

## ABOUT THE WORKSHOP

Time series forecasting (TSF) helps in making appropriate strategic decisions under uncertain circumstances so that wise investments can be made, financial crisis can be avoided, staffs can be scheduled appropriately, under/over contracting of utility can be avoided, service providers can provide better service, mankind can get prepared for natural disasters and many more. However, the accuracy in forecasting plays a vital role and achieving such is a challenging task owing to the vagueness and nonlinearity associated with most of the real world time series. This workshop will provide a forum for discussing theoretical and practical aspects of neural network, deep learning and its application in Time Series Forecasting. It will help in exchanging research ideas and challenges, exploring possible solutions and future directions. The main goal of this workshop is to bring together researchers & practitioners from both academia & industry.

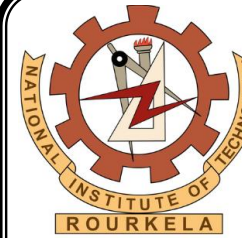
## CONTENTS OF THE WORKSHOP

1. Introduction to Neural Network and Deep Learning
  - Mathematical Formulation of Artificial Neural Network, Differentiation and its Application in Optimization.
  - Training Single Neuron Model and Training Multilayer Neural Network.
  - Dropout and Regularization, Weight Initialization, Batch Normalization.
  - Optimizers: Gradient Descent, Stochastic Gradient Descent, Nesterov Accelerated Gradient (NAG), Adaptive Gradient (AdaGrad), AdaDelta, RMSProp, ADAM, Choice between optimizers based on problem.
  - Deep Learning Models: LSTM, GRU, Bi-LSTM, BI-GRU, CNN.
  - Hands-on: Hard coding Neural Network for Classification and/or Regression Problems.
2. Crisp Time Series Forecasting using Deep Learning
  - Introduction to Time Series Forecasting (TSF), Methodologies used in Time Series Forecasting, Crisp TSF using Deep Learning Models
  - Additive, Multiplicative and Decomposition Based Hybrid models employing Deep Learning and Statistical Models.
  - Hands-on using Tensorflow and Keras

3. Fuzzy Time Series Forecasting
  - Introduction to Fuzzy TSF (FTSF)
  - FTSF Ignoring Membership Values.
  - FTSF considering Membership values (Traditional Fuzzy Set, Intuitionistic Fuzzy Set, Hesitant Fuzzy Set and Neutrosophic Fuzzy Set).
  - Fuzzy Time Series Forecasting using Deep Learning.
  - Hands-on using Tensorflow and Keras
4. Transfer Learning and Hybrid Machine Learning and Deep Learning for Time Series Forecasting
  - Introduction to Convolutional Neural Network: Convolution, Padding and Strides, Convolution Layer, Pooling, Data Augmentation, Popular CNN Models.
  - Transfer Learning & Fusion: Early Fusion, Late Fusion.
  - 1-D CNN and ConvLSTM for Time Series Forecasting.
  - Hands on using Tensorflow and Keras.
5. Probabilistic Forecasting, Performance Evaluation, Enhancement and Deployment
  - Probabilistic Forecasting: Parametric Methods, Non-Parametric Methods, LUBE method.
  - Hyper-Parameter Optimization: Grid Search, Keras Tuner, Swarm and Evolutionary Algorithm Optimized DL Models.
  - Model Evaluation using Non-parametric statistical tests.
  - Deployment of Deep Learning Models.

## WORKSHOP OBJECTIVES

1. To familiarize the participants with the basics of Neural Network and recent advances in Deep Learning.
2. To familiarize the participants with the basics and recent advances in crisp and fuzzy Time Series Forecasting (TSF) using Deep Learning models.
3. To familiarize the participants with transfer learning and perform TSF using hybridization of Deep Learning and shallow Machine Learning models.
4. To familiarize the participants with different hyperparameter optimization methods of Deep Learning models.
5. To have 15-hours of Theory and 15-hours of Handson Session relating to above four objectives.



