Ideation Phase

Define the Problem Statements

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

CleanTech: Transforming Waste Management with Transfer Learning

HematoVision aims to develop an accurate and efficient model for classifying blood cells by employing transfer learning techniques. Utilizing a dataset of 12,000 annotated blood cell images, categorized into distinct classes such as eosinophils, lymphocytes, monocytes, and neutrophils, the project leverages pre-trained convolutional neural networks (CNNs) to expedite training and improve classification accuracy. Transfer learning allows the model to benefit from pre-existing knowledge of image features, significantly enhancing its performance and reducing computational costs. This approach provides a reliable and scalable tool for pathologists and healthcare professionals, ensuring precise and efficient blood cell classification.

Scenario 1: Automated Diagnostic Systems for Healthcare

Integrating HematoVision into automated diagnostic systems in clinical settings can revolutionize blood analysis. By using transfer learning, the system quickly adapts to the specifics of blood cell classification, capturing images of blood samples, classifying the cells in real-time, and generating detailed reports. This automation reduces the manual workload on pathologists, speeds up diagnostic processes, and ensures high accuracy in results, ultimately improving patient care and treatment efficiency.

Scenario 2: Remote Medical Consultations

HematoVision can be employed in telemedicine platforms to enhance remote consultations and diagnostics. With transfer learning, the model's ability to accurately classify blood cells from diverse sources is improved, allowing healthcare providers to upload blood cell

images for automated analysis. This enables timely and accurate assessments without the need for in-person visits, facilitating better access to specialized medical expertise and improving healthcare delivery in remote or underserved areas.

Scenario 3: Educational Tools for Medical Training

HematoVision's transfer learning-based classification model can be integrated into educational tools for medical training. By incorporating this advanced technology into interactive learning platforms, students and laboratory technicians can upload and analyze blood cell images to receive instant feedback. This hands-on learning experience enhances their understanding of blood cell morphology and classification, providing practical skills and knowledge that are crucial for accurate diagnostic practice and medical training.

Prior Knowledge

You must have prior knowledge of the following topics to complete this project:

- DL Concepts

- Neural Networks: https://www.analyticsvidhya.com/blog/2020/02/cnn-vs-rnn-vs-mlp-analyzing-3-types-of-neural-networks-in-deep-learning/

- Deep Learning Frameworks: https://www.knowledgehut.com/blog/data-science/pytorch-vs-tensorflow

- Transfer Learning: https://towardsdatascience.com/a-demonstration-of-transfer-learning-of-vgg-convolutional-neural-network-pre-trained-model-with-c9f5b8b1ab0a

- VGG16: https://www.geeksforgeeks.org/vgg-16-cnn-model/

- Convolutional Neural Networks (CNNs): https://www.analyticsvidhya.com/blog/2021/05/convolutional-neural-networks-cnn/

- Overfitting and Regularization: https://www.analyticsvidhya.com/blog/2021/07/prevent-overfitting-using-regularization-techniques/

- Optimizers: https://www.analyticsvidhya.com/blog/2021/10/a-comprehensive-guide-on-deep-learning-optimizers/

- Flask Basics: https://www.youtube.com/watch?v=lj4I_CvBnt0

Project Objectives

- Know fundamental concepts and techniques used for Deep Learning.

- Gain a broad understanding of data.

- Have knowledge of pre-processing the data/transformation techniques on outliers and some visualization concepts.

Project Flow

- The user interacts with the UI (User Interface) to choose the image.

- The chosen image is analyzed by the model which is integrated with the flask application.

- Once the model analyses the input the prediction is showcased on the UI.

Activities

- Data Collection: Collect or download the dataset that you want to train.

- Data pre-processing

- Data Augmentation

- Splitting data into train and test

- Model building

- Import the model-building libraries

- Initializing the model

- Training and testing the model

- Evaluating the performance of the model

- Save the model

- Application Building

- Create an HTML file

- Build python code

Project Structure

Create the Project folder which contains files as shown below

We are building a Flask application with HTML pages stored in the templates folder and a Python script app.py for scripting.

Vgg16.h5 is our saved model. Further, we will use this model for flask integration.

Architecture