Project Proposal
‘Melanoma detection’

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Title: *“Melanoma detection using regular convolutional neural networks”*
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Authors: Aya Abu Ali and Hasan Al-Marzouqi

Summary:

This paper proposes an automated method for **classifying melanoma images as benign or malignant using Convolutional Neural Networks (CNNs),** with the goal of assisting dermatologists in early diagnosis. By utilizing a standard CNN architecture with fewer parameters, the authors aim to achieve results comparable to state-of-the-art methods. The dataset used is from the **ISBI 2016 challenge,** and no advanced preprocessing such as image segmentation or cropping is applied. Simple image preprocessing, including resizing and normalization, is used before feeding the images into a 17-layer CNN composed of convolutional layers, ReLU activations, pooling, dropout, and a final softmax classifier. The proposed method shows high **specificity (98%) but low sensitivity (14.86%), with an overall accuracy of 81.6%.** Despite the relatively simple approach, the model demonstrates that high specificity can be achieved with a lower number of parameters, although improvements are needed to address the low sensitivity in detecting malignant melanoma cases.

Problem Statement:

The problem is the **automatic detection and classification of melanoma**, a dangerous form of skin cancer, through non-invasive medical imaging. Diagnosing melanoma is complex and often requires expert dermatologists. The **accuracy of human dermatologists is estimated to range from 75% to 85%,** and current clinical diagnostic methods, such as the ABCD rule, can fail in early detection, particularly for small-diameter melanomas. This project aims to **improve early**

and accurate diagnosis by providing a CNN-based automated solution that can assist dermatologists and potentially improve melanoma detection outcomes.

Approach:

Firstly, we will **implement** the solutions proposed in the paper and **verify** that the obtained results align with the expected outcomes. Then, our goal will be to explore ways to improve the model by **incorporating techniques** such as data augmentation or attention mechanisms. We will assess the feasibility of these techniques and implement them with the aim of enhancing the model's accuracy.

Data:

The dataset used is from the ***ISBI 2016 challenge***, and no advanced preprocessing such as image segmentation or cropping is applied. The dataset consists of 900 training and 379 testing dermoscopic images with labels of benign and malignant. This dataset has 727 benign images and 173 melanoma images.

Team member responsibilities:

- **Nicolás Cortisi:** Data **preparation** (EDA, data preprocessing and data splitting) and data **modeling** (training and algorithm selection).

- **Antonio Castañares:** Data **modeling** (training and algorithm selection) and model **evaluation** (performance, validation and testing).

References:

1. *Aya Abu Ali, & Hasan Al-Marzouqi. (2017). Melanoma Detection Using Regular Convolutional Neural Networks [Department of Electrical and Computer Engineering, Khalifa University of Science and Technology]. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8252041&tag=1*
2. *International Symposium on Biomedical Imaging (ISBIC). (2017). ISBIC 2016 Challenge Dataset [Dataset]. https://www.kaggle.com/datasets/aliyumuazu/isic2016dataset*