**National Workshop**  
**on**  
*Crisp and Fuzzy Time Series*  
*Forecasting using Deep Learning*  
*Techniques*  
**(CFTSFDL - 2024)**  
**(Sponsored by SERB)**  
**Hybrid Mode**  
**(Online and Offline)**  
**25<sup>th</sup>–29<sup>th</sup> September 2024**

### Chairman

Prof. Bibhudatta Sahoo

### Convener

Dr. Sibarama Panigrahi

**Department of Computer Science  
and Engineering**

**National Institute of Technology**

**Rourkela-769 008, Odisha**

<http://www.nitrkl.ac.in>

## ABOUT NIT ROURKELA

National Institute of Technology (NIT) Rourkela is an institution of national importance funded by the Ministry of Education. NIT Rourkela was established as Regional Engineering College (REC) on August 15, 1961. In India, it was ranked 16 among engineering colleges by the National Institutional Ranking Framework (NIRF) in 2023. For details about the institute please visit us at [www.nitrkl.ac.in](http://www.nitrkl.ac.in).



## ABOUT DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Department of Computer Science & Engineering, NIT, Rourkela was established in 1982. Since its inception, the Department is under dynamic progress and is able to establish the reputation for imparting quality education both at undergraduate and graduate programmes. The department also offers Ph. D. for regular as well as sponsored candidates. Please visit <https://website.nitrkl.ac.in/CS/> to know more about the Department of CSE. The department has well equipped modern laboratories such as Software Engineering, Distributed Object Systems, Information Security & Data Communication, Image Processing & Cluster Computing and Advanced Database Engineering Labs for pursuing research keeping in view of the technological advancement.



## TARGET PARTICIPANTS

The workshop is of immense interest for UG/ PG students, research scholars/professionals, staff/ faculty members and industry professionals working in the area of Machine Learning and/or Time Series Forecasting. The participants from different Science and Engineering (Computer Science and Engineering, Electronics and Communication Engineering, Electrical Engineering, etc.) background will be benefitted with this course.

## IMPORTANT DATES

Registration Starts	25 <sup>th</sup> August 2024
Registration Ends	20 <sup>th</sup> September 2024
Maximum Offline Participants (First Come First Serve Basis)	50
Registration Confirmation	22 <sup>nd</sup> September 2024
Workshop Schedule	25-29 September 2024

## PREREQUISITES

1. The offline participants should bring their laptop.
2. Basics of programming language and data structure will be a plus.

## TOURIST PLACES NEARBY



**Khandadhar  
Waterfall**



**Pitamahal Dam**



**Vedvyas Temple**



**Mandira Dam**

## REGISTRATION & FEE PARTICULARS

<b>Registration Fee</b>	
Students	Rs. 590/-
Faculty from Academic Institutions	Rs. 590/-
Employees from Industry and R&D Organizations	Rs. 590/-
<b>Accommodation Charges</b>	
Guest house (South / North block)	As Per Institute
Hostel	Norms

Registration fees include Registration Kit, Refreshment, Tea and Snacks and 18% GST. Lodging, boarding, lunch and dinner facility can be availed on separate payment basis and based on availability.

## BANK ACCOUNT DETAILS FOR REGISTRATION

Account Name:	CONTINUING EDUCATION NIT ROURKELA
Account No.:	10138951784
Bank Name	State Bank of India(002109)
Branch:	NIT Rourkela Campus
IFSC Code	SBIN0002109

## REGISTRATION FORM

To complete the online registration, the participants need to fill the following google form:  
[Click here for the Google Form Registration Link](#)

<b>Patron</b>	Prof. K. Umamaheswar Rao, Director, NIT Rourkela
<b>Chaiman</b>	Prof. Bibhudatta Sahoo
<b>Convenor</b>	Dr. Sibarama Panigrahi

## Correspondence

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