# **High Impact Skills Development Program** **AI & Data Science**

**Neural Network Module Project-I**

**Project Title: Train a CNN on the SVHN Dataset for Classification**

**Learning Objectives:**

* Understand the fundamentals of using a Convolutional Neural Network (CNN).
* Learn how to use TensorFlow/Keras for deep learning.
* Gain hands-on experience working with real-world image datasets.
* Learn to preprocess data for optimal model performance.
* Train and evaluate a CNN for digit classification.

**Overview:**

This project focuses on training a CNN on the Street View House Numbers (SVHN) dataset to classify images of digits. The dataset presents unique challenges due to its real-world nature, including variations in lighting, scale, and rotation of digits. The goal is to build a model that accurately classifies digits despite these challenges.

Such a system can be useful in numerous applications, such as automatic number plate recognition, postal address scanning, or digit classification in mobile applications. The project will help participants implement concepts learned in computer vision by developing a robust CNN model that can handle real-world digit classification.

**Dataset:**

The dataset used for this project is the Street View House Numbers (SVHN) dataset, which contains over 600,000 labeled digit images. The dataset is available for download from the following link:  
[SVHN Dataset](http://ufldl.stanford.edu/housenumbers/)

**Project Stages:**

1. **Preprocessing**:
   * Normalize the pixel values and apply data augmentation techniques to increase the diversity of the training set (e.g., rotation, zoom, and flip).
2. **Training**:
   * Use TensorFlow/Keras to build and train a CNN on the SVHN dataset. Experiment with different architectures and hyperparameters (e.g., number of layers, learning rate).
3. **Testing**:
   * Evaluate the performance of the model on the test dataset to ensure that the model generalizes well to unseen data.
4. **Evaluation**:
   * Measure the model’s accuracy, precision, recall, and F1-score. Use a confusion matrix to understand which digits are misclassified and why.

**Requirements:**

1. Create a GitHub account.
2. Share your GitHub profile link in the project report.
3. Upload your code to GitHub.
4. Prepare a short 3-4 page report detailing the project:
   * **Title**
   * **Your name, email address, GitHub profile link**
   * **100-word project summary**
   * **Details**: Overview, literature review (2 articles from 2022-23), model architecture, dataset details, hyperparameters, evaluation metrics, analysis of results, and possible improvements.
5. Prepare a 5-slide presentation summarizing the work.
6. Submit the report and slides to the LMS.

**Timeline for Project:**

**Day 1**: Project Introduction, Dataset Overview, Initial Implementation  
**Day 2**: Continued Implementation, Model Development  
**Day 3**: Complete Model Training, Write Report, Prepare Slides  
**Day 4**: Submit Report and Presentation