Summer Internship Research Report

K SHANMUKHA NAVEEN
SSN College of Engineering, Chennai

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Certification

This is to certify that **Shanmukha Naveen** of **SSN College of Engineering, Chennai** has successfully completed an internship under my guidance. The internship took place from **15, May 2023** to **7, July 2023** at **Indian Institute Of Information Technology Design And Manufacturing, Kancheepuram**.

During his internship, he actively participated in various tasks and projects under my supervision and mentorship.he gained valuable experience and knowledge in the fields of Image processing and deep learning during his internship.

Throughout the internship period, he demonstrated excellent dedication, commitment and professionalism. he exhibited strong analytical and problem-solving skills and consistently delivered high-quality work and actively contributed to the team, collaborating with colleagues and adapting to new challenges.

This internship certification attests to **Shanmukha Naveen**'s successful completion of the internship program and his acquired skills and competencies during the period. The experience gained through this internship will contribute to his professional growth and career advancement.

Dr Preeth R
Assistant Professor
Department of Computer Science and Engineering
Indian Institute Of Information Technology Design and Manufacturing, Kancheepuram
Date: July 7, 2023

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1 Introduction

This report provides a detailed overview of the tasks and activities undertaken during the research internship conducted from May 15th, 2023 to July 7th, 2023. The internship focused on various aspects of image processing, deep learning, attention mechanism, and Transfer learning models. This report outlines the specific tasks accomplished and the progress made throughout the internship.

2 Weeks 1-3

During the first three weeks of the internship, the focus was on gaining a comprehensive understanding of image processing, deep learning, and various models utilized in the field. The following points were covered:

2.1 Week 1: Literature Survey of Deep Learning and Multi-Modal Attention Networks

Multi-Modal Retinal Image Classification with Modality-Specific Attention Network. Xingxin He, Ying Deng, Leyuan Fang, Senior Member, IEEE, and Qinghua Peng The above-mentioned paper was surveyed along with many other similarly related papers and a clear perception of the various techniques and methodologies used currently were noted. The research papers provide a good starting point for understanding the concepts and advancements in deep learning and multi-modal attention networks.

2.2 Week 2: Learning TensorFlow and keras

Learnt about Tensors, Neurons, Various Layers like Dense layers, Dropout layers,Fully Connected layers, Batch Normalization, Conv2d, MaxPooling2d and AveragePooling2D layers. Learnt about different optimizers like rmsprop, adam and sgdm. Learnt about cost function and Loss functions like sse, rmse etc. Activation functions like Relu, Leaky Relu, Sigmoid and Tanh. Image data generators and the various data augmentation techniques were also learnt. Basics on RNN, CNN and LSTMs were understood as well.

2.3 Week 3: Attention Networks and Multi Modal Dataset

A proper Multi-Modal Dataset was obtained that was available as open-source data. The dataset was prepared for using it in the models that are going to be created by categorizing and putting the images in their respective folders corresponding to the class labels of the images. Many Attention Network mechanisms like Multi-Scale Attention Networks, Regional Attention Network,Self-Attention Networks and Spatial Attention Networks were learnt and tried out in google colab.

3 Weeks 4-5: Training and Testing Various DL, TL and Attention Network Models

Multiple models were made for both the fundus and oct data sets. Transfer learning models like ResNet50, InceptionV3 and vgg16 were used and different learning rates like 0.1, 0.01, 0.001 were tried and tested. Different optimizers like rmsprop, sdgm and adam were also tried out. Different Epoch values were tested to see which gives great accuracy and over fitting and under fitting were also checked if they are present.

Attention network models like Multi-Scale Attention Networks and Region Guided Attention Networks were also used for the fundus and oct models respectively and the hyper parameters were tuned to get the desired results

4 Week 6 : Introducing novelty by combining pre-trained models

During the 6th week of the internship, the focus shifted towards the introducing novelty into our work by concatenating two pre-trained models. We tried to combine Fundus model trained with multi-scale attention mechanism and OCT model trained with region guided attention mechanism by removing their output layers and adding a fully connected layer to improve model's performance

5 Week 7 : Graphs and Results

Our work moved to analysing and interpreting the model's architecture and performance Matplotlib was used to create graphs and plots for various values like Loss and Validation Loss, Accuracy and Validation Accuracy. Then Confusion Matrices were created to elaborately explain the various Metrics like precision, accuracy , f1- score. Heatmaps were also created for better representation of the obtained results.

6 Attachments

Here Attached the link to all the files, codes, and assignments done during the internship period. You can access the work here.

7 Conclusion

The internship experience provided an enriching opportunity to delve into various aspects of deep learning and Attention Network algorithms. Over the course of six weeks, significant progress was made in multiple areas, including image processing, learning about attention networks and transfer learning models, exploring multi-modal Image dataset in the context of convolutional neural networks, and implementation using Modality Specific Attention Network.

In conclusion, the internship provided a comprehensive learning experience encompassing image processing, deep learning algorithms and architectures, convolutional neural networks. The acquired knowledge and skills can be applied to various real-world scenarios, ranging from multimodal classification and multilabel to prediction problems using image dataset and convolutional neural networks.

The internship not only expanded technical expertise but also fostered critical thinking, problem-solving, and research skills. It highlighted the importance of interdisciplinary collaboration and staying abreast of current advancements in the field of machine learning and artificial intelligence.

Overall, the internship was a valuable journey, providing hands-on experience and deepening my understanding of the rapidly evolving field of deep learning. The gained knowledge and skills will undoubtedly serve as a strong foundation for future endeavors in the field of AI and contribute to the development of innovative solutions and advancements in the domain.