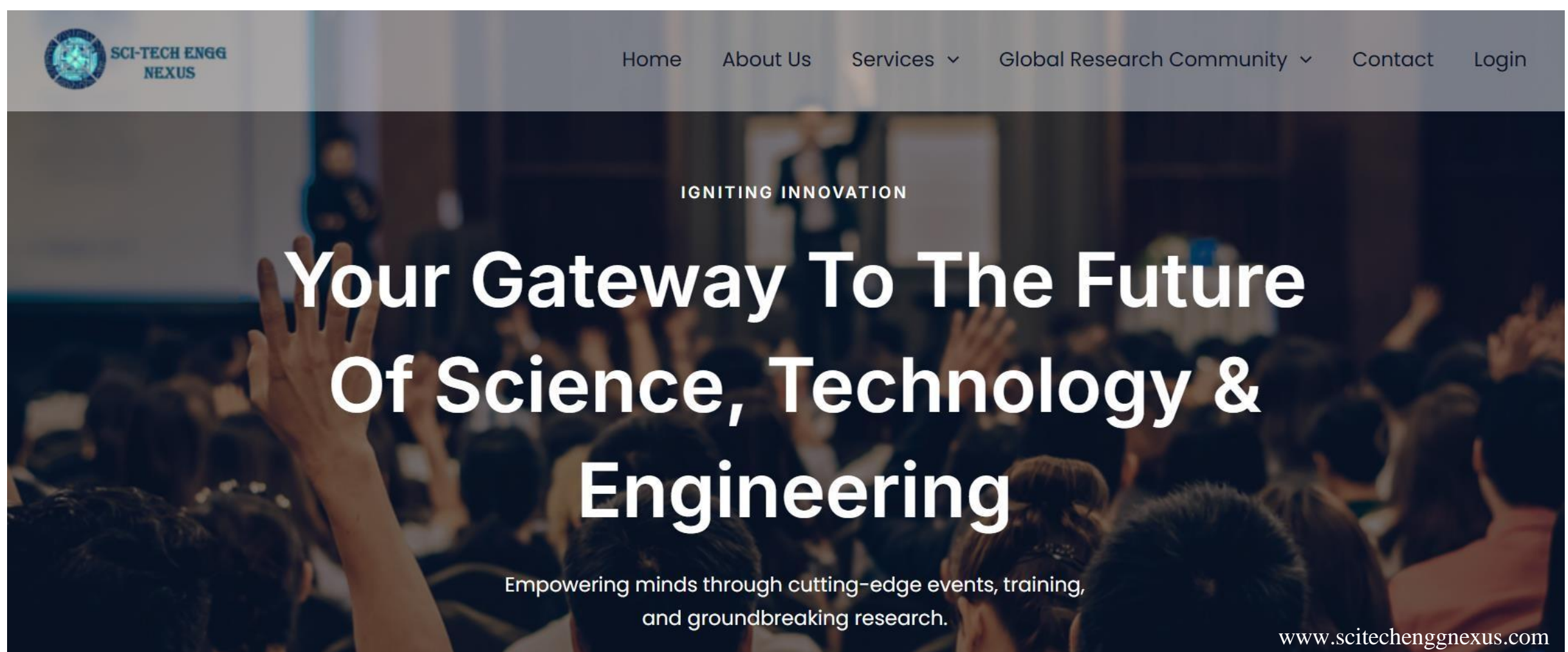


SCI-TECH ENGG NEXUS: Scientific Machine Learning Bootcamp

Transition to ML | Hands on industrial projects | Path to ML research



We, as the Global Research Community of STE-NEXUS, comprise:

- **Chief Scientists (Professors)** – with over 20 years of experience in teaching and applied science research
- **Chief Technologists** – with more than 17 years of professional experience in industry
- **Principal Scientists** – PhDs with applied science research with top-cited Web of Science Q1 journals publications, and over 10 years of professional and research experience
- **Senior Scientists** – MS degree holders with applied research published in well-cited Web of Science journals, with least 5 years of professional and research experience
- **Bootcamp Resource Persons** – domain experts and practitioners who facilitate knowledge transfer and hands-on training through real-world industrial projects

At the heart of this course is a new and emerging field of Scientific Machine Learning (SciML). This field combines the knowledge of scientific disciplines with ML. You will master SciML after completing this course.

This is not a traditional ML course.

