Capstone Project: Computer Vision for Image Classification

Objective:
The objective of this capstone project is to develop a computer vision solution for image classification tasks. The project involves image collection, preprocessing, model training using basic CNN and transfer learning techniques, evaluation, hyperparameter tuning, and deployment of the best-performing model as a web application.

Dataset:
- The dataset for this project should comprise at least 5000 images.
- Image collection will involve gathering images from various sources and uploading them to a cloud storage platform such as SharePoint or Google Drive.

Project Workflow:
1. Image Collection:
   - Gather at least 5000 images relevant to the classification task.
   - Organize the images into appropriate categories.

2. Data Management:
   - Upload the images to a cloud storage platform (e.g., SharePoint, Google Drive) for easy accessibility and collaboration.

3. Preprocessing and Augmentation:
   - Preprocess the images to ensure uniformity and compatibility with the chosen model.
   - Apply augmentation techniques to increase the diversity of the dataset and improve model generalization.

4. Model Building:
   - Build a basic Convolutional Neural Network (CNN) model for image classification.
   - Apply different transfer learning techniques using pre-trained models (e.g., VGG, ResNet, Inception) to leverage their learned features.

5. Model Evaluation:
   - Evaluate the performance of each model using appropriate evaluation metrics (e.g., accuracy, precision, recall).
   - Compare the performance of the basic CNN model and the transfer learning models.

6. Hyperparameter Tuning:
   - Conduct hyperparameter tuning to optimize the performance of the models.

7. Model Selection:
   - Select the best-performing model based on evaluation metrics and hyperparameter tuning results.
   - Justify the selection of the best model based on its performance and suitability for the task.

8. Web Application Development:
   - Develop a web application to deploy the best-performing model.
   - Provide user-friendly interfaces for uploading images and displaying classification results.

9. Reporting:
   - Prepare a detailed image analysis and modeling report documenting the project workflow, findings, and conclusions.
   - Create a PowerPoint presentation summarizing the key aspects of the project for presentation.

Deliverables:
- Organized dataset with at least 5000 images.
- Preprocessed and augmented image dataset.
- Jupyter Notebook or Python script containing code for model building, evaluation, and hyperparameter tuning.
- Web application URL and files for model deployment.
- Detailed image analysis and modeling report.
- PowerPoint presentation slides.

Evaluation Criteria:
- Completion of each project stage.
- Quality of image preprocessing, augmentation, and model building.
- Effectiveness of model evaluation and hyperparameter tuning.
- Successful deployment of the web application.
- Clarity and coherence of the image analysis and modeling report.

Resources:
- Sample Dataset Sources: [https://www.kaggle.com/] [https://roboflow.com/]