# **Evaluating the Efficacy and Impact of Batch Normalization, Dropout Rates, and Neural Architectures on Image Classification**

## Topic

Comparative Analysis of Neural Architectures and Regularization Techniques in Deep Learning Models for Image Classification.

## Objective

To systematically analyze the impact of Batch Normalization and varying dropout rates on the performance of different neural architectures, aiming to identify optimal configurations for efficient and accurate image classification.

## Summary

This project aims to provide an in-depth benchmarking analysis of various neural network architectures with a special emphasis on image classification tasks. By examining the effects of Batch Normalization, Dropout, and architectures like CNN, ANN, and ViT, the project seeks to glean insights into optimizing error rates, training durations, hardware resource utilization, and ensuring stable training dynamics.

## Group Members

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## Detailed Plan

Neural Architecture Comparison: Benchmark the baseline performance of various image classification models trained using CNN, ANN, and ViT variants.

1. Hyperparameter Tuning: While keeping certain hyperparameters constant (such as learning rate, optimizer type, etc.), models from each architecture (CNN, ANN, ViT) will undergo training with dropout rates of p = 0.2, 0.3, 0.4, and 0.5 without Batch Normalization. Subsequently, they'll be trained with Batch Normalization but without Dropout. Key performance metrics such as accuracy, loss, training duration, resource utilization, and loss curves, among others, will be reported.
2. Dataset Utilization: Multiple datasets from Kaggle will be fused to create a custom-tailored dataset, focusing on more than five distinct classes. A brief methodology will be established to ensure seamless integration and compatibility of these datasets.
3. Conclusions: The final phase will synthesize all findings, aiming to pinpoint the most efficient configurations for each neural architecture. This will provide the deep learning community with valuable insights into leveraging Batch Normalization, Dropout, and specific neural architectures for image classification tasks.