You won't be working on simple, toy Kaggle projects. Instead, you will engage with real-world data and projects, including:

- Modeling and predicting complex dynamical systems
- Developing systems-level models using ordinary differential equations (ODEs) combined with AI/ML
- Applying ML to analyze gene expression time profiles
- Designing artificial neural network–based conditional controllers for biomedical area like artificial organs development as artificial pancreas, artificial heart development
- Creating neural network–based controllers for hybrid AC/DC microgrids
- Creating neural network–based controllers for quadcopter, and vice versa

Bootcamp objectives

- 1) You will confidently transition into the field of Machine Learning (ML).
- 2) You will complete impactful, hands-on ML projects that you can add to your CV.
- 3) You will learn how to identify ML problems in your field of study and start projects independently.
- 4) You will gain the skills to convert your results into a research paper.
- 5) You will learn and begin to master the field of Scientific Machine Learning.
- 6) You will be able to reach out to professors and start ML projects with them—boosting your profile for placements and graduate school applications.

Bootcamp Content

Lecture no.	Lecture	Module	What you will learn
1	Introduction: Transitioning to ML	Introduction	<ul style="list-style-type: none">➤ Introduction to the course➤ How traditional ML is taught➤ Introduction to SciML➤ Basics of SciML➤ Problems which can be solved using SciML➤ Learnings from this course➤ How can you transition to ML?
2	Scientific Machine Learning (SciML) technical overview		
3-4	Installing and understanding <ul style="list-style-type: none">(a) Python and/or(b) Julia programming language	What is Python? What is Julia?	Introduction to python and Julia
5-10	ODE-based model development	What is system of ODEs?	<ul style="list-style-type: none">➤ Building your ODEs for any dynamical problem in hand➤ Design controllers➤ Implement via MATLAB-Simulink and applying optimization technique like genetic algorithm and NN➤ Mini projects➤ Guest Lecture by a distinguished professor with national and international recognition (SINES/SEECS NUST, Islamabad)
11	Physics Informed Neural Networks -Theory	The 2 Pillars of Scientific Machine Learning	<ul style="list-style-type: none">➤ What are Physics Informed Neural Networks (PINNs)?➤ Building your first PINN in Julia➤ Applications of PINNs➤ What are Neural ODEs?➤ Building your first Neural ODE in Julia➤ Applications of Neural ODEs➤ What are Universal Differential Equations (UDEs)?➤ Building your first UDE in Julia➤ Applications of UDEs➤ Mini projects➤ Guest lecture by a distinguished professor with national and international recognition
12	Physical Informed Neural Network -Practical		
13	Neural ODE - Theory		
14	Neural ODE - Practical		
15-16	Graph neural network (GNN) Theory and practical	What is GNN?	<ul style="list-style-type: none">➤ GNN and LLM integration➤ Mini projects ideas and implementation➤ Guest Lecture by a distinguished professor with national and international recognition
17-22	Large language model Theory and practical	What is LLM?	
23	Converting projects idea to research	How to write a research paper?	<ul style="list-style-type: none">➤ What is a research paper and how different is it from a projects?➤ Paper title and abstract➤ Introduction➤ Figures➤ Conclusion

In each lecture, you will get:

1. Access to videos
2. Access to all code files used during the lectures
3. Lecture Notes
4. Homework assignments

4 ways you can access the bootcamp

Student Plan

Lifetime access to all videos, codefiles, homework assignments

Rs 10,000

Community Plan

- **Lifetime access** to all videos, code files, and homework assignment
- **Access to the bootcamp community** on Discord
- **Student collaboration opportunities** via Discord – with potential for co-authored publications
- **Assignment review and doubt clarification** related to lectures and homework
- **Free access** to all Machine Learning webinars and seminar conducted throughout the year

Rs 30,000

Researcher Plan

- **Lifetime access** to all videos, code files, and homework assignments
- **Access to the bootcamp community** on Discord
- **Assignment review and doubt clarification** for lectures and homework
- **Free access** to all ML webinars conducted throughout the year
- **Access to an open list of research problems** in Scientific Machine Learning (SciML)
- **Support in selecting a research topic**
- **4 months of personalized guidance** for conducting research on the selected topic
- **Assistance in publishing** your research in conferences or journals

