



RET Site: Research Experience in Cybersecurity for Nevada Teachers (RECNT) BIOMETRICS CYBER SECURITY RESEARCH

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BIOMETRICS: IMAGE VIEWER / AUGMENTATION / RECOGNITION ENGINEERING DESIGN IN THE CLASSROOM

Ask:

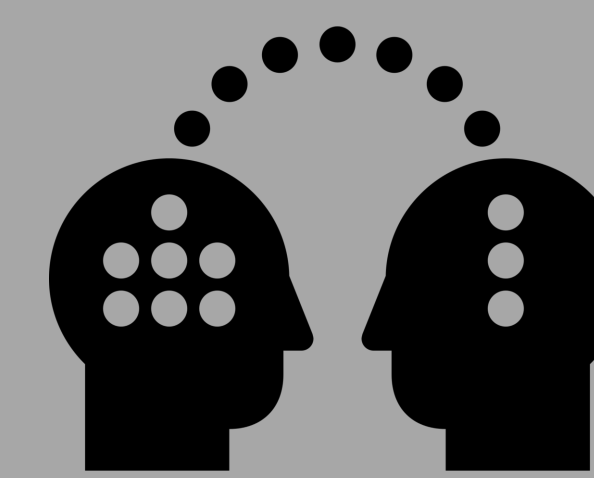
identify needs and constraints

1. Problem – Facial Recognition programs are not perfect.
2. Why do "Facial Recognition" programs fail?
3. At what point do "Facial Recognition" programs fail?
4. We need to design a tool that records when a facial recognition program fails and why it failed.
5. The program designed should record when facial recognition fails and why, this will provide facial recognition program developers information on limitations which should be considered throughout their development process.

Research:

Research the problem

1. Online searches for the reasons for failures by facial recognition programs.
2. Conducting online searches for what tools are used to create facial recognition programs.
3. Discussions with Biometrics Mentor on reasons for failures and the constraints of machine learning in the realm of facial recognition.

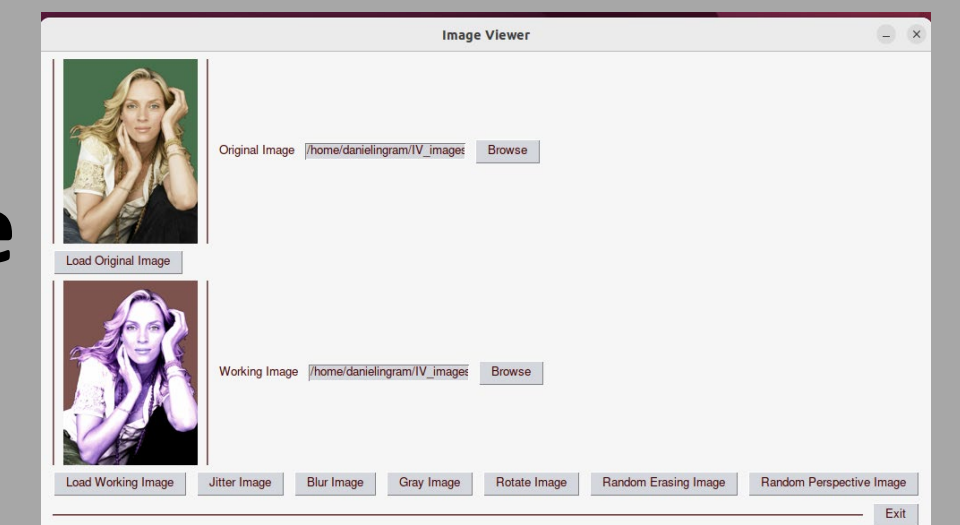


Imagine:

Develop possible solutions

The biometrics team brainstormed ideas to limit facial recognition failures, such as but not limited to:

1. Focusing on one particular part of the face that changes little over time, such as an eye.
2. Build an image viewer where the team can augment the image until the machine no longer recognizes the image and record the augmentation that causes the facial recognition to fail.

