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## PATRON

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Science & Technology Department, Govt. of Odisha

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Director,  
Institute of Mathematics and Applications, Bhubaneswar

## ORGANIZING SECRETARY

**Dr. Sudhakar Sahoo**

Institute of Mathematics and Applications, Bhubaneswar

## LOCAL ORGANIZING COMMITTEE

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**Dr. Pinakadhar Baliarsingh**, IMA, Bhubaneswar

**Dr. Alka Rai**, IMA, Bhubaneswar

**Shri Niranjan Sahoo**, IMA, Bhubaneswar

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**Dr. Kishore Kumar Dash**, IMA, Bhubaneswar

**Dr. (Mrs) Anasuya Nath**, Utkal University

**Shri Indra Bate**, IMA, Bhubaneswar

## TECHNICAL COMMITTEE

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**Prof. (Dr.) Jagannath Patel**, EX-Prof, Utkal University

**Prof. (Dr.) Akshy Kumar Ojha**, IIT, Bhubaneswar

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**Dr. Sudhansu Sekhar Rout**, NIT, Calicut

**Mr. Pradipta Kumar Pattanayak**, Silicon University

**Mr. Umasankar Das**, Forants Interactive System Pvt. Ltd

**Mr. Chinmayananda Padhy**, Udiyate Technologies Pvt. Ltd

## **ABOUT INSTITUTE OF MATHEMATICS AND APPLICATIONS:**

The Institute of Mathematics and Applications was established by the Government of Odisha in the year 1999, vide the Resolution of the Government of Odisha, Science and Technology Department letter no. 368-ST-I (SC) – 159/98 dated 31st May 1999 with wide ranging aims and objectives as notified in the Gazette No. 18, July 23, 1999 / SRAVANA, 1, 1921. The Institute has been registered on 28th March 2000 under provision of Registration of Societies Act 1860 with Registration No. 20851 /187 of 1999-2000. In the last several years since its inception, consistent with its aims and objectives, it has been active in searching and nurturing talents in mathematics by organizing training and interactive camps for successful students in various mathematical Olympiad tests. It has engaged itself in exploring the applicability of mathematical ideas in exotic areas of studies besides its engagement in traditional research in various disciplines of mathematics. At present IMA offers three courses namely B. Sc. (H) in Mathematics and Computing, M. A./M. Sc. in Mathematics with Computational Finance and M. A./M. Sc. in Mathematics with Data Science.

## **AIM OF THE WORKSHOP:**

To equip faculty members, research scholars, industry person and students, eager to teach/learn Machine Learning with a rigorous and detailed understanding of most prevalent Machine Learning algorithms (including derivations). The workshop will enable them to apply the techniques to solve real world problems by developing their own code using python.

## **LEARNING OUTCOMES:**

- i) Analyse and implement existing machine learning algorithms for classification, regression, and clustering.
- ii) Integrate multiple facets of practical Machine Learning in a single system; data preprocessing, learning, regularization, and model selection.
- iii) Design experiment to evaluate and compare different Machine Learning techniques on real world problems.
- iv) Employ probability, statistics, linear algebra, and optimization to develop new learning methods.
- v) Given a Machine Learning Algorithm analyse it to identify.
  - Computational properties of the algorithm.
  - Size and complexity of search space.
  - The inductive bias implicit in the algorithm.
  - Any guarantees (or lack thereof) regarding termination, convergence, correctness, accuracy of generalization power.

## **TOPICS TO BE COVERED:**

- 1) Review of Linear Algebra, Optimization, Probability, Statistics for Machine Learning.
- 2) Introduction to Machine learning.
- 3) Multiple Linear Regression, Ridge Regression, LASSO, Elastic net.
- 4) Logistic regression, KNN, Naive Bayes Classifiers.
- 5) Dimensionality reduction (Feature Selection Algorithms, PCA, Non-negative matrix factorization).
- 6) Loss function, bias variance trade off, Cross validation, Boot strapping.
- 7) Performance analysis of ML algorithms (Confusion matrix, Testing of hypothesis, ROC curve)
- 8) Classification and regression trees.
- 9) Performance enhancement methods (Regularization, Ensemble methods: Ada boost, Gradient boosting, XG boost, Random Forest).
- 10) Kernel methods and support vector machine for classification and regression.

