ANNEXURE II

SUBMISSION OF PROJECT SYNOPSIS AND GUIDE ACCEPTANCE FORM

(To be submitted to the Project Steering Committee)

PART A: Project Synopsis

I. Student Details:

1. Name of the Program: BCA
2. Name of the Student: ASHA S R
3. Roll Number: 2214100645
4. Session & Year: MARCH 2024

II. Project Synopsis:

1. Title of the Project:

AI-based Image Classifier

2. Introduction and Review of Literature:

In recent years, artificial intelligence (AI) has made significant strides in the field of image classification. Image classification involves categorizing images into predefined classes based on their visual content. This technology has a wide range of applications, including medical imaging, autonomous vehicles, security systems, and social media. The advent of deep learning, particularly convolutional neural networks (CNNs), has revolutionized image classification by achieving unprecedented accuracy levels.

Early methods of image classification relied on manual feature extraction and traditional machine learning algorithms. However, these methods were limited by their inability to handle the complexity and variability of real-world images. The introduction of CNNs, as demonstrated by Krizhevsky et al. in their groundbreaking work on AlexNet, marked a significant breakthrough. CNNs automatically learn hierarchical features from raw pixel data, enabling them to capture intricate patterns and structures in images.

Subsequent advancements, such as VGGNet, ResNet, and InceptionNet, have further improved the performance and efficiency of CNNs. These models have been trained on large-scale datasets like ImageNet, which contains millions of labeled images across thousands of categories. Transfer learning, a technique where pre-trained models are fine-tuned on specific tasks, has also become a popular approach to leverage the power of these state-of-the-art models for various applications.

Despite these advancements, challenges remain in the field of image classification. Issues such as data scarcity, class imbalance, and adversarial attacks pose significant hurdles. Researchers are actively exploring techniques like data augmentation, synthetic data generation, and robust model architectures to address these challenges.

3. Objectives of the Study:

The primary objectives of this study are:

- To develop an AI-based image classifier using convolutional neural networks (CNNs).
- To evaluate the performance of the classifier on a benchmark dataset.
- To explore the impact of various hyperparameters and data augmentation techniques on the classifier's accuracy.
- To implement transfer learning to enhance the classifier's performance on specific image classification tasks.
- To analyze the classifier's robustness against adversarial attacks and propose potential mitigation strategies.

4. Research Methodology:

The research methodology for this project involves the following steps:

1. Literature Review: Conduct a comprehensive review of existing literature on image classification techniques, focusing on CNNs and their applications.
2. Dataset Selection: Choose a benchmark dataset, such as CIFAR-10 or ImageNet, for training and evaluating the image classifier.
3. Data Preprocessing: Perform data preprocessing steps, including normalization, resizing, and data augmentation, to prepare the dataset for training.

4. Model Development: Develop a CNN-based image classifier using popular deep learning frameworks like TensorFlow or PyTorch. Experiment with different architectures, such as AlexNet, VGGNet, and ResNet.
5. Training and Evaluation: Train the model on the selected dataset and evaluate its performance using metrics like accuracy, precision, recall, and F1-score. Perform hyperparameter tuning to optimize the model's performance.
6. Transfer Learning: Implement transfer learning by fine-tuning a pre-trained model on the specific image classification task. Compare the performance with the baseline model.
7. Robustness Analysis: Analyze the classifier's robustness against adversarial attacks using techniques like FGSM (Fast Gradient Sign Method) and propose potential mitigation strategies.
8. Documentation and Reporting: Document the entire process, including the methodology, results, and conclusions. Prepare a detailed project report and presentation.

5. Technology to be Used:

The following technologies will be used in this project:

1. Programming Languages: Python will be the primary programming language due to its extensive libraries and frameworks for machine learning and deep learning.
2. Deep Learning Frameworks: TensorFlow and PyTorch will be used for developing and training the CNN models. These frameworks provide powerful tools for building, training, and evaluating deep learning models.
3. Data Processing Libraries: Libraries such as NumPy, Pandas, and OpenCV will be used for data preprocessing and augmentation.
4. Visualization Tools: Matplotlib and Seaborn will be used for visualizing the data and model performance metrics.
5. Hardware: A high-performance GPU will be utilized to accelerate the training process. Cloud-based platforms like Google Colab or AWS EC2 can be used for accessing GPU resources.
6. Version Control: Git will be used for version control to manage the project's codebase and collaborate with team members.

6. References:

- Krizhevsky, A., Sutskever, I., & Hinton, G. E. (2012). ImageNet Classification with Deep Convolutional Neural Networks. Advances in Neural Information Processing Systems, 25, 1097-1105.
- Simonyan, K., & Zisserman, A. (2014). Very Deep Convolutional Networks for Large-Scale Image Recognition. arXiv preprint arXiv:1409.1556.
- He, K., Zhang, X., Ren, S., & Sun, J. (2016). Deep Residual Learning for Image Recognition. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 770-778.
- Szegedy, C., Liu, W., Jia, Y., Sermanet, P., Reed, S., Anguelov, D., ... & Rabinovich, A. (2015). Going Deeper with Convolutions. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 1-9.
- Goodfellow, I. J., Shlens, J., & Szegedy, C. (2015). Explaining and Harnessing Adversarial Examples. arXiv preprint arXiv:1412.6572.

III. Guide Details:

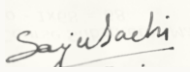
1. Name of Proposed Guide: Saju Sachi
2. Guide Registration No. (If available): Guide Approved
3. Designation: Technical Architect
4. Affiliation:
5. Qualification: B-Tech
6. Total Experience: 18 Years
7. Communication Address: Revathi, Poothakkulam, Kollam, Kerala - 691302
8. Contact No.: 9447328588
9. E-mail ID: sajusachimail@gmail.com

PART – B: Guide Acceptance

I, Mr. Saju Sachi working with QuEST Global as Technical Architect hereby confirm my willingness to guide Ms. Asha S R Reg No. 2214100645 for the topic **AI-based Image Classifier** during the period March 2024 to March 2025.

Place: TRIVANDRUM

Date: 30-July 2024



(Signature of the Guide)

(Note: A Guide needs to get registered with the University if he/ she is guiding a MUJDOE project for the first time. The guide Registration form can be downloaded from the LMS portal)

DECLARATION

I hereby declare that this project synopsis is an original work carried out by me and has not been/will not be submitted to any other University for the fulfilment of any course of study.

Place: TRIVANDRUM

Date: 30-July 2024

(*Filled in application forms to be signed by both student and the Guide. Forms must be scanned in either .pdf/.doc format and submitted through the LMS student's Login.)

(Signature of the Student)