One Week

"Faculty Development Program"

on

Emerging Trends in Computational Intelligence

(June 18-22, 2019)

Sponsored by

Dr. APJ Abdul Kalam Technical University, Lucknow

Under TEQIP - III

Babu Banarasi Das

Northern India Institute of Technology

Lucknow

Faculty Development Program on
Emerging Trends in Computational Intelligence COIN-2019
Babu Banarasi Das Northern India Institute of Technology
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FDP SESSIONS REPORT

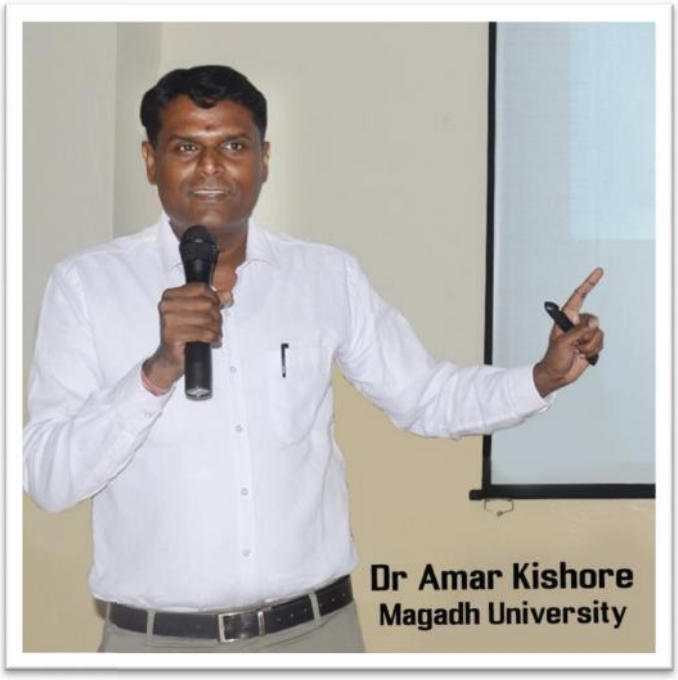
DAY 01 - June 18, 2019 - SESSION I and II

SPEAKER-1: DR. AMAR KISHORE

Head of the Department
Department of Mathematics, S.N. Sinha College, Magadh University

This session focused on the Introduction of Ordered Weight Aggregation operator given by researcher named R. R. Yager, and can be of good use for problems where objectives may not be associative but sometimes conflict each other in a Multi Objective Optimization problem.

This Ordered Weight Aggregation (OWA) can be used in Fuzzy inference system. This discussion let to the main conditions of OWA operator which is that it much follow Identity property, must have a boundary condition and follow Monotonicity Property.



Dr. Amar Kishore, also discussed about the types of aggregation, and orness concept utilized for choosing weight for a system which was modified by one of his research in the year 2014 and was thus redefined. Stancu OWA operator was also discussed which was proved by using Mathematical Index.

This Session also contained the knowledge of Multi objective Optimization for cases where many decision making problems involve conflicting objectives with an example. The basic concept of Multi Optimization was outlined and Pareto Optimal Solution curve was discussed in the cases where we need extra preference information coming from a decision maker to be able to select the most preferred solution. It lead to the fact that for solving decision making problems in Multi Optimization can be efficiently handled by Evolutionary Algorithm which has an approach of viewing a large number of possible optimal solution and select from it.

DAY 01 - June 18, 2019 - SESSION III and IV

SPEAKER 2 : DR. J.C. BANSAL

Associate Professor, South Asia University, New Delhi.

This session focused on how Nature Inspired Optimization techniques are beneficial to Computational intelligence and stated that the nature Inspired Optimization is a mathematical method for non linear optimization which have their origin in the way various species behave in order to optimize the chances of their survival.

The discussion mainly focuses on Swarm Intelligence which is defined as an Emergent Collective Intelligence of groups of simple agents which are active, dynamic and collaborative.

Dr. Bansal explained about the necessary and sufficient condition for swarm Intelligence which are Self Organization, Division of Labour and Large number of Individuals and then gave a brief introduction about the basic types of Swarm Intelligence which includes: Particle Swarm Optimization, Ant Colony Optimization, Artificial Bee Colony and Spider Monkey Optimization.

The spider monkey Optimization a new approach for optimization is proposed by modeling the

structure based animals. The animals which follow social systems, initially work in a large group and based on need after some time, they divide themselves in smaller groups led by an adult female for foraging. Therefore, the proposed strategy broadly classified as inspiration from the intelligent foraging behaviour of fission-fusion social structure based animals. Its working algorithm was discussed which led us to the scope and application of this optimization technique.

