# Bucky's Smart Pub

BadgerHacks 2021, Jack Wolf

Overview

- Use ML to efficiently learn a user's preferences
- Ranking and recommendation systems
- Two parts:
    - Siamese neural network for learning pairwise ranking
    - Active learning algorithm for selecting training points
- Bucky's Smart Pub: Bucky the Bartender's goal is to learn patrons' beer preferences quickly and accurately without getting them too drunk

Siamese Neural Network

- Siamese networks use the same weights for two different inputs
- Training input:
    - Pair of points being ranked: (point_i, point_j)
    - Pairwise ranking: {+1, -1}
- Model
    - Two layers, X^ and L^, of shapes (1,D) and (D,L)
    - Output of model, L^ @ X^, is learned preference, LP
    - score(p) = norm(P - LP)
   - Pred = +1 if score(point_i) > score(point_j), else -1
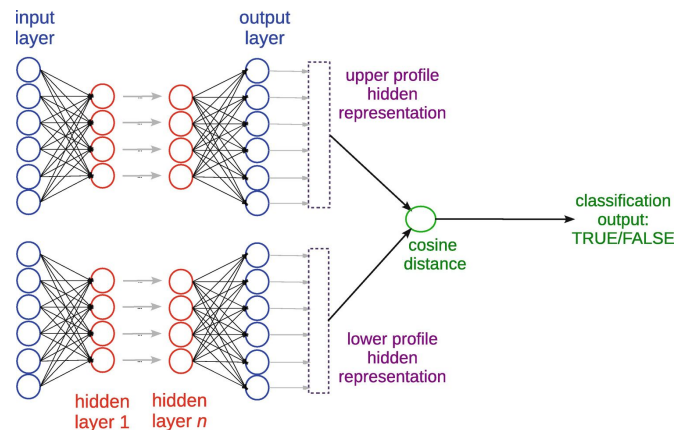
Active Learning

- A dataset of N points has N!(N-2)! Pairwise combinations
- Easy to learn preference by viewing all rankings, but not always possible
    - User cannot watch every movie on Netflix or drink every beer at the bar
- Some points carry more information than others
- Approach
    - Select initial set of training points, T
    - Put the rest of the points in a set E
    - While there are points in E:
        - S = [score(e) for e in E]
        - Selection = E[argmin(s)]
        - Pop selection from E to T
        - Train model(T)
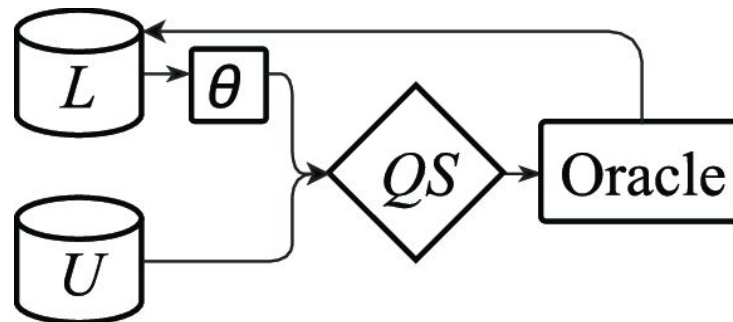
Bucky's Smart Pub application

- API and website to allow users to interact with model
    - Watch progress
    - Get live recommendations
    - Give model feedback
- Add users to the pub and watch Bucky learn their preferences
- API calls ran in background so users do not have to wait
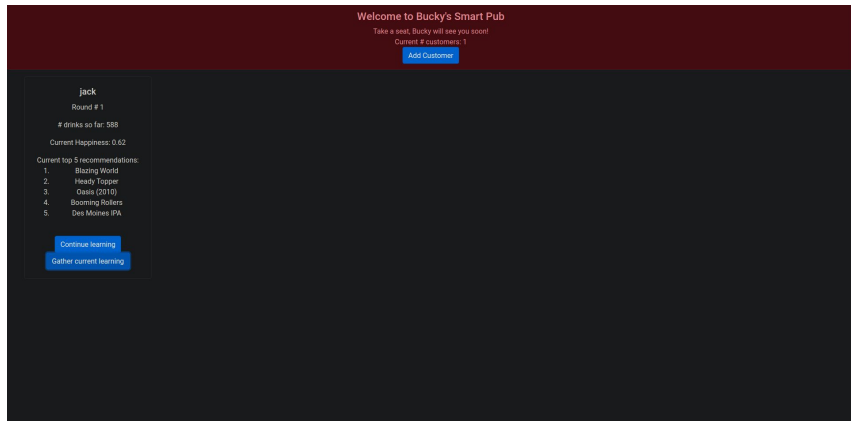
Performance

- Performance is twitchy
- Need to fix scoring heuristic

Customer ID: skippy

Customer Happiness by Round