- 11) Clustering.
- 12) EM algorithm and Gaussian mixture model with applications to clustering and anomaly detection.
- 13) Introduction to Neural Network.

**NOTE:** As a sequel to this course organisation of an advanced level workshop on Probabilistic Graphical models, Deep learning and Re- enforcement learning is envisaged.

#### **MODES OF PRESENTATION:**

- 1) Lectures including the derivation of the learning algorithms, and their analysis and applications.
- 2) Quizzes and Problem-Solving Sessions.
- 3) Lab sessions to implement the algorithms developed in lecture sessions by writing the own code using python.
- 4) Some case studies based on real world problems will be discussed.

**RESOURCE PERSON:** Will be from National Level Institutes, Universities & Industries.

**ELIGIBILITY:** Faculty, Research Scholars, PG & Final Year UG Students.

#### **ACCOMMODATION:**

Lodging and boarding arrangements for all interested participants will be made on payment basis in hostels within the campus. The delegates are required to inform the organizing secretary prior to the workshop regarding accommodation. Bhubaneswar is well connected by Road/Rail/Air services. The Institute is nearly 07kms from the Bus Station and 15 KM from the Railway Station and Airport.

**REGISTRATION FEES:** Rs 2000/- for outside IMA participants.

#### **BANK DETAILS:**

Registration fee, other fee, any financial support may be deposited in the Acc. No. 80172010000580 of CANARA Bank by NEFT/RTGS. Draft may be sent in favour of "DIRECTOR, INSTITUTE OF MATHEMATICS & APPLICATIONS, BHUBANESWAR", payable at Bhubaneswar, Odisha. IFSC Code: CNRB0018017.

**HOW TO APPLY?** Interested participants may fill up the registration form and send in the email [sudhakar@iomaorissa.ac.in](mailto:sudhakar@iomaorissa.ac.in)

**NOTE:** Selected participants are required to bring their own laptops for hands-on computation.

#### **CONTACT DETAILS FOR WORKSHOP:**

**Dr. Sudhakar Sahoo,**  
**Organising Secretary,**  
IMA Silver Jubilee Year Workshop:  
Exploring Machine Learning Algorithms,  
Applications, and Implementations  
INSTITUTE OF MATHEMATICS AND APPLICATIONS,  
ANDHARUA, BHUBANESWAR,  
ODISHA, INDIA - 751029  
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**IMA SILVER JUBILEE YEAR WORKSHOP: EXPLORING MACHINE LEARNING ALGORITHMS, APPLICATIONS, & IMPLEMENTATIONS**

**REGISTRATION FORM**

DATE: .....

1. NAME : .....

2. CATEGORY OF PARTICIPANTS : (ATTACH PROOF )

STUDENT                       TEACHER                       INDUSTRY

3. DESIGNATION AND DEPARTMENT : .....

4. NAME OF THE INSTITUTE/COLLEGE/UNIVERSITY : .....

5. ADDRESS FOR CORRESPONDENCE : .....

6. PHONE / MOBILE NO : .....

7. E MAIL ID : .....

8: ACCOMMODATION NEEDED :                      YES                       NO

ARRIVAL DATE : .....

DETAILS OF THE DRAFT / NEFT / RTGS FOR REGISTRATION : .....

DATE :                      .                      SIGNATURE :

NOTES :

- i) ITS MANDATORY TO PROVIDE A COPY OF ID PROOF ALONG WITH THIS REGISTRATION FORM
- ii) IT IS REQUIRED TO SEND THE FILLED UP REGISTRATION FORM IN THE EMAIL : [sudhakar@iomaorssa.ac.in](mailto:sudhakar@iomaorssa.ac.in)

**DR . SUDHAKAR SAHOO**  
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IMA Silver Jubilee Year Workshop:  
Exploring Machine Learning Algorithms,  
Applications, and Implementations  
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