

Found: Reuniting Families Using Facial Recognition

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Purpose: To help reunite families that have been separated in locations like refugee camps, I created FOUND, an easy-to-use web app that uses facial recognition to identify facial similarities between children and their parents. The goal of this web app was to quickly and inexpensively match a picture of an unaccompanied child with their parents' picture. Compare a child's picture with hundreds or even thousands of parents' pictures.

Data: The FOUND API was trained using *Faces in the Wild*, an open-source collection of facial photographs. This collection, which includes photographs of public figures and their family members, is organized into family units, making it a perfect resource for training this kind of model. The FOUND API has an accuracy of 82% and is likely to underperform when used in populations that were not well-represented in the Faces in the Wild dataset that was used to train the machine learning model. This could be improved with a larger and more diverse training set.

Methods: FOUND has two pieces. First is the Found API, a program that compares two pictures and reports the probability that they are related. In order to make this part of the program, machine learning was used to train a model capable of making this kind of prediction. Second is the Found web app, a user-friendly "front-end" for the FOUND API, written in C# and HTML using the Blazor platform.

Conclusion: FOUND meets the original design goals, although is not yet freely available online. FOUND is ready for adoption in refugee camps around the world, including Syria and the southern border of the U.S. Thousands of children may soon be back in the arms of their parents.

A blue-tinted photograph of a busy outdoor market or distribution center. The scene is filled with people, including many children, and numerous wheelbarrows. Some people are carrying boxes, and others are pushing wheelbarrows. The background shows simple, possibly temporary, structures. The overall atmosphere is one of activity and movement.

The Problem: Family Separation

Design Goals

The goal of this project was to create an easy-to-use website that uses facial recognition to reunite families by identifying facial similarities between children and their parents.

1. Quickly and inexpensively match a picture of an unaccompanied child with their parents' picture
2. Compare a child's picture with hundreds or even thousands of parents' pictures
3. Available online for worldwide use

Anticipated Challenges

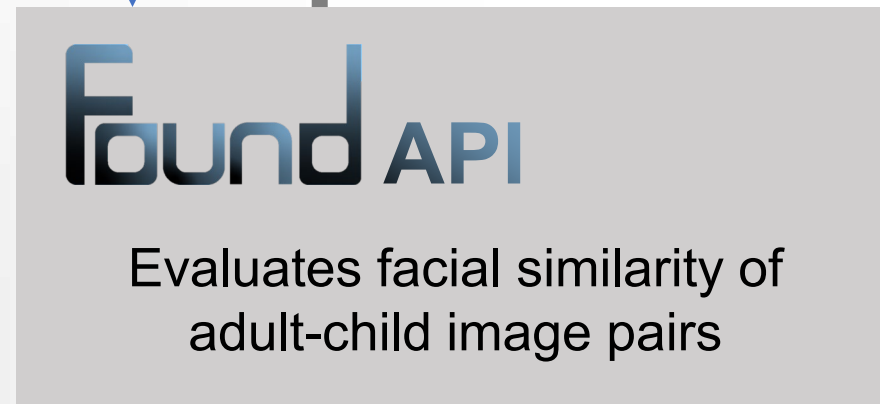
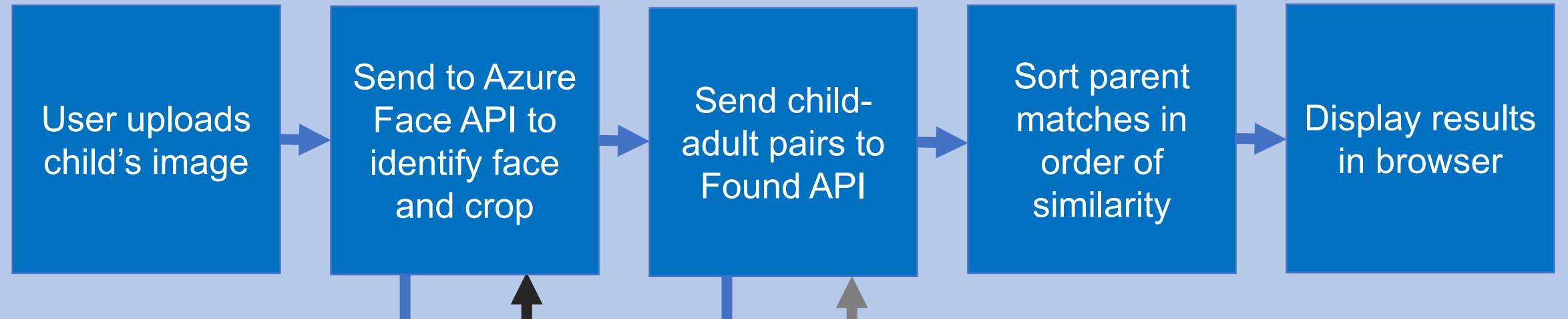
- Experience with HTML and C#, but I have never used Blazor.
- No existing Application Programming Interface (API) that matches children to their parents using facial recognition.

