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How to Write a Scientific Paper

Given below is the format for a scientific paper. Do note that there is a difference between a scientific paper and a scientific report. This handout only deals with how to write a scientific paper.

TITLE OF THE PAPER

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Abstract— Give a brief description of your project/research here. Do specify the techniques that you are using to implement your project/research. It should be understood by the any reader who reads it irrespective of their background. One should be able to understand what the project is about just reading your abstract.

The following should be highlighted here:

- Problem that is being solved
- Major technical challenges involved
- Solution/approach taken to solve this particular problem
- Key features/attributes of the chosen solution
- Proof of concept
- Way forward

Keywords— include at least 5 keywords or phrases

Example of an Abstract:

Abstract— Melanoma is known to be a dangerous and harmful form of cancer. The early detection of melanoma cancers cell makes the recovery and survival rate to increase dramatically. However, being able to accurately detect the possibilities of a melanoma cancer cell being malignant as compared to benign is a challenge that we haven't solved yet. The reason being that both benign and malignant cells have high similarities, their features are extremely similar to the human eye, and the presence of artefacts such as skin colours, hair, and others make it difficult to distinguish between them. For this very reason, in order to develop a reliable system to detect and classify melanoma cells, large amounts of research is being conducted in areas of computer vision in terms of skin lesion analysis. The International Skin Imaging Collaboration (ISIC) has made public a dataset of melanoma images and announced challenges in segmentation, feature extraction, and classification. In this paper, we propose a classification method based on Convolutional Neural Networks. Prior to training our model, we propose a pre-processing unit to enhance the quality of the given dataset. We apply techniques such as region of interest extraction, artefact removal, and data augmentation. Our results have been promising in terms of our model classifying the test images. We have been able to obtain an accuracy of 0.8214 for our proposed system.

Keywords – melanoma cancer cells, skin lesion analysis, melanoma recognition, convolutional neural networks, melanoma classification, melanoma segmentation

I. INTRODUCTION

Talk about the need(s) and motivation of solving this problem. Provide any necessary background information that could aid the reader to understand the problem. Talk about the expected functions and features of the solution. Also, mention the technical challenges that show the development of a solution.
Use pictures, tables, graphs, etc. to better explain the problem and proposed solution. Note that any images you use should be of high quality and resolution. Example given on next page.

Discuss the stakeholders and their requirements. Mention a list of requirements from the view point of the stakeholders. Describe the objectives for the project and their corresponding metrics, e.g. minimizing the cost or time etc. Also, mention the functions that the final product will perform. If there are any constraints placed by the stakeholders, they need to be written here in a clear manner.
In this section, you will not go into too many details of the solution as that will be covered in the next section.

Fig. 1 Example of an image with acceptable resolution

Discuss different ideas and possible solutions that were generated during the ideation phase. There are many ways to go about this. A big problem could be broken down into several smaller problems and their solutions could be given to solve those smaller problems, resulting in an integration of these small solutions to eventually solve the big problem. A comparison of different possible solutions could also be discussed here and why a certain solution is chosen. You can use an appendix to include additional details.

Give an overview of the final design without mentioning the project details. Provide quantitative specifications for the features in your solution and the means through which these features could be verified. For example, if the given solution measures the speed of an incoming vehicle then provide the maximum and minimum speed it will be able to measure. If applicable, mention the allowable tolerances of your solution.

II. METHODOLOGY

Here discuss the methodology of your research. This is where you also explain the details of the solutions with different subheadings:

A. Subheading A

Details of subsystem A.

B. Subheading B

Details of subsystem B.

You should also mention the prototyping and implementation phases in detail in different subheadings here. Show pictures of the system and other related data.

III. PERFORMANCE ANALYSIS

Here you discuss the results and compare your actual results with the theoretical values. You can also draw comparisons between your results and what is already available.
Use tables and graphs to summarize these comparisons.

No.	Heading		
	Subheading 1	**Subheading 2**	**Subheading 2**
1	Blah	Blah	-
2	Blah	-	Blah
3	Blah	Blah	Blah
4	Blah	-	-
5	-	Blah	Blah
6	Blah	Blah	-

Table. 1 Give a relevant caption to the table

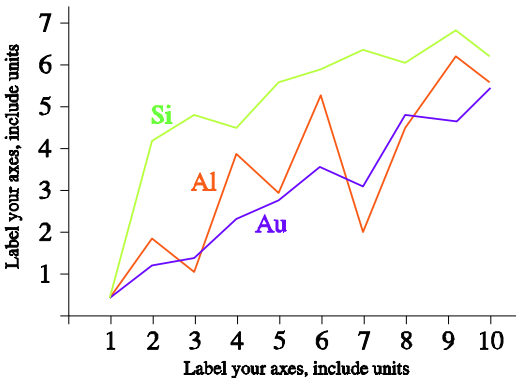

Fig. 2 Give a relevant caption to the graph.

Explain your tables and graphs where necessary.

IV. CONCLUSION

Provide a summary of what has been accomplished and your conclusions. Discuss the remaining work (if any) and/or provide suggestions for future work.

Example of a Conclusion:

In this paper, we proposed a method to classify melanoma cancer cell images using a Convolutional Neural Network that was 14 layers deep along with a pre-processing module that involved segmentation, region of interest extraction, artefact removal, and finally data augmentation. Our aim was to be able to classify images using a model trained on CPU with a decent enough accuracy. Moreover, due to the presence of a limited dataset, we had to ensure our pre-processing techniques were outstanding in order to generate the desired results. If we were able to train our model on GPU, by increasing the number of layers and moving towards a very deep neural network, then our accuracy might further increase given that we can increase our dataset as well. Our performance was evaluated based on various different metrics and we observed that our results were quite competitive as compared to the ones present in the International Skin Imaging Collaboration 2017. Our evaluation metrics were calculated to be: accuracy 0.85, jaccard index 0.75, dice coefficient 0.86, sensitivity 0.91 and specificity 0.78. For this very reason, our proposed model demonstrates its abilities to address the challenge at hand in a quite competitive manner.

V. REFERENCES

Put all the references here in IEEE format.

[1] A. F. Jerant, J. T. Johnson, C. D. Sheridan, and T. J. Caffrey, "Early detection and treatment of skin cancer," American Family Physician, vol. 62, no. 2, pp. 381-382, 2000.

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[3] Yu, Lequan & Chen, Hao & Dou, Qi & Qin, Jing & Heng, PhengAnn. (2016). Automated Melanoma Recognition in Dermoscopy Images via Very Deep Residual Networks. IEEE Transactions on Medical Imaging. PP. 10.1109/TMI.2016.2642839.

[4] Codella, Noel & Nguyen, Quoc-Bao & Pankanti, S & Gutman, David & Helba, Brian & Halpern, Allan & R. Smith, John. (2017). Deep Learning Ensembles for Melanoma Recognition in Dermoscopy Images. Ibm Journal of Research and Development. 61. 10.1147/JRD.2017.2708299.

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