

ICAR-Sponsored Winter School on

Applications of Artificial Intelligence and Machine Learning in Agricultural Research

02 - 22 December 2026

Venue: College of Agriculture, UAS, GKVK, Bengaluru



Organized by
Department of Agricultural Statistics, Applied Mathematics & Computer Science

College of Agriculture
UAS, GKVK, Bengaluru – 560 065, Karnataka, India



Introduction

Agriculture is witnessing a rapid digital transformation. Field experiments, crop surveys, weather stations, remote sensing platforms, IoT sensors, drones, market information systems and farm advisories now generate large volumes of complex and heterogeneous data. Converting this data into reliable knowledge requires research approaches that go beyond conventional analysis. Artificial Intelligence (AI) and Machine Learning (ML) offer powerful tools to learn patterns from such data, make accurate predictions, classify images and signals, and support timely decisions for farmers, researchers and policy makers.

AI and ML applications are increasingly visible across the agricultural research landscape, including crop yield and weather forecasting, plant disease and pest detection from images, precision agriculture, soil and nutrient management, market intelligence and AI- based advisory systems. Recent advances in deep learning, computer vision, Natural Language Processing, Generative AI, and large language models (LLMs) have further widened the scope of data-driven agricultural research. However, using these tools effectively requires a sound understanding of data handling, statistical foundations, model building, validation and result interpretation.

Therefore, this Winter School aims to provide faculty members and scientists under the National Agricultural Research and Education System (NARES) an opportunity to update and strengthen their knowledge and practical skills in AI and ML for agricultural research. The programme covers the complete data science lifecycle, starting from Python programming, data collection, wrangling and visualization, through statistical concepts, regression, supervised and unsupervised learning, ensemble methods and model evaluation, to deep learning, computer vision, NLP, Generative AI, IoT, remote sensing and model deployment.

The programme will have a strong emphasis on hands-on learning using Python and its data science libraries, along with contemporary AI platforms and tools. Sessions will be handled by experienced faculty and scientists from ICAR, State Agricultural Universities, IIIT-Bangalore, IIIT-Dharwad, REVA University, GITAM University, NIMHANS and AI-driven agri-startup (Avyagraha). The Winter School will use a combination of classroom lectures, live coding demonstrations, practical exercises and a mini project with model deployment.

Objectives

- To familiarize participants with the concepts, tools and emerging applications of Artificial Intelligence and Machine Learning in agricultural research.
- To develop practical skills in Python programming, data wrangling, visualization and building, validating and deploying machine learning and deep learning models using agricultural datasets.
- To enhance participants' ability to apply computer vision, NLP, Generative AI, IoT and remote sensing based approaches for solving real-world problems in agriculture and allied sciences.

Main Themes

Foundations of AI and Data Science

- Introduction to Artificial Intelligence in Agriculture
- Outcomes of AI & ML in ICAR/SAU research
- Introduction to the data science
- Applications of AI & ML in crop science

Python programming for Data Science

- Introduction to Python programming
- Python basics and libraries for data science

Data Management and Exploratory Analysis

- Data collection and agricultural databases
- Data wrangling and preprocessing techniques
- Exploratory data analysis using Python & statistical inference
- Data visualization using Matplotlib and Seaborn

Statistical Modelling and Regression

- Statistical concepts for machine learning
- Correlation and regression analysis
- Linear regression models and anomaly detection
- Logistic regression models

Machine Learning techniques

- Introduction to machine learning workflow
- Supervised and unsupervised learning techniques
 - Decision tree algorithms
 - Random forest, ensemble methods and SVM
 - PCA and clustering techniques in agriculture
- Model evaluation, validation and hyperparameter tuning

Deep learning

- Introduction to deep learning
- Artificial Neural Networks (ANN)
- Convolutional Neural Networks (CNN)
- Recurrent Neural Networks (RNN), GRU and LSTM

