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CSE 40536/60536 Term Project: Preliminary Design and Architectural Description

1. **Set of Methods to Try for Detection of Individual Objects in Plastic Totes:**
    a. SIFT/SURF Keypoints: Experiment with connecting all keypoints and use the the center of keypoints as the center of the object. Use keypoint matching to localize objects among different tote configurations
    b. YOLO: Experiment with different grid sizes of object detection.
    c. Augmenting our data with other datasets found on the web.
    d. Run pretrained object detection networks on our datasets (e.g. Mask R-CNN, YOLO, FixResNeXt-101) to see their performance without modification or retraining of the last n layers
    e. Training a custom neural network architecture based on class labels for the class's collective objects

2. **Experiments with Data:**
    a. Crop all images to contain the object by itself.
    b. Preprocessing images to normalize all images to the same size and mask out background. This can be done at the beginning of each network's implementation
    c. Randomized dropout or image clarity during training of networks
    d. Divide data into train dev and test. Changing Dev Test sets and evaluate methods based on the aggregate average of all different data splits.
    e. Augmenting data by introducing noise into the dataset to what system is more robust to noise. This can be done using pytorch-randaugment (https://github.com/ildoonet/pytorch-randaugment)to introduce noise into train sets

3. **Steps to Have Preliminary Solution by March 6:**
    a. 02/14/2020: Assign unique names (e.g. "Pill Bottle") to all objects in our cluster tote, both individual objects and objects from instructors. This can be housed in a file like "names.csv"
    b. 02/14/2020: Preprocess pictures of the plastic totes.
    c. 02/21/2020: Acquire additional image datasets of similar items and settings
    d. 02/28/2020: Download pretrained networks and accesses with items can already be identified by the pretrained network and which ones will need to be trained manually.
    e. 03/06/2020: Start designing custom neural network architecture to address the shortcomings of (d)

4. Division of Free Labor:

a. 02/05/2020: Cropping images of our plastic tote is done by Xing Jie Zhong
b. 02/05/2020: Cropping images of our objects is done by Alden Kane
c. Programming and implementation of methods in (1) will primarily be done in conjunction
d. Training of Neural Networks will be done by Xing Jie Zhong on his resources with the Chiang Lab
e. Procuring additional datasets will be done in conjunction