



## Students' Placement Office, IIT Kanpur

### Project Verification Form



Title of the Project	Small-World-Inspired Optical Neural Network
Commencement Date	15 May 2025
Completion Date	Ongoing
Project Supervisor	Prof. Rajesh M. Hegde
Organization/Institution where the Project was accomplished	Indian Institute of Technology, Kanpur
Project Description (You can use extra A4 sheets in case you run out of space however the extra sheets should also have the seal & signature of the Project Supervisor or the relevant authority )	
<p>Objective</p> <ul style="list-style-type: none"> <li>To develop a novel small-world-inspired Optical Neural Network (ONN) architecture for image classification.</li> </ul> <p>Approach</p> <ul style="list-style-type: none"> <li>Designed a grayscale ONN based on a Multi-Lens Array (MLA) with small-world inter-layer connections to capture local and global spatial features; a cross-layer connections based multi-lane small-world model was also developed</li> <li>Implemented saturable absorber to introduce non-linearity, significantly enhancing model optimization and learning capability</li> <li>Extended the model for RGB inputs by constructing three parallel small-world ONN subnetworks for the R, G, and B channels, each independently capturing color-specific features and merging them through a final feature-fusion stage</li> <li>An ensemble of small-world ONN variants was also constructed to enhance robustness and generalization performance.</li> </ul> <p>Impact</p> <ul style="list-style-type: none"> <li>Achieved 98% on MNIST, 82.78% on EMNIST, and 87.88% on Fashion-MNIST; for CIFAR-10, reached 55.87%</li> <li>Performance gains stem from integration of MLA, saturable absorber, and small-world connectivity, enabling efficient and compact ONN design</li> </ul>	

**By appending your signatures to this form you acknowledge and agree that:**

- This form along with the certificate would serve as the official document between the project supervisor and Students Placement Office, IIT Kanpur regarding verification of the student's project work
- The student will provide additional information and documentation relevant to his/her project upon request by the Students' Placement Office
- The student has clearly defined his/her individual role in projects done in cooperation with other students, faculty, groups or company personnel.
- Incorrectly over-stating the reach, impact and/or quantitative/qualitative results of a project is unethical.
- In case of violation of any of the above rules, Students' Placement Office, IIT Kanpur reserves the right to take necessary action including de-registering the student from the placement season and reporting the misconduct to the Institute Authorities.

Submitted by:-	Project Supervisor Details:-
Name: Kaushal Mehra	Name: <i>Rajesh M. Hegde</i>
Roll No: 230546	Designation: <i>Professor</i>
Signature: <i>Kaushal Mehra</i>	Signature: <i>[Signature]</i>

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