2D Cerebral Blood Vessel Segmentation

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Background

- 2D Cerebral Blood Vessel Segmentation is essential when making diagnosis and treatment evaluation of stroke.
- A stroke occurs when the blood supply to part of the brain is interrupted or reduced, depriving brain tissue of oxygen and nutrients. Within minutes, brain cells begin to die.
- There are different types of strokes:
    - Ischemic stroke
    - Hemorrhagic stroke
- Different treatments for different types.
- A doctor must know the exact location and the type of stroke that is present to give the proper treatment. If not given the correct treatment, the consequences can be severe.
- By using 2D Cerebral Blood Vessel Segmentation, the location where a stroke occurs is more clear for the doctor to analyze.

Method

- We used machine learning to train our program to generate blood vessel segmentation when given a 2D angiography of the brain.
- Program trained on image pairs:
    - Angiography of the brain
    - Hand drawn annotation of blood vessels
- After training, given an angiography, the program can generate the annotation of blood vessels.

Retinal Image Predictions

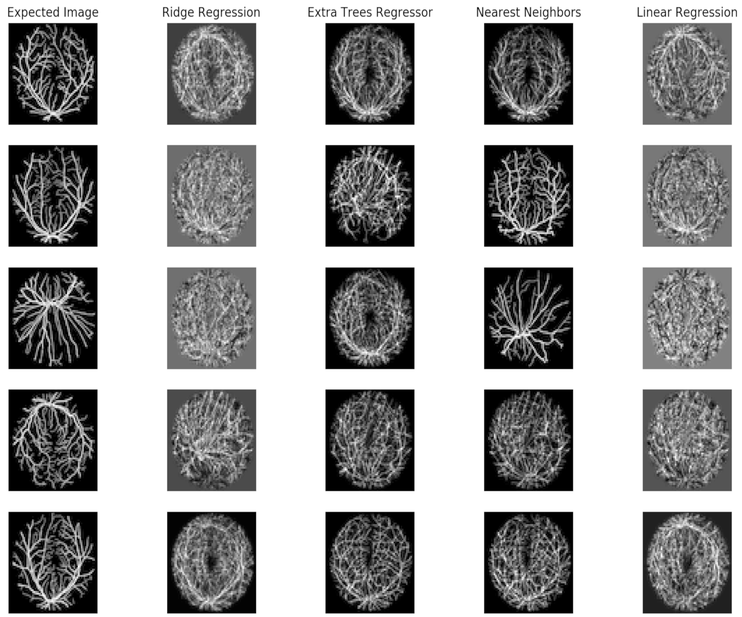
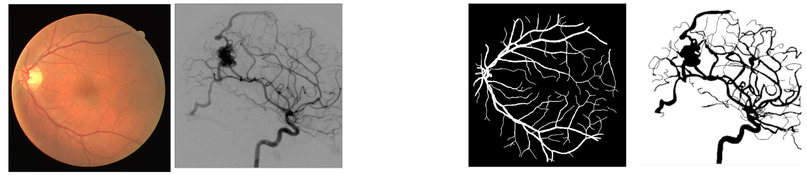


Figure 1. Illustration of Retinal image predictions with different types of algorithms.

Results

- Due to the lack of test data on cerebral angiography scans, we used retinal scans provided by Professor Scalzo:
    - Image pairs contain:
        - Original retinal scan
        - Hand-drawn annotations of blood vessels in retinal scans
- This shows that our project is general enough that it can be used in many different types of uses if given the proper learning data



Conclusion

- Our Python program was able to properly generate a blood vessel drawing given an input image but not perfectly due to imperfections in the machine learning algorithms and lack of enough test data. By giving our program more test data, we can produce a more accurate depiction of the blood vessels in a given scan. This technology can be used in aiding doctors when diagnosis a specific patient. Whether it being diagnosing a stroke victim or issues with the blood vessels in the eye, our technology can be used to lend a helping hand.

References

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