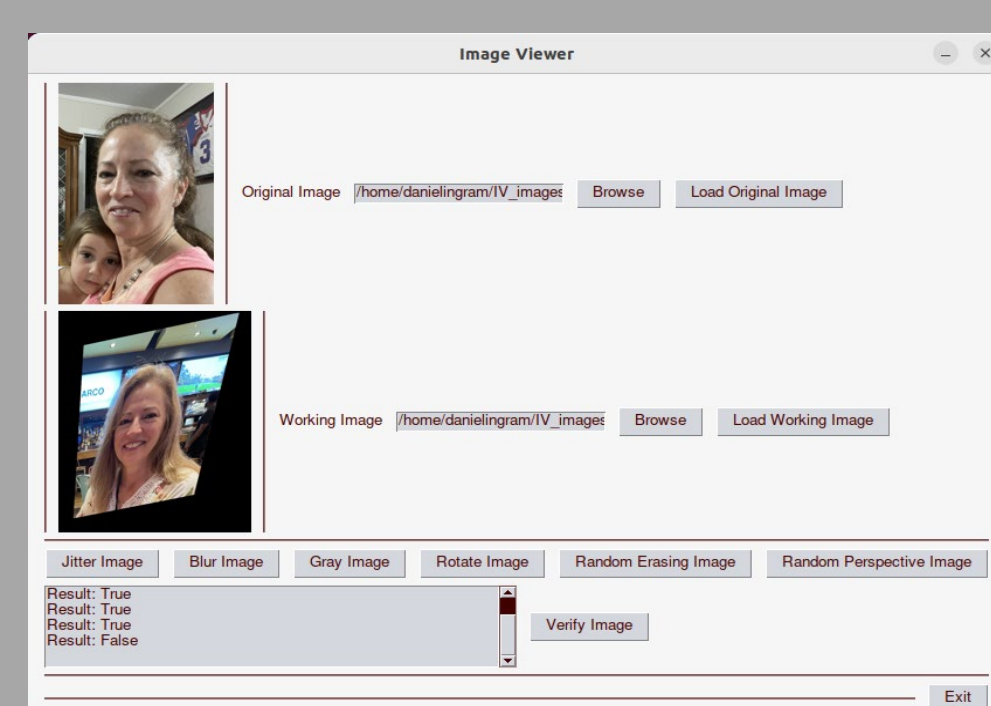
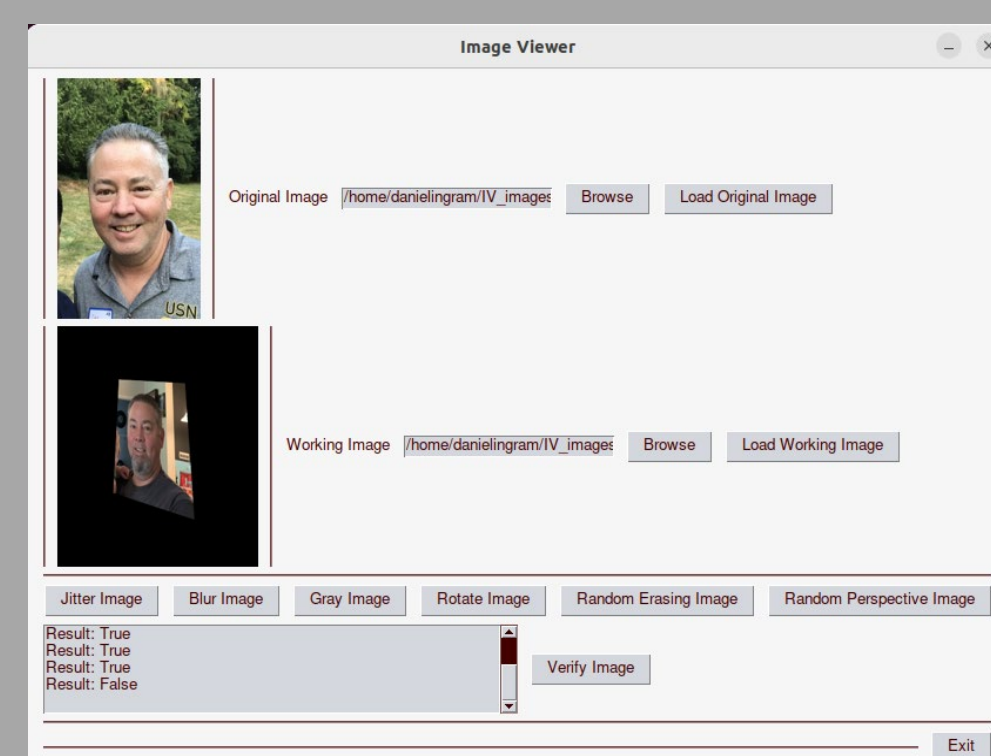


Improve:

Redesign as needed

Further research and development in the area of image perspective for better recognition should be improved.

Applications in the public sector capture images for recognition purposes but fail. Having a more robust program that supports change of perspective will assist in better recognition overall.



Test:

Test and evaluate the prototype

Overall testing results in success.

The Biometrics team tested the facial recognition program hundreds of times, using hundreds of different images for comparisons.

The biometrics team applied hundreds of different combinations of augmentations to the working images to record what causes the facial recognition machine learning model to fail.

The results from creating this program reveal that the changing of the perspective of one of the images will cause the Facial Recognition program to fail even though the images are the exact same. Further research is needed in this area.