The challenges of the swarm intelligence was discussed which led us to the future scope of the swarm intelligence optimization and provided a vision towards a area of ongoing research in this field in India and Worldwide.

DAY 02 - June 19, 2019 - SESSION I and II

SPEAKER-1: DR. PAWAN TIWARI

Assistant Professor in Computer Science & Engineering Department of IET Lucknow

This session gave an overview of Heuristic and Meta Heuristic approach of computation and compared their computational performance, domain specification and their rules.

Heuristic method is an alternative optimization which is non perfect accurate solution, but set of good quality approximate to exact solution and Meta Heuristic is an iterative generation process which combines exploring and exploitation in search space and learning strategies are used to structure information for near optimal solution.

It continued with a brief application of both the techniques and there was a discussion about constraint programming problem and combinatorial optimization which can be used for discrete decision variable having finite solution space.

The session continued with the advantages of soft computing techniques and explanation of two techniques of soft computing – Genetic Algorithm and Ant Colony Optimization was primarily discussed. The ant colony optimization algorithm (ACO) is a probabilistic technique for solving computational problems which can be reduced to finding good paths through graphs. Artificial Ants stand for multi-agent methods inspired by the behavior of real ants. Combinations of Artificial Ants and local search algorithms have become a method of choice for numerous optimization tasks involving some sort of graph, e.g., vehicle routing and internet routing. The burgeoning activity in this field has led to conferences dedicated solely to Artificial Ants, and to numerous commercial applications by specialized companies such as Ant Optima.

DAY 02 - June 19, 2019 - SESSION III and IV

SPEAKER-1: DR. MANOJ TRIPATHI

Associate Professor, Department of Electrical Engineering, IIT Roorkee

This session focused on Deep Neural Network and its applications where the explanation was given about how is Deep Neural network an extension of classical neural network and what are its goals with Machine Learning. There was a comparative discussion on Classical Neural Network ,its architecture, training of NN and its types. The basics of Machine Learning was also discussed. The talk also stated how Deep Neural Network is a better performer than any of the classical neural network methods and how are features extracted by the Deep Neural Network based on probabilistic conditions. Types of DNN was also discussed and then sir explained how is DNN been trained and focused on the importance of Unsupervised Learning in the DNN.

It lead to discussion on Data augmentation in DNN and the role of memory in Deep Neural

network and explained about Convolution Neural Network and Recurrent Neural Network , Boltzman Machine, Deep Belief Network and Long Short term memory. Application of Deep Neural Network in Denoising was discussed in this session and then the ongoing work and its proposed and successful algorithm on Fuzzy0 Mask Based Method for Speech Enhancement was discussed.

DAY 03 - June 20, 2019 - SESSION I

SPEAKER-1: DR. RAVI SHANKAR SINGH

Associate Professor, Department of Computer Science & Engineering, IIT BHU

This session Covered the concepts of High Performance Computational Intelligence and its applications in various streams of Engineering. The session elaborated the difference between Serial Computing and Parallel Computing and explained the three main concern of parallel computing which are Connectivity, Coordination and Synchronization. The talk explained in detail how large problems are solved faster than possible single system with the help of high performance computing.

The session also contained basics of Parallel computing, Distributed Computing and Grid Computing and their service models. The talk also dealt with problem decomposition in a HPC which is broadly categorized into Data Decomposition and Recursive Decomposition.

Dr. Shankar also explained the terminologies related to HPC which includes speedup, Amdahl's law, Task, task allocation etc and explained it with the help of a scheduling problem.

DAY 03 - June 20, 2019 - SESSION II

SPEAKER-1: DR. SANJAY DWIVEDI

Associate Professor, Department of Computer Science, BBAU, Lucknow

This session was about the emerging research in Cross Language Information Retrieval which includes the explanation about Information Retrieval and its types. The talk contained about the research trends in this field which includes Web Mining, Recommender System, Text Classification, Cross Language Information Retrieval.

The main challenges of CLIR are Queries and document in different languages, Ambiguous query, shorter query, Unavailability of documents, effective retrieval, incorrect representation of a query etc. Dr. Dwivedi discussed about machine translation and back translation and discussed a case study of CLIR from Hindi to English where he have used the queries from Forum for Information Retrieval Evaluation (FIRE). And uses Google, Microsoft and Babylon translators for comparison of precision, recall and F-measure and with the help of Okapi model discussed about three test which are based on Expansion terms from FIRE dataset, Snippets and Nearest Neighbour concept and come to the conclusion that best search is done by Snippet in this case study.