Computer vision in Agriculture

- Computer vision applications in agriculture
- Plant disease detection using AI

NLP, Generative AI and LLMs

- Natural Language Processing (NLP) in agriculture & transformers overview
- AI-based chatbots & advisory systems
- Generative AI, LLMs, prompt engineering and RAG

Smart & Precision Agriculture

- Internet of Things (IoT), data mining and smart farming
- Precision agriculture and remote sensing
- AI applications in weather and crop forecasting

Model Deployment & AI ecosystem

- MLOps: FastAPI, Streamlit and Docker
- Overview of Hugging Face, LinkedIn & GitHub optimization
- Mini project, model deployment & project presentation

The Winter School will be organized through a combination of classroom lectures, live demonstrations and hands-on sessions in the dedicated AI & ML Laboratory. The focus will be on applying AI and ML techniques to agricultural datasets, interpreting model outputs and understanding the relevance of different algorithms to research problems. The programme concludes with a mini project in which participants build, deploy and present a working model.

Participants will be provided with instructional materials, code notebooks and training resources forming part of the course. Participants are encouraged to bring one or two datasets from their own research work, which may be used during the practical sessions and the mini project.

About UAS Bangalore

The University of Agricultural Sciences (UAS), Bangalore, established in 1964, is one of the premier State Agricultural Universities in India, with its main campus at Gandhi Krishi Vigyana Kendra (GKVK), Bengaluru. The University is mandated with teaching, research and extension education in agriculture and allied sciences.

The Department of Agricultural Statistics, Applied Mathematics & Computer Science, College of Agriculture, GKVK, has recently established the Department of Artificial Intelligence & Machine Learning to promote interdisciplinary education, research, skill development and innovation in AI-driven agricultural technologies. The Department has coordinated an AI training programme for PG and Ph.D. students in collaboration with Samsung Innovation Campus, conducted Experiential Learning/Hands-on Training programmes on “Applications of AI & ML in Agriculture” with REVA University, filed a patent on an AI-based cocoon cutting machine, is implementing a research project on ML approaches for the sericulture industry, and mentors the agri-startup Avyagraha R&A LLP in developing the AI-enabled “SeriMitra” advisory platform.

21

Days of training

37

Lectures & practicals

27

Expert resource persons

1

Hands-on mini project

Expected Outcomes: To equip participants with practical knowledge and skills to apply AI and ML techniques in agricultural research, data analysis, predictive modelling and decision-making.

Facilities at the Venue

- ✓ Designated AI & ML Laboratory
- ✓ Computers, accessories & networking facilities
- ✓ Programming tools (Python & R)
- ✓ High-speed internet and Wi-Fi enabled campus
- ✓ Smart classrooms and seminar hall
- ✓ GIS/Remote sensing and phenomics labs
- ✓ CIDSA computer & automation laboratories
- ✓ Agri IoT sensor irrigation field and research farms
- ✓ Agri Startup Hub, AKMU and ATIC
- ✓ Central library and digital resources
- ✓ Guest house, canteen and dispensary
- ✓ Banking, Medical & Postal facilities within campus

Eligibility

Faculty and scientists in agriculture and all disciplines from State Agricultural Universities/ICAR Institutes/other institutions under NARES, possessing a Master's degree in Agriculture or allied disciplines with working knowledge of computers and working not below the rank of Assistant Professor/Scientist or equivalent in the concerned subject, are eligible to apply.

Selection of Participants

Twenty-five participants will be selected for the programme as per ICAR norms. Candidates with experience in fields pertaining to the training will be given preference. Nomination from the respective heads of organizations does not entail confirmed participation in the programme. UAS Bangalore will issue an official confirmation letter to the selected candidates.

