SPIRAL

PES UNIVERSITY

National-Level Hackathon

SYNAPSE 2.0

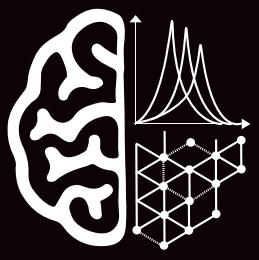
HACKATHON BROCHURE

INDEX

1.0 Introduction

Who are we?

Signal Processing, Imaging, Reasoning and Artificial Learning (SPIRAL) is a technical forum of the Signal Processing and Systems Engineering (SPaSE) domain, Department of ECE, PES University.



SPIRAL, has been Established with a commitment to foster discovery and development, SPIRAL is at the forefront of cutting-edge technology, specializing in signal processing, robotics, and artificial intelligence. SPIRAL provides a dynamic platform for students to engage in an exhilarating journey of innovation.

What is SYNAPSE 2.0?

Get ready to unleash the power of Artificial Intelligence and Machine Learning at SYNAPSE 2.0, a national level hackathon hosted by SPIRAL. This electrifying 24-hour event is your chance to crack real-world problems using cutting-edge AI/ML solutions.

National-Level Hackathon

SYNAPSE 2.0

Think you have what it takes?

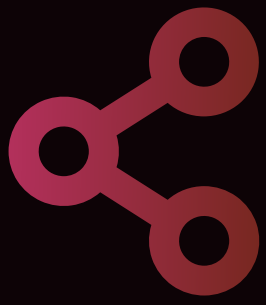
At SYNAPSE 2.0, we're building the future. Here, innovation meets impact. You'll be part of a vibrant community of AI enthusiasts, collaborating and competing to design groundbreaking solutions that address critical challenges.

Why Participate?

Push the boundaries of AI/ML:
Dive deep into the world of AI and Machine Learning under the guidance of industry experts. Refine your technical skills and explore the potential of these powerful technologies.

Hack for real-world impact:
Dive deep into the world of AI and Machine Learning under the guidance of industry experts. Refine your technical skills and explore the potential of these powerful technologies.

Amp up your network:
Connect with fellow AI enthusiasts, mentors, & industry professionals. Forge valuable connections that can accelerate your career in AI/ML.



Become a leader of tomorrow:
Sharpen your problem-solving skills, hone your creativity, and emerge as a future leader in the ever-evolving field of AI.

National-Level Hackathon

SYNAPSE 2.0

is your chance to
turn ideas into reality.

Are you ready to join the REVOLUTION?

2.0 Problem Statements

Computer Vision

Defect Detection In Circuit Boards:

Printed circuit boards play a pivotal role in interconnecting electronic components, forming a crucial stage in electronic product manufacturing. Minor defects within the PCB can render the final product non-functional.

Hence meticulous defect detection procedures are necessary throughout the PCB manufacturing process. Automated defect detection using computer vision can significantly improve manufacturing processes and reduce costs associated with manual inspection.

Autonomous Vehicle Navigation:

Autonomous vehicles enhance road safety by minimizing human errors, improve accessibility for individuals with disabilities and contribute to more efficient transportation systems.

By processing visual data from cameras and sensors, computer vision systems can detect obstacles, interpret road signs, and make real-time decisions, leading to safe transport.

Biomedical Image Analysis:

Computer Vision is crucial for interpreting complex medical images, such as X-rays, MRIs and CT scans, to aid in disease diagnosis and treatment planning.

It enables healthcare professionals to extract valuable insights from large volumes of imaging data, leading to more accurate and timely medical decisions. It also plays a vital role in research by facilitating the study of anatomical structures, disease progression, and treatment efficacy.

Machine Learning

Detection of AI-Generated Media:

With the rise of deepfake technology and large language models, detecting AI-generated media is crucial for preventing misinformation and ensuring the integrity of digital content.

Machine learning models can be trained to identify subtle differences between real and manipulated media, mitigating the spread of misinformation and upholding ethical standards.

Diagnosis From Biomedical Signal Data:

Machine learning is essential for diagnosing medical conditions from biomedical signal data due to its ability to analyse complex patterns and trends that may not be easily discernible by human experts. This helps in earlier and more accurate diagnoses, and optimizing treatment plans.

