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Human Computer Interaction HW #1: User Interface Design
The Average Joe Classifier: Object Detection & Recognition for Everyone

The concept of computer vision has been around since the 1960s, but in recent years the field has exploded due to advanced algorithms and powerful computers. Computer vision is now a powerful tool which is transforming industries. Computer vision is helping improve the performance of self-driving cars, allowing Google Translate to do real time translations by pointing one's phone camera at text, and helping doctors with diagnoses by analyzing x-ray images. In today's world there are cameras everywhere, from street corners to your doorbell, many of them accessible to the average person. All of these cameras pose an opportunity for computer vision to continue to grow and help more people. However, in order for an average person to harness the power of computer vision, he needs experience with programming and an understanding of computer vision. Because many people do not have this experience, our Average Joe Classifier will do the work for them.

**Effectiveness:** Our product will have a simple pipeline that allows the user to upload images, create bounding boxes on what the user is trying to label and then submit the images to be trained. After, the classifier will send back the results. If the customer does not agree with the results, he can correct what was labeled incorrectly or missed and resubmit his new labels. This simple cycle allows our product to be effective because the objective of the Average Joe Classifier is to have a normal person not trained in computer science create a classifier. The simple cycle allows the user to create their classifier without confusion.

**Efficiency:** Our user interface will achieve efficiency with a small time commitment. The goal of the Average Joe Classifier is to have the user create their classifier with as few iterations as possible. The simple cycle described in effectiveness will take as long as the user wants it to. It can be performed a few times or many if the user wants the classifier to be very accurate. This will allow the user to decide their own time commitment. There is a minimum number of steps of five. The user must upload images, draw boxes on the object being classified, submit it to be classified, correct the results and then retrain the classifier. The user at the end can then decide if he wants to submit his classifier to the database to be used by other customers of the product. The minimum number of steps described above is supporting our user in creating his classifier.

**Safety:** The safety of the Average Joe Classifier's interface will be very important when the user is drawing and correcting the bounding boxes. We will be focused on making sure the user does not accidentally remove or alter a bounding box by accident. One way we plan on achieving this is with confirmation dialogs for deleting a bounding box. When the user chooses to delete a bounding box, he will be prompted to confirm the deletion before proceeding. We will also enable and disable buttons based on the situation so the user does not accidentally click on

one. For example, the button to retrain the model will be disabled until the user has finished checking all of the test images. Another important part of safety is the ability to go back to previous images or boxes and change them. During the labeling process the user will be able to navigate back and forth between all of the images and bounding boxes until the is satisfied with the labels. The Average Joe Classifier's interface will minimize mistakes and keep the user on track.

**Utility:** The functions for the user to create their classifier will require the user to be able to draw bounding boxes on the images. The UI for creating bounding boxes lets the user know the pixels that are being captured (this is the part that the user is classifying). Another requirement for the user to create their classifier is have the ability to upload the images to the database. We have a simple page created with JavaScript and HTML where the user can search their device and select what images or videos he wants to upload. The user will then simply hit the submit button and it uploads to the database. The user interface also displays on the same page the images already in the database, so the user can see what he has already submitted. There will also be a page that shows the user what classifiers are already in the database so that the user does not create one that already exists. This page will be linked to the main page of the user interface with a simple tab. The tab will say "classifiers in the database", so it is easy to navigate.

**Learnability:** Our project does not take long to learn since our project is catered to needs for the average joe. The project is constructed to make something complex like machine learning and computer vision are accessible for anyone. The project is made around the concept of making an object classifier simple, so anyone can pick up our software and immediately start using it. The buttons explain the action for exactly what the user is doing. At each step there are instructions explaining what the functionality is for that step. The icons and menus will be displayed in a standard way, not straying from how typical applications/software are laid out. To draw a bounding box around the object the user wants to classify is similar to how image cropping software function. These components are intended to help the user, so he will not have a hard time learning our system.

**Memorability:** The Average Joe Classifier uses a simple interface with one pipeline/cycle that repeats as the user labels and classifies images. This goes hand in hand with learnability since the software is made for the average joe, it is easy to learn, therefore, easy to remember how to use. Once a user does the labeling once, it's the same thing over and over again to retrain the classifier and refine it to the user's liking. When the user logs back into the system, the user will be guided through the classifying and labeling process due to the buttons and instructions that explain what each component is doing. There should not be a need to memorize the interface and process since many of the screens and directions will remain on the control screens.

**Data Visualization:** There are three main data visualizations which we plan to use to demonstrate the Average Joe Classifier. The first visualization we want to use is simply some example images with bound boxes in order to demonstrate the product. Another visualization

will be a chart of how the accuracy of the model increases with each iteration of correcting and retraining. The goal of the Average Joe Classifier is to create an accurate model and this visualization will demonstrate the effectiveness of our process. The last visualization will be a chart of how long the correcting and training process takes for each iteration. The iterative training process is supposed to be quick and efficient, and this visualization will demonstrate how our process saves the user time. We will also train a model on a full dataset so we can compare the results and time taken to our method. These visualizations will demonstrate how the Average Joe Classifier is achieving its goals.

In conclusion, all of these components create an effective user interface, so the average joe can successfully create their classifier. The simple welcome page will walk the user through how to upload and then label their images. The customer will have an easy time remembering how to use it because of the simple cycle that has been built in to creating the classifier.