DAY 03 - June 20, 2019 - SESSION III & IV

SPEAKER-1: DR. Y. N. SINGH

Professor & Head, Department of Computer Science & Engg., IET, Lucknow

This session focused on Machine Intelligence system and its applications. Machine intelligence components includes tools that behave externally like humans, programs hat operate internally computational system that behave internally and the rational behaviour. Dr. Singh explained that MI has three types of system which includes Analytical, Human inspired and Humanized Intelligence.

The talk also explained about the types of learning approach used for Machine Learning and discussed about curse of dimensionality and peaking phenomenon. The talk also dealt with Support Vector Machine which is a classifier and discussed the difference between the Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) and explained their application and research scope in various types of engineering problems.

DAY 04 - June 21, 2019 - SESSION I &II

SPEAKER-1: DR. PRAMOD KUMAR SINGH

Associate Professor, Atal Bihari Vajpayee-Indian Institute of Information Technology and Management, Gwalior

In this session the discussion focused on the two Algorithm framework: Artificial Bee Colony and Real Coded Genetic Algorithm on diverse set of Unimodal, Multimodal and Rotated Multimodal and compared with comparison criteria as Solution Quantity, Convergence speed, robustness and scalability to judge the efficacy of the algorithms. After looking into the algorithms of both the techniques and testing it on benchmark problems it was clear that the performance of RCGA is better than ABC in case of Unimodal(except Sphere function) and rotated multimodal problems. On the other hand ABC dominates RCGA in case of multimodal problems. The RCGA techniques is thus more scalable than ABC. With these results Dr. Singh has developed a new framework of ABC-GA Algorithm framework which was also discussed. This new framework uses GA for better scalability and fast convergence and uses ABC for decreasing the flaw of decreasing diversity.

This talk also focused on Multi Objective and Non Dominant sorting ABC . It is an extension of the artificial bee colony algorithm ABC, which is a single objective optimization algorithm, to the multi-objective optimization domain. It uses a novel approach in the employee bee phase to steer the solutions to simultaneously achieve both the orthogonal goals in the multi-objective optimization – convergence and diversity. The onlooker bee phase is similar to the ABC except for the fitness computation to exploit the promising solutions whereas there is no change in the scout bee phase, which is used to get rid of bad solutions and add diversity in the swarm by introducing random

placed using crowding distance and non dominant sorting and thus have a novel way of exploring new solutions. The talk concluded with the fact that NSABC is simple but powerful algorithms for handling multi Objective Optimization.

DAY 04 - June 21, 2019 - SESSION III & IV

SPEAKER-1: DR. D.K. VISHWAKARMA

Associate Professor, Department of Information Technology, Delhi Technological University, New Delhi

In this talk Dr. Vishwakarma discussed about Machine Learning its Trends, Prospects and Applications. Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves with the help of wide range of ML algorithms. It has a wide range of application domain which includes Digit Recognition, Robotic Surgery, Huan Object Interaction, Surveillance and security, Elderly care system, Movie analysis , sentiment analysis yoga training analysis etc. It fundamentally uses the three types of learning methods which are Supervised learning, Unsupervised learning and Reinforced Learning and the main task of ML are Classification, Regression and Clustering. It optimizes weight to make best final prediction.

The main limitation of ML currently are that they are very tedious, costly and dependent on one application. It uses deep Learning Algorithm for application which uses the method of transfer learning for Updation of weights. The main disadvantage of Deep Learning is that it requires large volume of data and high end infrastructure and have large research areas where a lot of research is ongoing and trends are not only increasing in industrial application but also in commercial domain.

DAY 05 - June 22, 2019 - SESSION I & II

SPEAKER-1: DR. G.N. PILLAI

Professor ,Department of Electrical Engineering, IIT-Roorkee

This session focused on Recurrent Neural Network and LSTM in Deep Learning. Deep learning has layered Hierarchal architecture of learning and representing data when there is requirement of extraction of high level features. It is used to reduce the difference between training and testing error. This talk covered the gradient decent rule and its application in Neural network and covered the use of Long short term memory which helps in solving the vanishing gradient problem in deep learning.

The talk discussed that one of the appeals of RNNs is the idea that they might be able to connect previous information to the present task, such as using previous video frames might inform the understanding of the present frame. If RNNs could do this, they'd be extremely useful.

