

# Do You Even Lift, Bro?

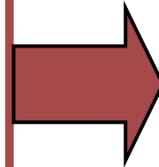
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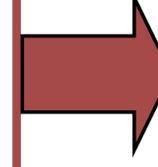
## PREDICTING:

- . We created a tool that will enable users to choose the best sport for them.
- . The tool will also predict the likely success of a user in their optimal sport.
- . We base the prediction on relevant user information, including gender, age, and workout history in selected exercises.
- . The data we used were gleaned from the "Fitocracy" social media fitness application [1]. We used 105 total sports in our model, with around 1200 exercises.



## DATA AND FEATURES:

- . Data comes from three separate datasets
- . Rows denote one exercise per user/group
- . Columns included information on age, height, gender, each exercise performed (paired with a tuple of rep and weight values), and the sport(s) the user plays.
- . In our proficiency step, our features were "calculated one-rep maxima" for each exercise. For the supervised learning, we used indicators on exercises performed, as well as on age and gender buckets.



## MODELS:

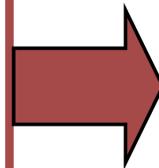
- . In order to select the optimal sport for a given user, we use softmax regression. We employ the stochastic update rule:
 
$$\theta_j := \theta_j + \alpha (\mathbf{1}[y_i = j] - h_{\theta_j}(x_i)) x_i$$
 where  $\theta_j$  is the weight vector for sport  $j$ ,  $(x_i, y_i)$  is the  $i^{\text{th}}$  training example, and  $h_{\theta_j}(x) = g(\theta_j^T x) = \frac{1}{1 + e^{-\theta_j^T x}}$ .
- . After solving for the weights, we assign
 
$$y_i = \arg \max_j h_{\theta_j}(x_i)$$
- . Finally, within each group, we create and average Gaussians on each exercise's 1-rep-max to predict proficiency.

## RESULTS:

- . Since users could play more than one sport, we considered a successful trial any trial in which the user played the predicted sport. With 26,274 training examples and 4,722 testing examples, 5 epochs, and step size  $n^{-1/2}$ , we achieved

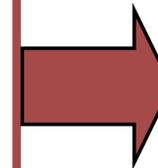
TRAINING ERROR	TESTING ERROR
37.26%	43.69%

- . For the Gaussians portion, accuracy can only be tested with more access to more specific data.



## DISCUSSION:

- . This was an interesting classification project because the training examples could be classified under multiple sports, not just one. This slightly affected the softmax algorithm.
- . Because of this, we did expect rather high errors to result. However, given 105 classes, these errors are quite acceptable to us.
- . The Gaussian algorithm was only an approximate attempt, and did not fully utilize our machine learning tools.



## FUTURE:

- . In the future, in addition to improving the time complexity of our algorithms, we could employ EM to improve the proficiency estimation portion.

## REFERENCES:

- [1] The Fitocracy dataset was provided by David Jurgens, who collected the data for [2].
- [2] Jurgens, David; McCorriston, James; Rhuts, Derek. 2015. An Analysis of Exercising Behavior in Online Populations. *McGill University Department of Computer Science*.