

DELEGATE BOOKLET : Guidelines and competition framework

01| What is the Institute of Electrical and Electronics Engineers?

IEEE is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity. IEEE leads in *advancing technology* for humanity across *electrical engineering, computer science, and related fields*. Home to 150+ peer-reviewed journals, magazines, and conference proceedings. IEEE maintains the highest ethical standards, a rigorous peer-review process, and robust global collaborations.

02| What is IEEE Engineering Medicine and Biology Society - University of Sri Jayewardenepura

The IEEE Engineering in Medicine and Biology Society (EMBS) Student Branch Chapter at the University of Sri Jayewardenepura is a vibrant, multidisciplinary community dedicated to empowering undergraduates with technical skills, industry exposure, and opportunities for academic excellence.

Working at the intersection of biosciences, engineering, and technology, EMBS-USJ brings together students from the faculties of Applied Sciences, Engineering, Technology, and Medicine, creating a unique platform for collaboration and innovation.

As part of the global IEEE EMBS network, the chapter connects students to international trends, cutting-edge research, and leading professionals through workshops, seminars, and professional development events. The chapter also supports its members in developing leadership, teamwork, and project management skills through its innovative initiatives and partnerships with academic and industry stakeholders.

03| What is BioFusion?

BioFusion is a national science convention and career fair organised by the IEEE EMBS Student Branch Chapter of the University of Sri Jayewardenepura, bringing together groundbreaking innovations from academia and industry under one platform. The event features an undergraduate research showcase, an industry innovation expo, and a career fair, creating opportunities for collaboration, talent discovery, and cross-contribution between industry and academia.

04| What is the BioFusion Hackathon?

The BioFusion Hackathon is a medical-themed AI/ML competition held in conjunction with the BioFusion Science Convention. Conducted entirely online, the hackathon invites participants to develop innovative machine-learning solutions to a healthcare or medical problem of their choice. It serves as a platform for students to apply their technical skills to real-world challenges, showcase creativity, and contribute to the future of medical technology.

05| Event Structure

Teams choose one medical/ healthcare related problem and propose an innovative, machine learning solution using datasets available on an open source dataset repository of their choice.

Teams build a working machine learning model focusing on creativity, relevance, and feasibility.

Teams submit their Google Colab notebooks and report via the provided Google Form link before the submission deadline at 8 PM on the 4th Jan 2026.

Submissions are evaluated by a panel of subject expert academics, and finalists are announced.

Winners will be awarded at the Award ceremony of the BioFusion event on the 22nd of January 2026.

06 | WHY SHOULD YOU PARTICIPATE?

Collaborate and Innovate

Work with like-minded peers in a team setting to ideate, develop, and pitch machine learning solutions to a real-world healthcare problem

Network with Industry Experts

Connect with mentors, professionals, and judges from industry and academia

Boost Your Portfolio

Showcase your cloud projects to potential recruiters or institutions

Win Exciting Prizes and Recognition

Compete for a prize of Rs. 50,000 and gain official certificates that recognize your skills

07| Prize Pool

1st Place - 50,000 LKR + Certificate

2nd Place- 15,000 LKR + Certificate

3rd Place - 10,000 LKR + Certificate

Certificates to all finalists

Digital Certificates to all participants

08| How to Register?

Form a team.

Teams must designate a leader responsible for submitting the registration form and receiving official communication.

Application must be submitted by team leader. Individual competitors may submit the application by themselves.

Register! Click [HERE](#) to fill out the application.

09| Team Formation

Each team may consist of 3-5 members.

A team must not exceed 5 members.

Team members may be from different universities. Only students enrolled in Sri Lankan universities are allowed.

All team members must be undergraduate students.

Teams cannot be changed after registration is complete.

Each participant may join only one team.

10| Event Overview

Participants design and implement a complete solution using AI for a healthcare or medical-related problem of their choice.

Each team will submit:

1. A Google Colab Notebook (with full code with comments, logs, outputs, metrics).
2. A Technical + Application Report (PDF).

Finalists are selected based on technical evaluation, documentation quality, and model performance.

11| Project Requirements

Participants must select:

1. A medical/healthcare problem
2. A dataset from an open source dataset repository (eg: Kaggle, OpenML)

12| Allowed Resources

✓ Allowed

- Any dataset from an **open source** dataset repository.
- Jupyter Notebook, Google Colab, Kaggle Notebook.
- Publicly available Python packages (TensorFlow / PyTorch / scikit-learn / OpenCV / NumPy / Pandas / Matplotlib etc.).
- Pretrained models, pretrained weights and embeddings are allowed, but the details of the pretrained model and model architecture should be clearly documented and justification for choosing the specific model should be provided.
- Academic papers, online documentation, textbooks.

Not Allowed

- Datasets from repositories that require subscriptions or membership are not allowed.
- Should not be another person's work. If proven even after announcing the winners teams can be disqualified.
- AutoML tools
- Previously built pipelines.

13| Submission Requirements

Submit the following renamed in the given format;

- A. Notebook - renamed as **TeamName_Notebook** (File format : .ipynb)
B. Report - renamed as **TeamName_Report** (File format: .pdf)

A. Notebook (Required Format)

Your notebook **must include all of the following**:

1. Problem Definition

- Clinical/healthcare relevance
- What is being predicted?

2. Dataset Documentation

- Full citation of the dataset
- Variables / labels description
- Data distribution + basic analysis
- Preprocessing steps taken

3. Model Initialization & Pretraining Disclosure

A. Pretrained model used

- Model name
- Source
- Task it was originally trained on (e.g., ImageNet, clinical text, generic images)

B. Weight usage

Did you use existing learned weights or did you start from scratch?