Materials

1. Visual Studio 2019
2. C# and HTML (for webapp)
3. Microsoft Azure's Face API.
4. Python (for API)
5. Computer with GPU

Methods

Found Webapp



Design Evolution: Design 1

Training the machine learning model for the FOUND API:

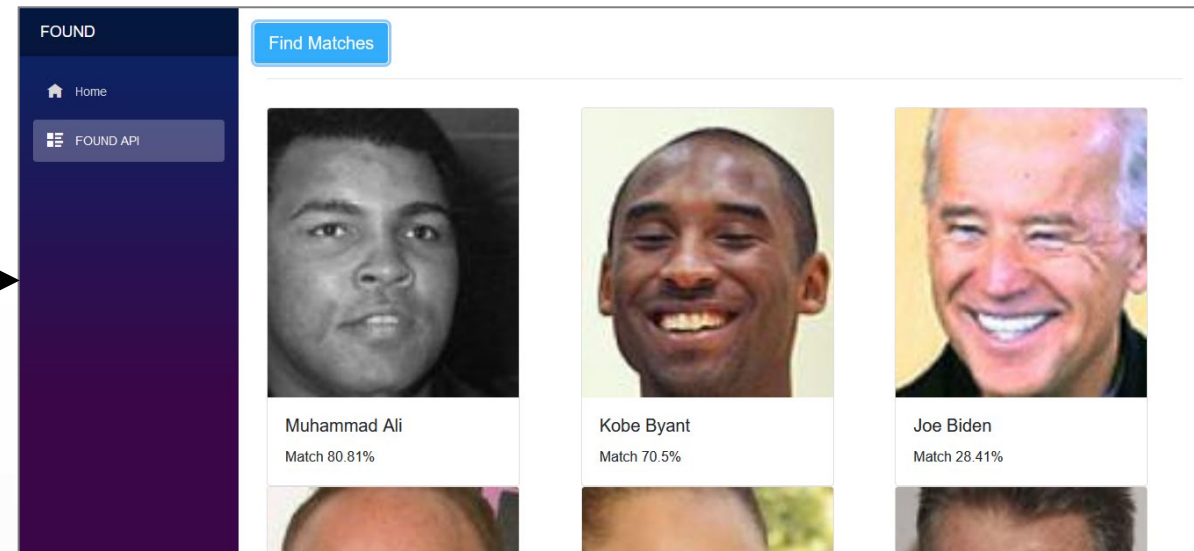
- Attempt 1-13 (CPU): Failed to start due to improperly built Python environment
- Attempt 14 (CPU): 7 days, 20 generations, unexpectedly stopped
- Attempt 15 (GPU): 12 hours, 200 generations, successful

Design Evolution: Design 2

Numerous unexpected challenges in the design of the Found web app:

1. Pictures submitted to API must be cropped to just the face
2. Web app could not reach API from different computer
3. Web app and API by default ran on same port
4. API reported probability of match in decimal form
5. Panels with parent matches would not sort properly

Design Evolution: Design 3



View code at <https://github.com/kylebrothers/FOUND2-Kyanite>

Discussion

Found compared with alternative methods for reuniting families

Existing Method	Disadvantages vs. FOUND
Ask child for ID or name	Young children unable to do this
DNA testing	Cannot be done quickly “in the field,” more expensive
Age-advancing old pictures of child	Old pictures of child not always available

Conclusion / Real World Connections

- Found meets original design goals, although is not yet freely available online
- Found is otherwise ready for adoption in refugee camps around the world, including Syria and the southern border of the U.S.
- Found API only has accuracy of 82%. This could be improved with a larger and more diverse training set.

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