

**INXOL TECHNOLOGIES**

**TASK 1**

IMAGE CLASSIFICATION

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***Problem Statement***

In a modern and technologically advanced world, an intelligence agency is tasked with monitoring public spaces and gathering information for various purposes, including security and threat assessment. As part of their efforts, the agency is collecting vast amounts of data, including facial images of individuals, from surveillance cameras, social media, and other sources.

One specific task they are working on is to develop an AI-powered gender classification model. This model will be used to automatically classify the gender of individuals in the collected facial images. The agency believes that this information could provide valuable insights into demographic patterns and potentially aid in identifying persons of interest more efficiently.

***Your Task:***

You are supposed to create ***Gender Classification*** model using ***Human Facial*** images dataset. Develop gender classification models using provided approaches:

* **Machine Learning Model:** Train a classification model using machine learning. Measure accuracy and computational cost.
* **Dense Neural Network:** Develop and train a dense neural network. Evaluate accuracy and computational cost.
* **Convolutional Neural Network (CNN):** Create a CNN architecture for gender classification. Assess accuracy and computational cost.
* **VGG16 Fine-Tuning:** Employ transfer learning with VGG16. Document accuracy and computational cost enhancements.

***Methodology:***

**Data Collection:** Collect Human Facial images dataset from Kaggle etc.

**Data Preprocessing:** Clean the dataset by removing duplicates, irrelevant images, and correcting any labeling errors. Resize or crop images to a consistent size to ensure uniformity. Normalize pixel values to a common scale (e.g., 0 to 1).

**Data Augmentation (Optional):** Generate additional training data by applying transformations like rotation, scaling, and flipping to enhance model generalization.

**Dataset Splitting:** Divide the dataset into training, validation, and test sets. The training set is used to train the model, the validation set helps tune hyperparameters, and the test set evaluates the final model's performance.

**Model Selection:** Train Above four models on dataset.

**Model Evaluation:** Assess the model's accuracy, precision, recall, F1-score, and other relevant metrics on the test set. This step provides insights into the model's real-world performance.

***Evaluation:***

Create a comparison documentation where accuracy, results, computational cost and training time of each model will be compared. Also discuss your findings.

***Conclusion:***

This study aims to provide a comprehensive analysis of four different approaches for gender classification on facial images. The comparison documentation will offer insights into the trade-offs between accuracy and computational cost, aiding decision-making for selecting the most suitable model for gender classification tasks.