You must clearly state one of these:

- Used pretrained weights.
- Random initialization (training from scratch)

4. Model Development

- Full architecture (from scratch) or using a pretrained model and justification for the chosen design.
- List and explain all hyperparameter choices (learning rate, batch size, optimizer, etc.)
- Fine-tuning / Training Strategy.
- Clearly show in code and markdown:
 - Which layers are frozen
 - Which layers are partially trainable
 - Which layers are fully trainable
 - Whether pretrained backbone is used only as a feature extractor or fully fine-tuned

Deep Learning Models

- You must **show how your model learns** by displaying the following steps:
 - Forward pass → how inputs produce predictions
 - Loss computation → how errors are calculated
 - Backpropagation → how gradients are computed
 - Optimizer update → how model weights are updated

- **Do not hide** training steps in one-line automated calls/ high level functions (eg: `model.fit()`) without explanation.

Machine Learning Models

- Clearly document your training procedure in code and markdown:
 - How the model was trained
 - Hyperparameters used
 - Data splitting strategy

Validation Approach

- Use train/validation/test split or k-fold cross-validation
- Explain your choice and show it in code/markdown

5. Outputs & Logs

- Training curves (loss, accuracy, etc.)
- Validation metrics
- Error analysis
- Computational constraints faced

6. Performance Metrics, including but not limited to

- Primary metrics
- Secondary metrics
- Confusion matrix (if classification)
- ROC curves (if applicable)

7. Reproducibility

-  Code cells must run when configurations are set up
- Random seeds must be set

8. Final Model File

B. Report (PDF)

Page Limit: 5 pages

Font Size : 12

Font Type : Times New Roman

Line Spacing : 1.15

Your report must include:

1. Literature Review

- Min 3 research papers
- What has been done before?
- Gaps in existing work
- What your solution improves or proposes

2. Problem Identification

- Who is affected?
- Why is this problem important?
- Specific unmet need in healthcare

3. Dataset Justification - Why the selected dataset is appropriate

4. Methodology

- Data preprocessing pipeline
- Model architecture (diagrams encouraged)
- Training process
- Validation strategy

5. Pretrained Model Usage & Adaptation

This should include:

a. Rationale

- Why a pretrained model was chosen
- Why it is appropriate for the medical task

b. Modifications

- Architectural changes made (e.g., replaced classifier head)
- New layers added
- Output adaptation

c. Training strategy

- Fine-tuning vs feature extraction
- Learning rates used for:
 - Pretrained layers
 - Newly added layers (if different)

d. Risk & bias discussion

- Domain mismatch (e.g., natural images → medical images)
- Potential bias inherited from pretraining data

5. Results

- Metric tables
- Visualizations
- Error analysis
- Limitations of your model

6. Real-world Application

- Proposed deployment scenario
- Potential users (clinicians, patients, hospitals)
- Integrating into healthcare workflow
- Risks & limitations

7. Marketing & Impact Strategy

- Who would adopt it?
- Practical benefits
- Cost, accessibility, reach

8. Future Improvements

- Model enhancements

- Additional data needs
- Clinical translation pathways

14| Rules and Regulations

Rules About Data

- ✓ Must be from an open source database repository.
- ✓ Teams may combine multiple datasets
- ✓ Data set used must have > 300 records. When using smaller datasets, competitors must clearly document the justification for the use of a smaller dataset.
- ✓ Standard data augmentation techniques (e.g., rotation, flipping, cropping) are allowed.
- ✗ Adding samples from external datasets or scraping additional images/text is not allowed.

Use of pretrained components must be explicitly declared

Other Rules

- All submissions due by **8 PM** on 4th Jan 2026.
- Only 1 submission per team
- Late submissions will not be accepted
- Plagiarism or code copying leads to disqualification

15| Evaluation criteria

Projects will be evaluated based on methodological rigor, transparency, and appropriateness of design, regardless of whether models are trained from scratch or initialized with pretrained weights.

The judge's decision will be the final decision.

A. Technical Evaluation (Model + Methods) — 65%

Category	Weight	Details
Model design and adaptation	20%	Appropriateness of model choice for the medical problem. If pretrained: correctness of adaptation If from scratch: soundness and originality of architecture Providing clear justification of design decisions.
Data Understanding & Preprocessing	10%	Dataset suitability and understanding Handling of imbalance, noise, missing data Prevention of data leakage
Training & Validation Strategy	10%	Correct training loop implementation Hyperparameter choices and justification Validation method (train/val/test, k-fold) Fair evaluation and reproducibility

Performance Metrics (task-appropriate)	20%	Correct choice of metrics for the task Honest reporting of results Interpretation of metrics Comparison with baselines (if provided)
Error Analysis and limitations	5%	Insight into failures, Model weaknesses

B. Notebook Quality — 20%

Category	Weight	Details
Code Clarity & Documentation	10%	Readability, comments, logical cell order
Reproducibility	10%	Runs without errors, paths intact, no hidden dependencies, Explicit disclosure of pretrained components.

C. Technical & Application Report — 15%

Section	Weight	Details
Literature Review & Problem Identification	5%	Understanding of clinical context + research foundation
Methodology Explanation	5%	Clear reasoning, workflow diagrams, decisions justified Transparency of pretrained model usage, Appropriateness of pretraining source Discussion of bias, domain mismatch, and limitations
Results, Discussion, Real-World Application	5%	Interpretation of findings, practicality, limitations

16| Contact Details

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