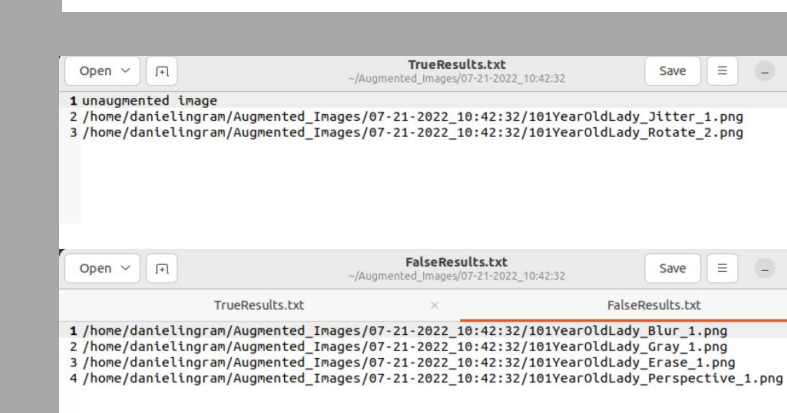
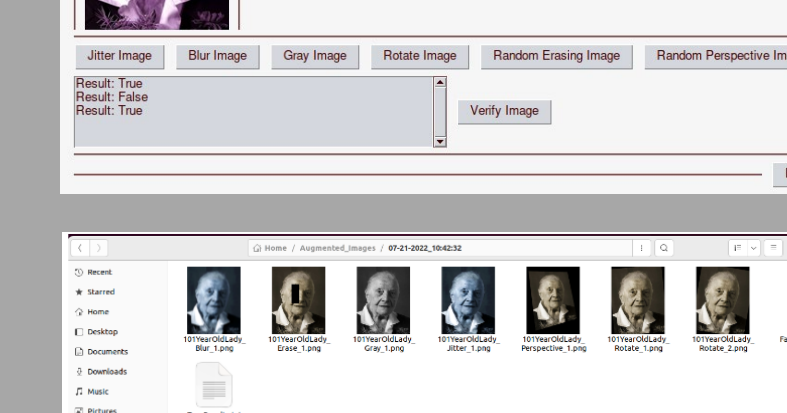
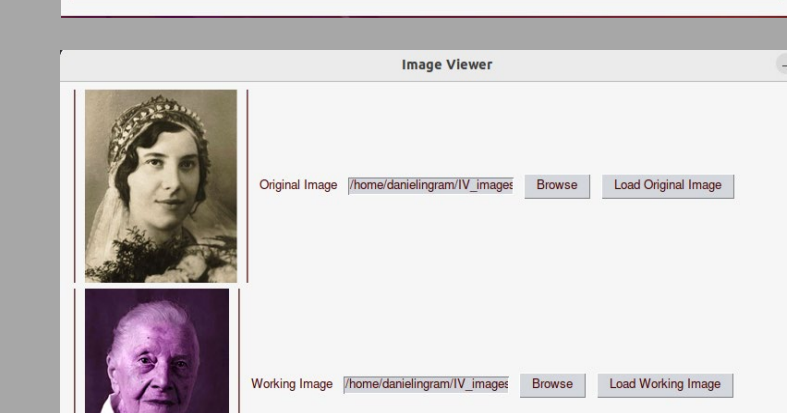
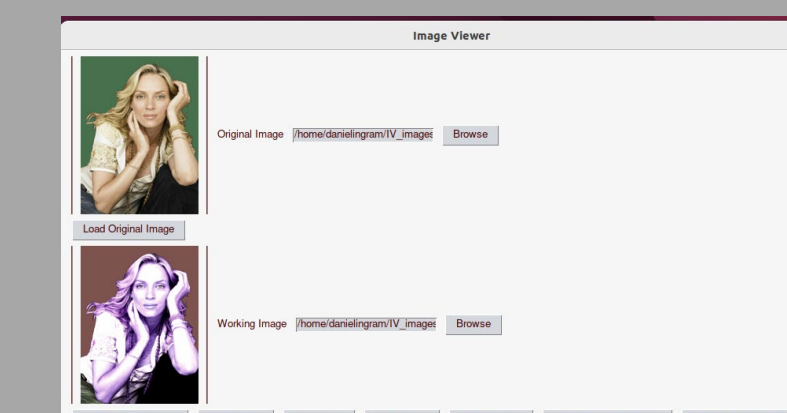
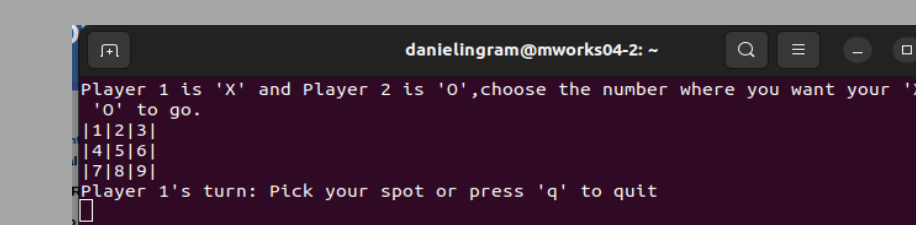
Create:

Build a prototype

1. python basic – we created a Tic-Tac-Toe board.

2. Intermediate python code and packages included GUI development, image viewer, augmenting images and saving augmented images.

3. Using advanced python code and packages, the biometrics team developed a machine learning model image viewer that compares to images after each augmentation and records and stores the information in image and text formats.



Plan:

Come up with a promising solution

1. Learn Terminal commands on a computer with Linux based OS.
2. Learn basic python code
3. Learn intermediate to advanced python code and library packages.
4. Use learned knowledge to build an image viewer where an original image and a working image are loaded, then augment the working image and then verify using a machine learning package if the images are the same and continue augmenting the image until the machine learning fails, and record the outcomes.