Project Design Phase-I
Proposed Solution Template

Date	19 September 2022
Team ID	PNT2022TMID53272
Project Name	Project - A Novel Method for Handwritten Digit Recognition System
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
	Problem Statement (Problem to be solved)	In the era of digitalisation, handwritten data can be a huge hinderance. There is a huge need to convert handwritten numerical data into digital data. However doing this process manually can be daunting due to the large amount of handwritten data that needs to be digitalised. Hence a method for computers converting handwritten numerical data to digital data is required. Various machine learning methods are available for this purpose. An efficient model will be used to detect numerical data in images.
	Idea / Solution description	Our team aims to develop a Novel Handwritten Digit recognition system that allows user to pass an input image and get an accurate prediction of the digits present in the image. The application will be efficient in time and space and also detect complex digit patterns accurately.
	Novelty / Uniqueness	While many methods exist to detect numerical data in images, our method proposes using auto encoders along with a classifier for the purpose of detecting numerical data. Reasons for choosing the above is that the method is unsupervised, which makes training large amounts of data easier and also the features of the output image will not be necessary as we need only the predicted value of numerical data.

	Social Impact / Customer Satisfaction	This application will help organisations in effectively detecting numerical data in images as auto encoders have very low space complexity thereby allowing large amounts of data being easily processed for the organisation.

	Business Model (Revenue Model)	**Key partners:** The members of the team alongside SSN and IBM mentors will work towards the development of this application. **Key resources:** The resources for the development are obtained using our personal equipment, various IDE, IBM's database and software, image dataset(numerical handwritten data), college systems etc. **Activities:** The main activities include building an auto encoder model using Jupyter Notebook or Google Colab, developing an application for the model using Flask, interfacing it with IBM DB2, SendGrid, containerising the application, and hosting it on the cloud. **Value Proposition:** The users will be provided with a web application that has a friendly GUI and serves all the tasks of the application in a transparent manner. Security compliance will be strictly monitored to ensure that the user's data is safeguarded against any form of threats. **Cost Structure:** Cost is levied due to the usage of proprietary software. However, IBM's software is provided to us due to the fortunate initiative. Other such software that are non-IBM may add on to the expenses if inevitable. **Revenue Streams:** Subscription fees, unlocking premium features, expanding the storage of the application etc. **Customer Segments:** Students, Interested individuals, Family Members, Working Professionals, Organisations **Customer Relationships:** All the customer segments will be treated alike. Thus, all the users will be treated in a strictly professional manner, i.e every user will be treated in a fair manner, a prospective customer with no additional priorities etc. **Channels:** The application will be publicised through the usage of various social media platforms and through word of mouth. As users begin to use the application, ratings in Google, Play Store, and App Store would increase, resulting in a huge influx of customers.

	Scalability of the Solution	The application will be scalable based on the requirements of the future. For instance, the application can be deployed in malls, houses or any public place with CCTV cameras which can monitor vehicle numbers of all vehicles coming in and out of the place. Similarly, the application could be made more advanced and modern by integrating an IoT feature that warns any unknown or barred vehicle entering the premises.