How to Apply

Eligible candidates are required to register and submit their application online through the Google Form: <https://forms.gle/Bkn1cP7epCkQN4B59>

Applicants should:

- Submit the advance copy of the application through the online form.
- Obtain approval from the competent authority of their organization and upload the scanned copy of the approved application through the link provided via response mail.
- Pay the ₹ 50/- registration fee using the QR code/account details provided below and enter the payment details in the application form.
- Send the original approved application by post to:

Dr. Manjunatha G R

Course Director

Department of Agril.Statistics, Appld.Mathematics & Comp.Science

College of Agriculture

UAS, GKVK, Bengaluru – 560 065, Karnataka, India

Account Details for Fee Payment:

Name: Comptroller, A/C: 110161951480, IFSC: CNRB0002737,

Bank: Canara, Branch: UAS Campus, GKVK

Important:

The application will be considered for final selection only after receipt of the approved original application before the prescribed last date.

For clarifications:

wsicar2026.uasbng@gmail.com

Last date for receipt of applications: 02nd Nov 2026

Intimation to selected candidates: 05th Nov 2026

Programme date: 02 – 22 Dec 2026

Boarding and Lodging

Free boarding and lodging will be provided to the participants during the training programme as per the approved ICAR norms for Winter School. The candidates are eligible for Travelling Allowance only for travelling by train to the maximum of AC II-tier (AC III-tier for Rajdhani/Duronto/Vande Bharat trains) fare by the shortest route. Please note that, strictly, no accommodation in the guest house will be provided to the family members or guests of the participants.

For more information, contact:

Chief Patron

Dr. S. V. Suresha, Vice-Chancellor, UAS, Bangalore

Course Director:

● **Dr. Manjunatha G R**

Associate Professor (Agril. Stat.)

Dept. of AS, AM & CS, College of Agriculture (CoA)

UAS, GKV, Bengaluru – 560 065, Karnataka, India

Tel: 080-23330153 (Extn. 364)

Mob: +91 9831878341

Email: mgr.dvg@gmail.com

Course Co-Directors:

● **Dr. Vimala M**

Assistant Professor (Computer Science)

Dept. of AS, AM & CS

College of Agriculture

UAS, GKV, Bengaluru – 560 065, Karnataka, India

Mob: +91 9448163513

Patron(s):

Dr. Y.N. Shivalingaiah

Dean (Agri.), CoA, UAS, Bangalore

Dr. Siddayya

Director, SDC, UAS, Bangalore

Dr.K.B. Murthy

HoD, Dept. of AS, AM & CS, CoA, UAS, Bangalore

● **Dr. Ranganath G**

Assistant Professor (Agribusiness Management)

Institute of Agri-Business Management

College of Agriculture

UAS, GKV, Bengaluru – 560 065, Karnataka, India

Mob: +91 8754991511





Application Form

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Registration Link: <https://forms.gle/Bkn1cP7epCkQN4B59>

1. Full Name (in block letters):
2. Designation:
3. Present employer and address:
4. Address to which reply should be sent (in block letters):
5. Permanent Address:
6. Telephone No. (Off.): (Res.): (Mob.):
7. Fax No.: E-mail:
8. Date of Birth: Sex (Male/Female/Other):
9. Marital Status (Married/Unmarried):
10. Teaching/Research/Professional Experience (mention the post(s) held during the last 5 years and the number of publications):
11. Have you participated in any training (Summer/Winter School/Short Course, etc.) during the last 5 years under ICAR/other organizations: Yes/No
(Name of the Institute, Title of the training):
12. Details of fee payment (₹ 50/-):

Date: Transaction Details:

13. Academic Record:

Exam. Passed	Subjects Main/ Subsidiary	Year of Passing	Class rank/ Distinction etc.	University/ Institution
Ph.D.				
Master's degree				
Other (specify)				

14. Discipline:

15. Level of knowledge of Statistics, Programming (Python/R) & Computer usage: Excellent/Good/Average

Signature of the Applicant with Date

16. Recommendations of the forwarding Institute

Signature of the Forwarding Authority
with Seal and Date

CERTIFICATE

It is certified that the information furnished above is correct. Travelling allowances will/will not be paid by this office.

Signature of the Sponsoring Authority
with Seal and Date