 5.0;</i> <i>Module 2: Supervised exploration of ontologies for resource management;</i> <i>Module 3: Supervised exploration of the multi-agent technology for collective decision-making;</i> <i>Module 4: Supervised exploration of the digital platform and eco-system of smart services for resource management;</i> <i>Module 5: Simulation of p2p communication of multi-agent solution in digital eco-systems with collective decision making.</i>
You Should Attend If...	You are a UG/ PG, or Doctoral student. Faculty members and corporate professionals, interested in Data Science, Big Data, and Linked Open Data, may also attend.
Fees	The participation fees for taking the course are as follows: Participants from abroad: US \$200. Indian Students (UG/PG): Rs.1000; Researchscholars (M Phil/PhD): Rs.2000; Faculty/others (Academic Institutions): 3000. The above fee is towards participation in the course, all instructional materials, lunch, tea, snacks etc. Accommodation and travel expenses should be paid by the participants. Accommodation in the guest house may be provided on a space-available basis with early reservation. Mode of payment: Please contact the Course Co-Ordinator.

The Faculty



Prof. Petr Skobelev, Founder and President of “Knowledge Genesis” Group of Companies, Head of Department of Samara State Technical University, Head of Laboratory of Multi-Agent Systems in Institute of Control of Complex Systems of Russian Academy of Science. In his academic career Petr is studying and advancing the theory of complex adaptive systems by developing multi-agent models, methods and tools for supporting collective decision-making for solving complex

problems, including resource management, data mining, pattern discovery, text understanding, etc. The solution to any problem in Petr’s approach is considered as competitive equilibrium (consensus) on a virtual market formed by guided self-organization of competing and cooperating agents which are representing the interests, preferences and constraints of all parties involved and are able to discover and solve conflicts by continuous, parallel and asynchrony, auction-like negotiations. In his business career, Petr is combining these R&D activities with industrial applications and innovative entrepreneurship being the founder and president of Knowledge Genesis Group of Companies (en.kg.ru) specialized in developing multi-agent technology and solutions for adaptive resource management. The Group includes a leading company in Moscow (Skolkovo), Smart Solutions Ltd in Samara, Multi-Agent Technology, Oy in Helsinki (Finland), Digital Eco-Systems in London, Ltd (UK) and some others. Together with Prof. G.Rzevski from Open University (UK, London), Petr was one of the first scientists, entrepreneurs and software engineers who is bringing multi-agent systems from the research lab - to industrial applications. The main challenge now is to form digital eco-systems of multi-agent solutions (systems of systems) for Industry 5.0 / Society 5.0 based on the digitalization of knowledge and a new model of society (society without hierarchies, self-organization, uberization of resources, dynamic pricing, result-based payments, etc).

(Homepage <https://scholar.google.com/citations?hl=en&user=54pb4j4AAAAJ>)



Dr. Animesh Dutta, Department of Computer Science and Engineering, National Institute of Technology Durgapur, India. Animesh Dutta received his B.E. and M.Tech degrees from NIT Durgapur, India. He completed his PhD from Jadavpur University, India. He is currently an Associate Professor in the Department of Computer Science & Engineering, NIT, Durgapur, India.

Professor Animesh Dutta’s research interests are Semantic Web and Linked Data Engineering, Big Data & Social Network Analysis, and Multi-agent Systems. Professor Animesh has supervised a number of PhD/M. Tech scholars, and handled a number of externally funded research projects (both national and international) in the capacity of PI/Co-PI. He has also published more than 50 peer-reviewed journal papers and top-tier conference papers. He is an awardee of the Visvesvaraya Young Faculty Research Fellowship Award in 2016 by the Ministry of Electronics and Information Technology (MeitY), Govt. of India and ASEM-DUO Professor Fellowship 2020 with Claude Bernard University Lyon 1, France by the European Union.

(Homepage <https://shorturl.at/esCOU>)

Course Co-Ordinator

Dr. Animesh Dutta
Department of Computer
Science and Engineering

National Institute of Technology
Durgapur Durgapur,
WB, India.
PIN 713209

Phone: 0343-2754532
M. 9434788180

E-mail:
animesh@cse.nitdgp.ac.in

www.nitdgp.ac.in