NSA Project: Image-Projection Plus Facial Recognition User Authentication

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Overview

User Authentication Method

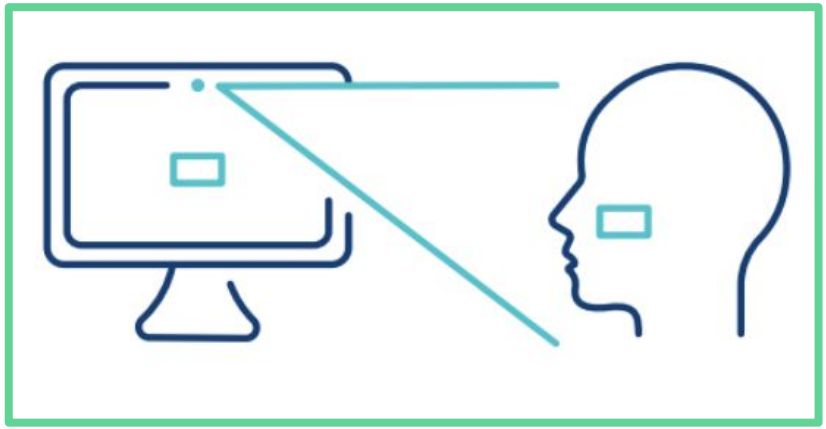
- Facial recognition combined with user interaction
  - Image user’s face
  - Selection of images from predefined image category and offset
- Projection of selected images onto image of face
- Matching of defined facial features for authentication
- Based on US Patent US8655027

Project Objective

- Further increase user controlled security for an application or workstation
- Utilize facial recognition as well as projection, rotation, and an image grid to verify identity
- Protect users so that authentication cannot be compromised by either keystroke monitoring or looking over the shoulder

Project Summary

- Integration of Image-Projection into a Facial Recognition System
- Flask-SQLAlchemy application with Python backend.
- Implement Python libraries to capture and manipulate user images.
    - Face_recognition Library
    - Pillow Library
    - Flask library
    - SQL library
    - CIFAR dataset



Explanation of Application

Create Account and Upload Test Images Pages

Create Account

Username

Name

Email

Image Category

Select a Category

Image Offset Pattern

Vertical

Select Vertical Offset

Horizontal

Select Horizontal Offset

First Face Location

Select First Location

Second Face Location

Select Second Location

Rotation Value

Continue to Capture Face Image

Capture Upload

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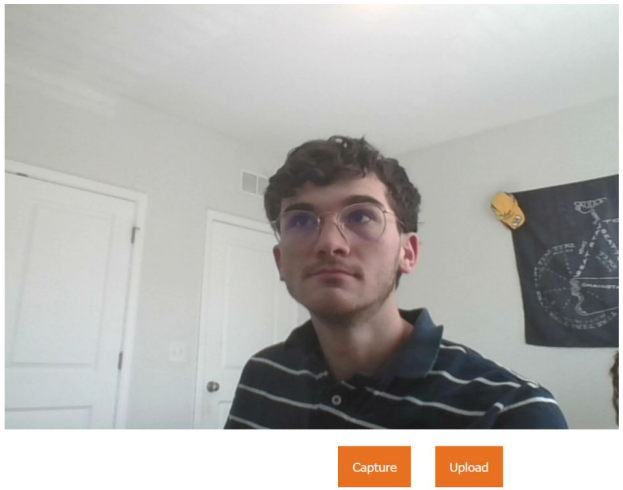
Face Recognition