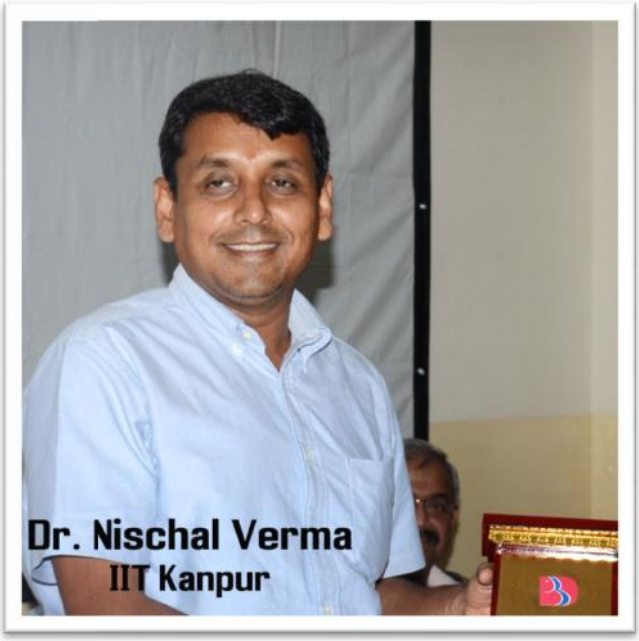
LSTMs are explicitly designed to avoid the long-term dependency problem. Remembering information for long periods of time is practically their default behaviour. All recurrent neural networks have the form of a chain of repeating modules of neural network. In standard RNNs, this repeating module will have a very simple structure, such as a single tanh layer. The LSTM does have the ability to remove or add information to the cell state, carefully regulated by structures called gates.

DAY 05 - June 22, 2019 - SESSION III & IV

SPEAKER-1: DR. NISHCHAL KUMAR VERMA

Professor, Department of Electrical Engineering and Inter-disciplinary Program in Cognitive Science, Indian Institute of Technology, Kanpur

In this session the topic of discussion was Deep Learning in Fuzzy logic and its applications. Deep learning is effective method to make highly accurate prediction from complex data sources. The convolutional neural network dominates the image classification problems and recursive neural network have proved their utility in language translations etc.



This talk discussed about auto encoders and deep fuzzy network which is used to deal with the uncertainty due to vagueness and incomplete information of data. e emergence of deep learning has impacted numerous machine learning based applications and research. The reason for its success lies in two main advantages: 1) it provides the ability to learn very complex non-linear

high dimensional data classification, Feature learning using Stacked auto encoder , computational simulation , health monitoring, aerodynamics and lot more.

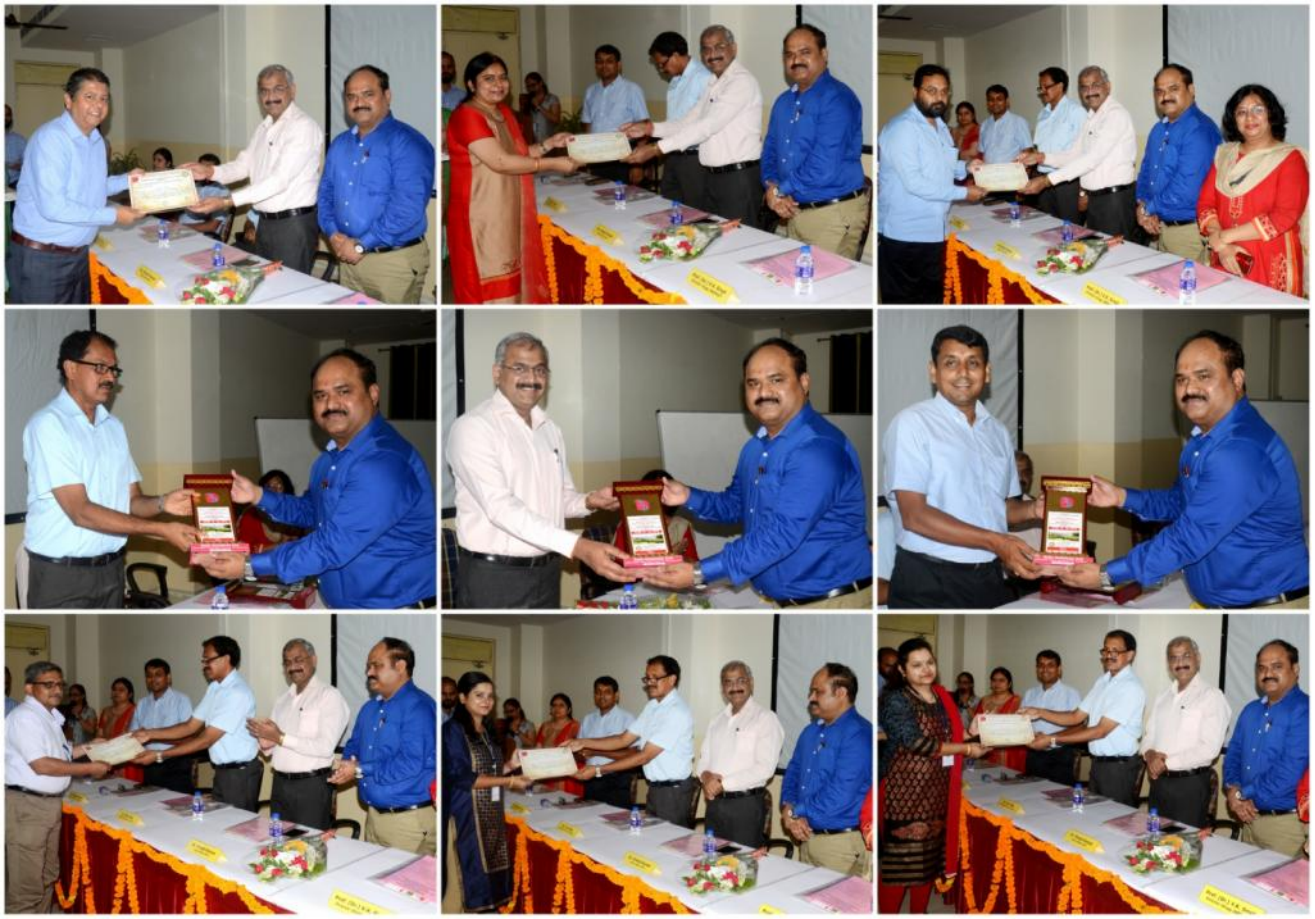
DETAILS OF VALEDICTORY SESSION – COIN 2019

