Machine Learning Engineer Nanodegree

Capstone Proposal

Jaime Aznar

June 9th, 2021

Melanoma diagnosis using Machine Learning techniques on skin-mole images

Domain Background

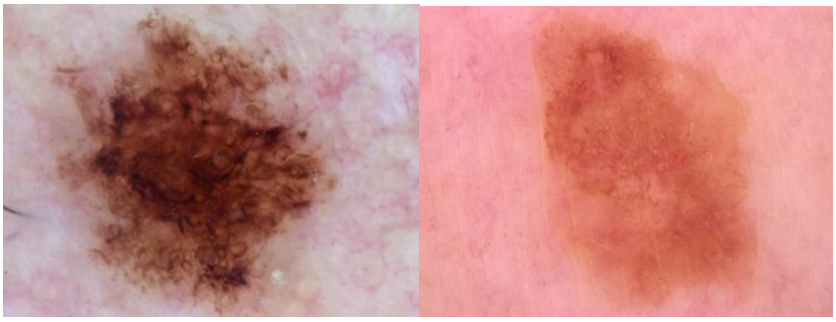
Over the past decades melanoma and skin cancer have spread. An early detection is considered to be a major factor when it comes to reducing the mortality rate associated with this type of cancer. The ability to detect the presence of malignant moles via images can prove to be a very useful tool in medical diagnosis.

Problem Statement

The goal of this project is to predict with a certain degree of accuracy if a certain mole is malignant or not. By applying machine learning techniques - such as CNN - we will be able to process an image of a skin mole and predict this value. By working in this solution, we will make it easier for doctors to determine if there are cancerous cells much faster and with higher accuracy.

Datasets and Inputs

The datasets we will be working with "The HAM10000 dataset" which contains 10.000 images of skin lesions classified into 10 clinical categories. These are color images with a medium-high resolution (450x600). The full dataset can be found at: https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/DBW86T.



For this project, we will focus on distinguishing between two of the 10 classes (the two most common skin lessons, and the ones that are hardes to tell apart): the *melanocytic nevi* (benign) and the *melanoma* (cancerous). To make the problem more manageable, we will use a lower resolution version of the dataset, with 75x100 pixel images. The reduced dataset then contains 2000 75x100 pixel color images, of which 1000 are labeled as *melanoma* and 1000 are labeled as *melanocytic nevi*.

Solution Statement

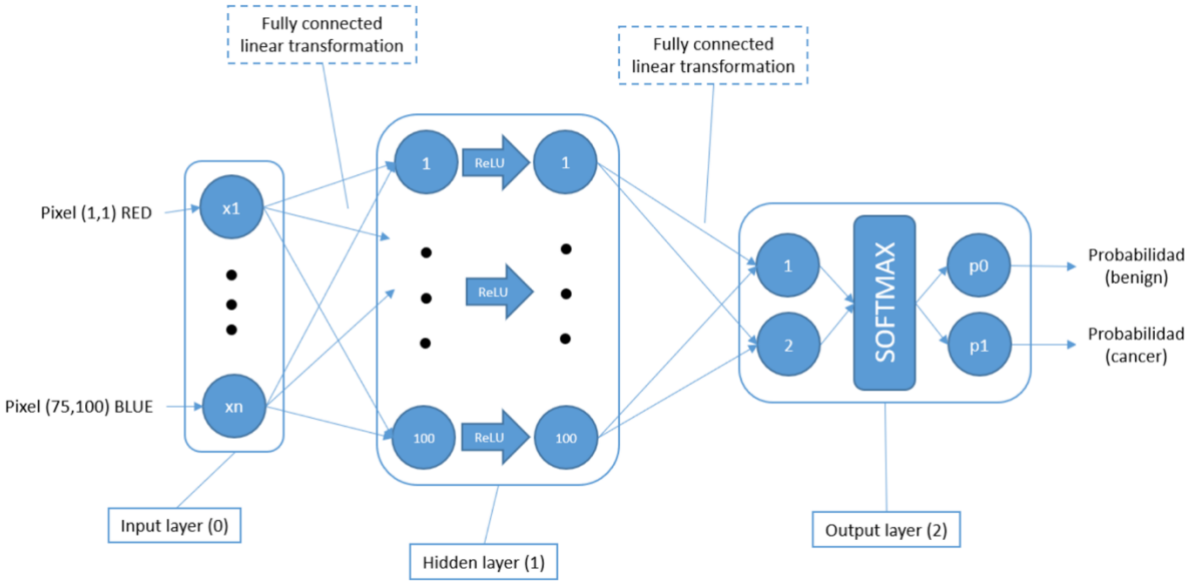
The solution will be a classification of the skin-mole in two categories (benign, malignant) and its percentage of accuracy. We will do so by building a convolutional neural network.
Benchmark Model
For this problem, the benchmark model will be reaching a +75% of accuracy based on the following published paper by BMC https://bmcmedimaging.biomedcentral.com/articles/10.1186/s12880-020-00534-8#Sec4.

Evaluation Metrics

The evaluation metric for this project will consist of measuring how accurate the model is by using a confusion matrix where we can see the true and false positives/negatives.

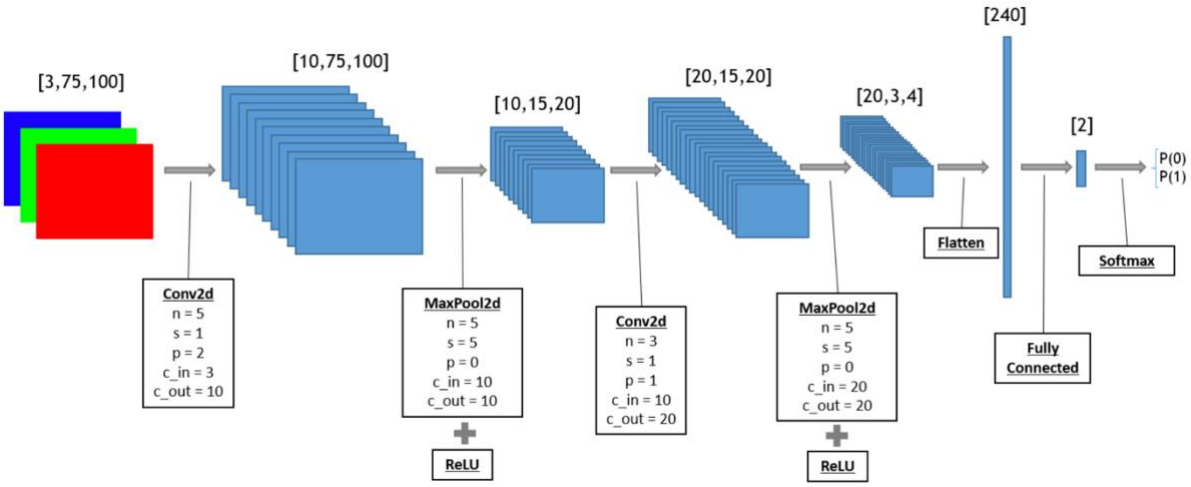
Project Design

Before even start training models, we will first take glimpse of the data see what the shape and is and how they are formatted. Then we will prepare the data. Once this done, we will proceed to define the network architecture.



Once the network architecture is defined, we will implement it in Pytorch. We will train the model and based on the results (overfitting, etc.) we will provide small improvements.

After that we will build a classification model with Convolutional Neural Networks. First, we will reduce the images size by max pooling and then build the CNN.



Finally, we will push the model into production.