Bioimage Computer Vision

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Introduction

- The goal of the project is to find, from a dataset of CT scans in Dicom/NIfTI format, kidneys and tumor, if present, making use of different techniques related to the field of Computer Vision.

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Dataset and Hardware Consideration

- I only work on the 100 first patients due to memory problems related to the free versions of Colab and Drive. Most of the slices in the dataset are 512x512; because of the limitations mentioned earlier, I decided to resample the images to 256x256, to ease the computational work.

Dataset: https://github.com/neheller/kits19

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Preprocessing

- Since it's a less demanding task, I've implemented a binary segmentation model, limiting myself to just recognize the kidneys. Therefore, I've modified the mask dataset by erasing any information about the tumor. Initially the mask values ranged from 0 to 2 (0 background, 1 kidneys, 2 tumor); with the code below I've uniformed all the values different from the background.

```
# Binary Segmentation
trainSet_seg[trainSet_seg != 0] = 1
```

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Neural Network

- U-Net is the neural network architecture I've used for the project and it's designed for image segmentation. This model is very used in medical image analysis and as well for other fields.

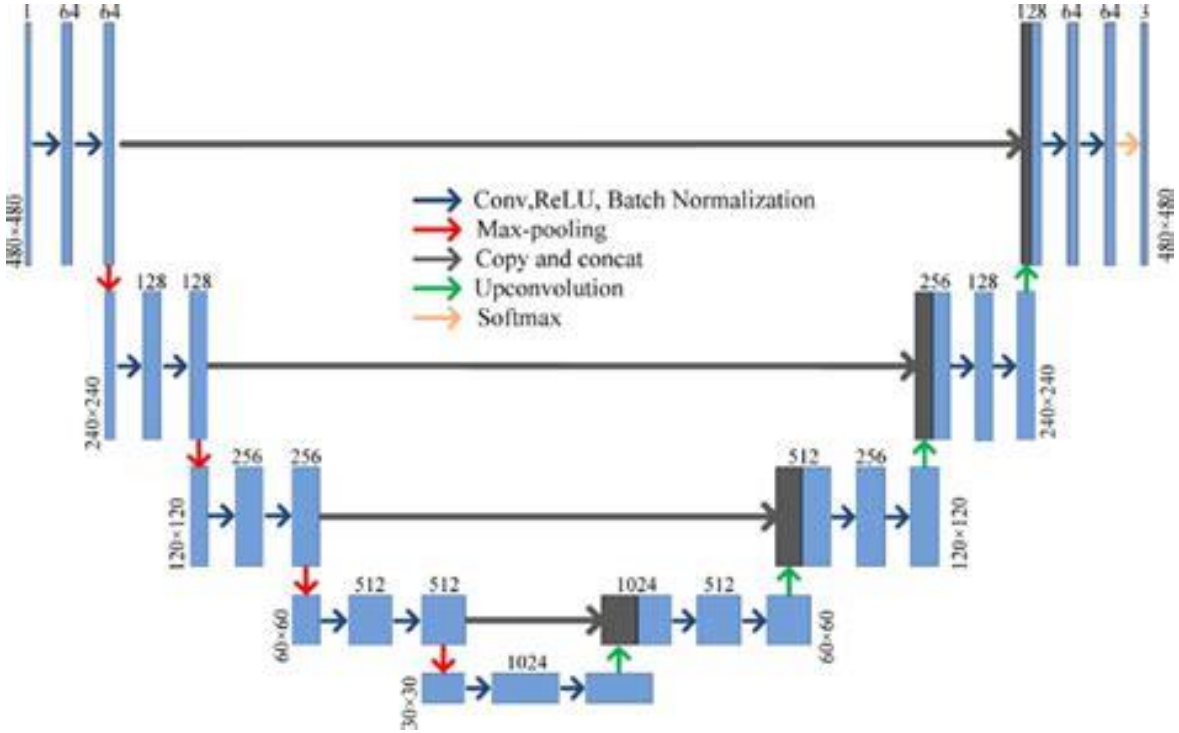

Image Segmentation using U-net | Kagglehttps://github.com/qubvel/segmentation_models