Rs 50,000

Industry Professional Plan

- **Lifetime access** to all videos, code files, and homework assignments
- **Access to the bootcamp community** on Discord
- **Assignment review and doubt clarification** for lectures and assignments
- **Free access** to all ML webinars conducted throughout the year
- **Access to an open list of research problems** in Scientific Machine Learning (SciML)
- **Guidance in selecting a research topic**
- **Four months of personalized mentorship** for conducting research on the selected topic
- **Support for publishing your research** in conferences or journals
- **AI in Industry:** Lectures on Generative AI and Large Language Models (LLMs)
- **Industry-focused AI doubt clearance forums**
- **Advisory support** for integrating AI into your industry workflows

Rs 100,000

4 ways you can access the bootcamp

Features	Student Plan	Community Plan	Researcher Plan	Industry Plan
Access to all video lectures	✓	✓	✓	✓
Access to all code files used during lectures	✓	✓	✓	✓
Homework assignments	✓	✓	✓	✓
Access to bootcamp community	✗	✓	✓	✓
Assignment checking	✗	✓	✓	✓
Free access to SciML webinars and seminar conducted throughout the year	✗	✓	✓	✓
Access to open list of research problem in SciML	✗	✓	✓	✓
Selection of research topic	✗	✓	✓	✓
Guidance on doing research on chosen topic: Literature review Paper writing Submitting to conferences/journals	✗	✗	✓	✓
Path to ML publication in the selected topic	✗	✗	✓	✓
AI in industry: speaker sessions from top industry experts	✗	✗	✗	✓
Industry AI doubt clearance forums	✗	✗	✗	✓

Our research community focuses on **Scientific Machine Learning (SciML)** techniques across a range of areas, including:

➤ **Computational Biology and Systems Biology**, with specific emphasis on:

- **Computational immunology** and **systems immunology**
- Development of protein-protein interaction models for the dynamics of cancer and infectious diseases

➤ **Computational chemistry**,

- Including the use of **Graph Neural Networks (GNNs)** and **Protein Language Models** to enhance compound–protein interactions (CPIs) and protein–protein interactions (PPIs) predictions

➤ **Biomedical field, including:**

- Signaling control in dynamic models for artificial organs such as the artificial pancreas and heart

➤ **Engineering:**

- Dynamic model and artificial neural network-based conditional controllers tailored to specific problems in areas such as:
- **Aerospace Engineering** with focused dynamic model unmanned Aerial Vehicles (UAVs)
- **Energy systems**, as hybrid AC/DC microgrids

➤ **Computational economics**,

- Leverages machine learning to model complex economic systems, forecast market behavior, and optimize decision-making.
- Integrating data-driven approaches with economic theory for enhanced predictive and analytical capabilities

➤ **Materials science**, with research on:

- Battery degradation
- Sintering dynamic

Additionally, we have proposed a number of distinct advanced project ideas. Please visit our website:

<https://scitechngnexus.com>

FAQ

1) Who are the organizers of this bootcamp?

Global Research Community of STE-NEXUS

2) Is my background suitable?

We have created different plans for students, community members, researchers, and industry professionals. Whether you're a beginner, have some experience, want to get into research, or are already working in the industry – this bootcamp is designed to suit everyone's needs.

3) Are the fees non-refundable?

Yes, the fees for this program are non-refundable. We are confident in the quality of the material, which has been carefully developed through several years of dedicated work.

4) Will the bootcamp be in person or online?

The bootcamp is entirely online.

Student Plan: Access to online content designed for students.

Community Plan: Access to the Discord community managed by the bootcamp organizers.

Researcher Plan: Access to the Discord community, plus a private chat group with the founders.

Industry Professional Plan: Access to the Discord community, plus a private chat group with the founders.

5) I am in a different time zone. Can I still attend the bootcamp?

Yes, absolutely. Live classes is to make the bootcamp accessible to students across multiple time zones.

6) How much time do I need to devote for this bootcamp?

There are approximately 23 lectures, each with coding exercises and assignments. If you dedicate 5–8 days to thoroughly understanding each lecture and completing the assignments, you should be able to finish the bootcamp material within 2 months.

7) I am an industry professional/ doing a PhD. Can I manage this simultaneously?

Yes, 100%. You can watch the lectures at your own pace and get comfortable with the codes and the assignments. You have lifetime access to all materials.

8) For the researcher plan, how much time of personalized assistance will I get for publishing paper?

You will receive 3 months of personalized assistance. We will work on everything together: right from topic selection, literature review, drafting the paper and the submission.

For more questions email to scitechenggngnexus@gmail.com

Thank you