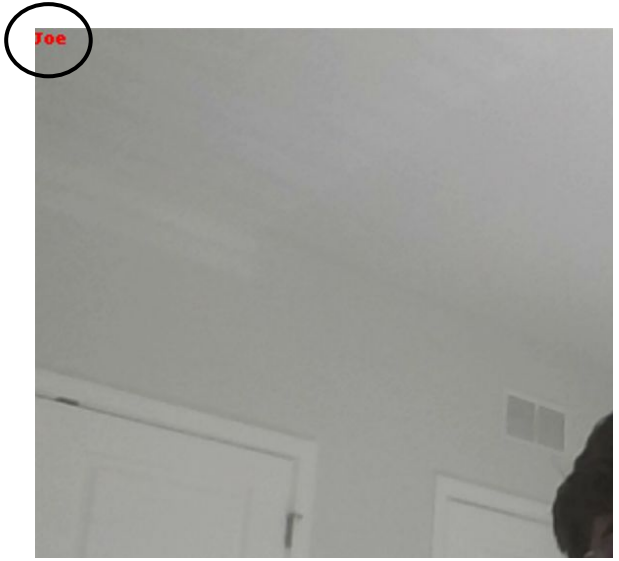


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Image Offset Grid

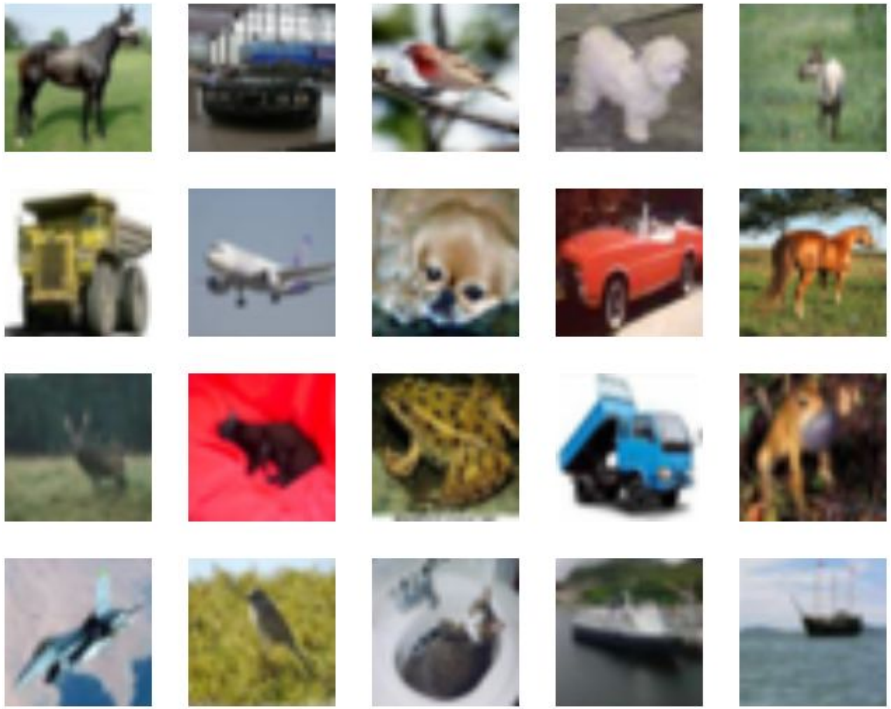


Image Offset Grid

Image Category
Dogs

Offset Values
Horizontal: 2
Vertical: 1

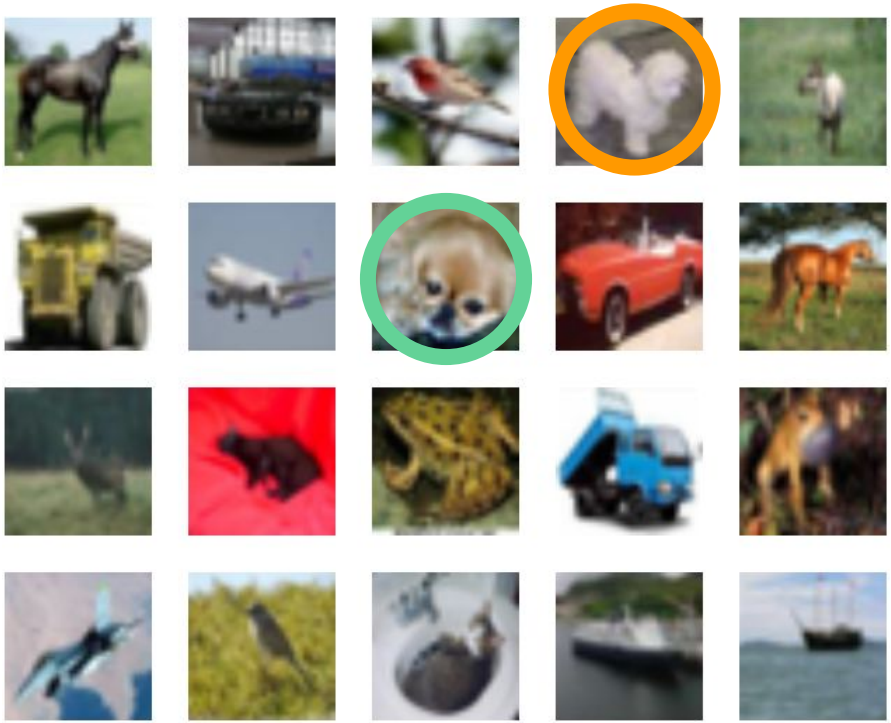
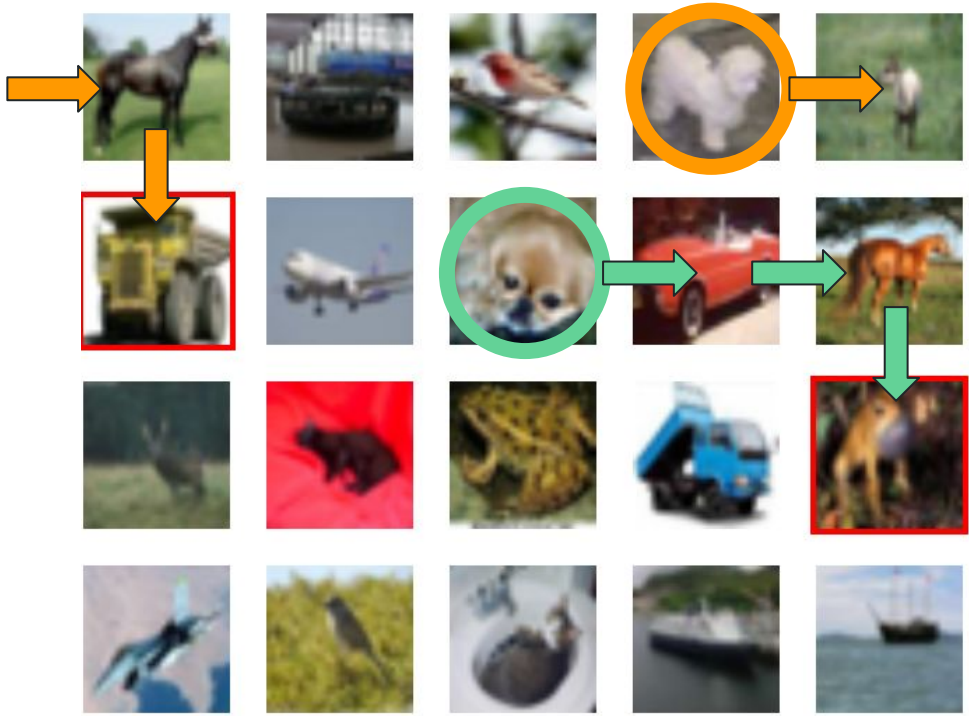


Image Offset Grid

Image Category
Dogs

Offset Values
Horizontal: 2
Vertical: 1



Live Demo

Final Thoughts

Project Challenges

- Implementing image grid
- Image Grid offset
- Database validation
- Access control through sessions

Future Steps

- Implement image projection onto face
- Use facial landmarks for image positioning
- Add image rotation when projecting image
- Secure the website
    - Limit login / incorrect selection attempts
    - Ensure users cannot visit incorrect endpoints
- Unit testing
- Provide users with better guidance
    - Add a better image counter in create account so user can see when images are taken
    - Have informational instructions on how to create an account

Conclusion

- Created a user system within the database that works in tandem with the authentication system.
- Implemented a system to submit images to a train facial recognition model.
- Added layers of security/authentication through Image Grid and Facial Recognition (more to be added in the future).
- We made the UI appealing and aesthetically pleasing

Questions?

Thank you