DATE: 22.06.2019

One week Faculty Development Programme on Emerging trends in Computational Intelligence (COIN-2019) sponsored by Dr. A.P.J Abdul Kalam Technical University TEQIP Phase-III had its valedictory session on 22nd of June 2019 in BBDNIIT, Lucknow with Chief Guest as Prof. (Dr.) Vineet Kansal , ,Dean UnderGraduate Studies and Entrepreneurship, Dr. A.P.J. Abdul Kalam Technical University.

The event also had gracious presence of Prof (Dr.) G.N. Pillai from IIT Roorkee and Prof. (Dr.) Nischal Verma from IIT Kanpur who were the eminent speakers of last day of this Faculty Development Program. On this Occasion Prof.(Dr.) V.K. Singh, Director(Engg.) BBDNIIT welcomed the Chief Guest , Dr. G.N. Pillai, Dr. Nischal Verma, Dr. Monika Mehrotra, Director BBDEC and Dr. Reena Srivastava Dean Computer Applications, BBDU and expressed his gratitude towards them for giving their valuable time and effort for successfully conducting this Faculty Development Program.

Chief Guest, Dr.VineetKansal, addressed all the invitee guest speakers and participants by expressing his faith in conducting such Faculty development workshop to enhance the skills of faculties such that it helps Dr. A.P.J Abdul Kalam Technical University attain new heights in field of Technology and research . Sir also assured the that University is working hard in this direction and is willing to organize more and more numbers of FDP. Dr. Kansal also encouraged BBDNIIT to conduct more of such Faculty development program and appreciated the effort of Institute and participants to make this programme a success.



The valedictorian address was given by Dr. V.K. Singh, Director(Engg.) BBDNIIT and Chief Convenor of COIN 2019 and stated the importance of Computational Intelligence in this fast growing world and insisted the importance of organization of such FDP to generated a wealth of information and experience and encouraged to take advantage of this occasion as an excellent opportunity through which to disseminate the experience and lessons learnt on Computational Intelligence.

Dr. V. K. Singh Started on the note that faculty members need to be prepared enough by some sort of a faculty development program (FDP) in order to deal with the rapid changes and shifting paradigms in technical education, without such training, teaching is often reduced to instructors presenting their understanding of the subject by one-way lecturing.

Dr. V.K. Singh emphasized that such Faculty Development Programmes entails faculty members to attain new knowledge, diverse skills, and abilities in many aspects including Managing multiple roles and new responsibilities. It also aims at Integrating technology into teaching, learning, and research and master new computer-based educational programs.

The Chief Guest Prof. (Dr.) Vineet Kansal, and the speakers for both the sessions Prof (Dr.) G.N. Pillai from IIT Roorkee and Prof. (Dr.) Nischal Verma from IIT Kanpur were presented memento by Dr. V.K.Singh, Director(Engg.) BBDNIIT as a token of reverence and respect

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