Anomaly Detection In Sensor Data For IoT:

Machine Learning models can help in the timely identification of abnormal patterns, potential malfunctions, cyber threats, or system failures. By swiftly detecting anomalies, IoT (Internet of Things) systems can mitigate risks, safeguard sensitive data, prevent downtime, and ensure optimal performance.

Reinforcement Learning

Optimal Vehicular Traffic Control:

Reinforcement learning is revolutionizing traffic light control systems by continuously learning from real-time traffic patterns. This adaptive approach allows the system to dynamically adjust signal timings based on current traffic conditions, leading to more efficient traffic flow and reduced congestion.

Optimization through RL improves commute times and also enhances overall road safety.

Nature Conservation:

RL algorithms can predict poaching threats by analysing historical data, terrain features, and animal movements, aiding anti-poaching patrols to safeguard endangered species. RL also assists in habitat management by simulating conservation strategies, helping in balancing ecological needs with human activities.

In waste management, RL optimizes recycling processes, handling diverse waste types effectively. Furthermore, in climate change mitigation, RL aids in energy grid optimization, reducing reliance on fossil fuels by managing renewable energy sources efficiently.

Gaming For Therapy And Mental Health:

Through RL, games can adapt to the player's behavior and preferences, creating personalized experiences. These games can be designed to target specific cognitive skills, such as memory, attention, and problem-solving, aiding in cognitive rehabilitation and mental wellness.

RL also enables the development of virtual environments that simulate real-life scenarios, providing safe spaces for exposure therapy and emotional regulation training.

Robotics

Enhanced Robotic Arm Automation

Develop an innovative robotic arm automation solution that demonstrates advanced capabilities beyond simple path following. Participants are encouraged to explore features such as object recognition and manipulation, adaptive grasping, or collaborative tasks.

The goal is to showcase the versatility and intelligence of robotic arms in various applications, highlighting advancements in automation and robotics technology.

Gesture-Controlled Robotics

Design and implement a robotic system capable of interpreting and responding to hand gestures for basic navigation commands. Participants will explore machine vision, sensor fusion, and robotics to create an intuitive and responsive interaction between humans and machines.

The challenge involves developing algorithms for gesture recognition and mapping them to corresponding robot actions such as movement, turning, and stopping. Participants can leverage various hardware platforms and programming languages to showcase their innovation in gesture-controlled robotics.

Autonomous Exploration for Disaster Response

In the aftermath of a disaster, such as an earthquake or a building collapse, navigating through debris-filled environments is a challenging task for rescue teams. In this hackathon, participants will develop a robot (or simulation) capable of autonomously navigating a maze representing a disaster area. The robot should be able to start from any position within the maze and find the optimal path to reach a simulated survivor (the goal).

This challenge requires innovative solutions in robotics, AI, and path planning to address real-life problems faced by rescue teams in disaster scenarios.

3.0 Itinerary

19th & 20th APRIL

2:00 PM - 3:00 PM	Registrations
3:20 PM - 4:20 PM	Inauguration
4:30 PM	Hackathon Begins
6:00 PM - 7:30 PM	Review
7:30 PM - 8 PM	Snacks
9 PM - 10 PM	Dinner
12 AM - 1 AM	Mid - Night Snack
2 AM - 3 AM	Mini - Games
5 AM - 7:30 AM	Review - 2
9 AM - 10 AM	Breakfast
12 PM - 1:30 PM	Final Review
1:30 PM - 2:30 PM	Lunch
2:30 PM - 3:00 PM	Top 10
3:30 PM - 5:00 PM	Final Presentations
5:00 PM - 6:00 PM	Winners & Closing Ceremony

4.0 Important Information

4 Tracks →

Computer Vision

Robotics

Reinforcement Learning

AI / ML

Submission
1 /team

Team Size
3 - 4 /persons

Idea Submission Deadline
4th April

Open To **ALL** College Students

Top 30 To Be Decided On
10 th
APRIL

Hack It Out In Bangalore On
19 th & 20 th
APRIL

Choose A Problem Statement **OR** Make Your Own