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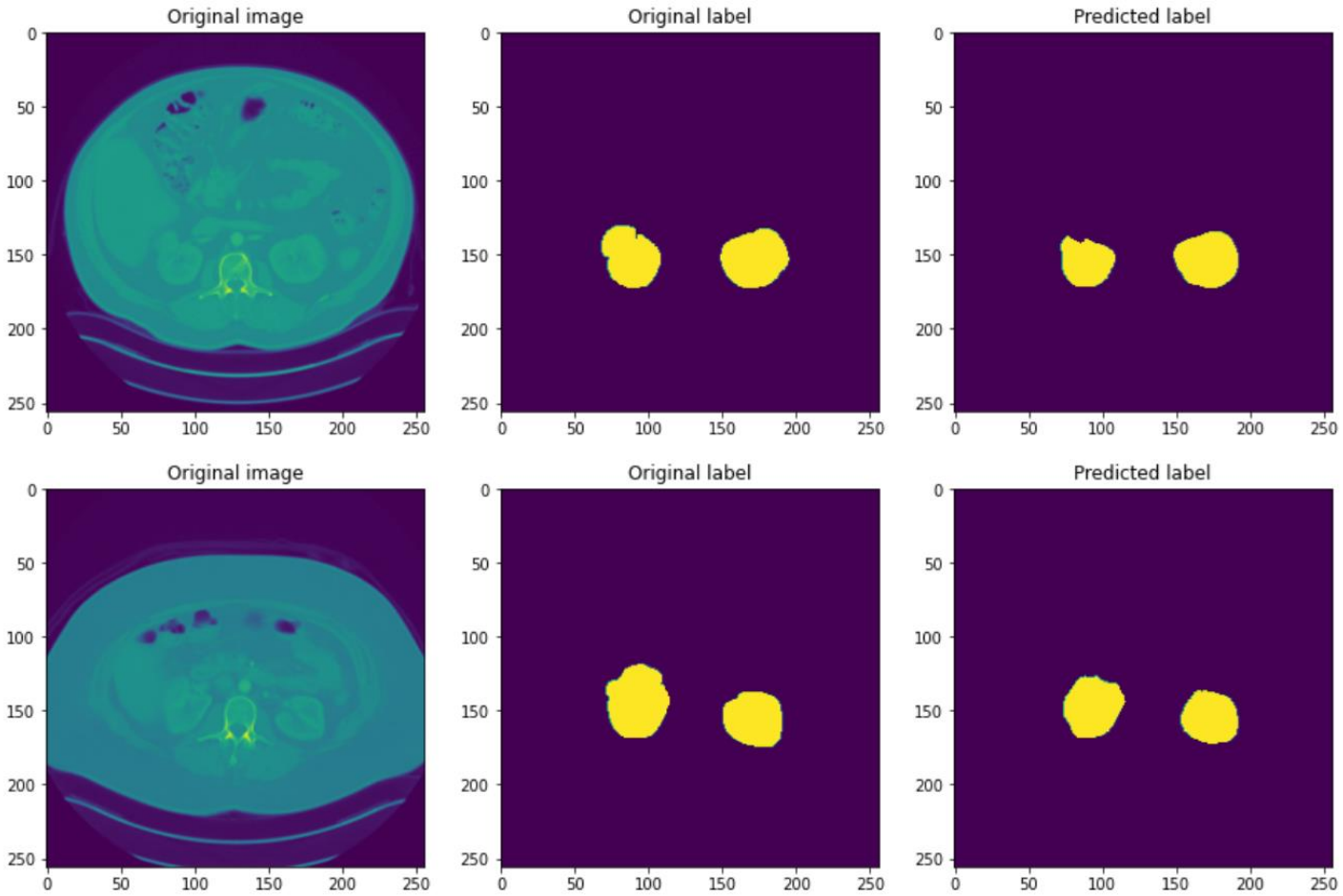
Examples of predicted Training Images



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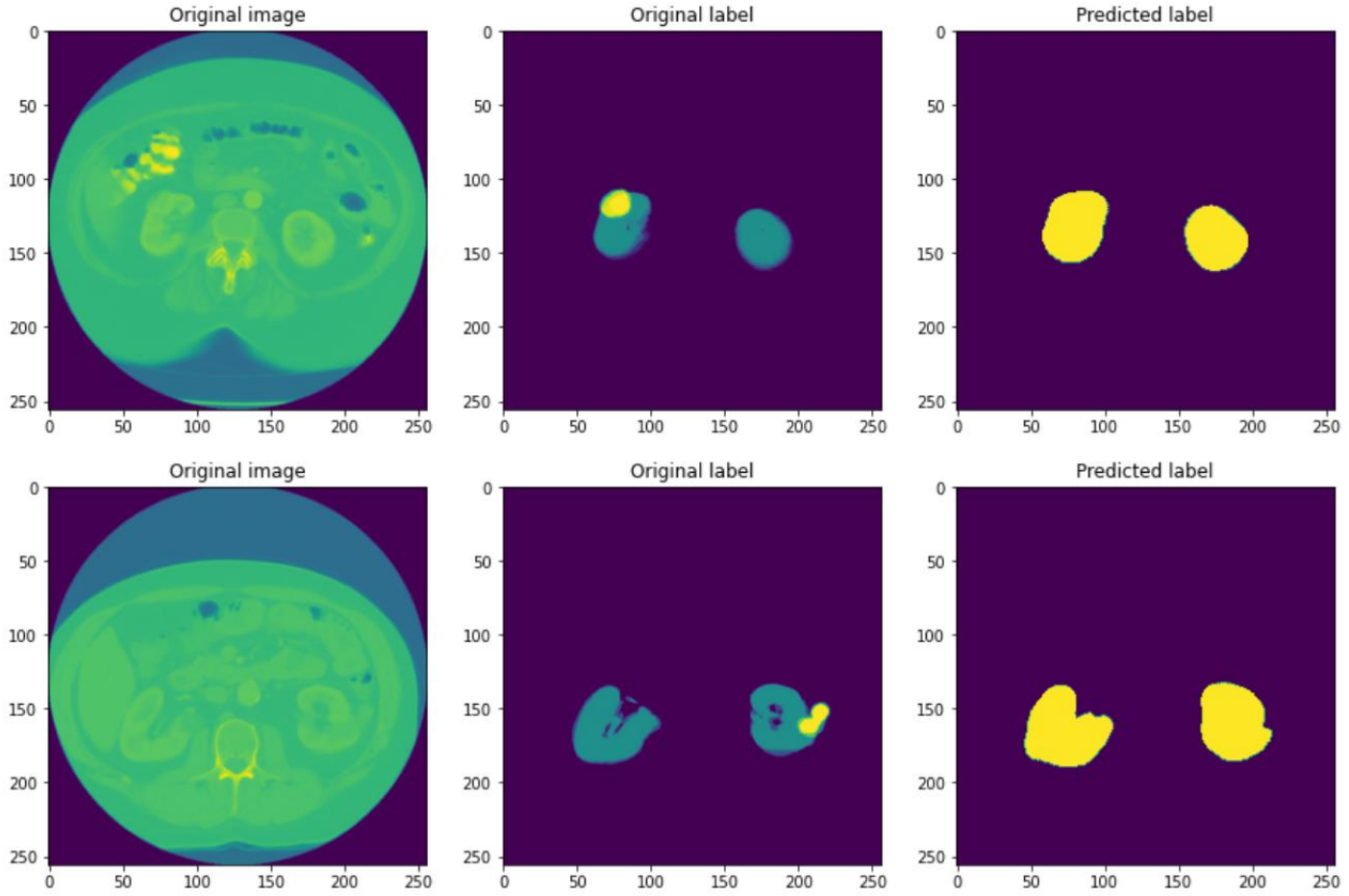
Examples of predicted Testing Images



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Conclusions

- At the end I didn’t have much time and the adeguate hardware to do the multiclass segmentation. I really struggled with Colab due to its many limitations present in the free version.
- The result expected from the binary segmentation has been successfully reached.