

MIS 284N: PROJECT MILESTONE 3

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(1) How did you approach Step 1?

- Created a new model with 4 features - high temperature, low temperature, humidity and actual step count for a particular day
- Set initial weights as follows:
 - W0: 1725.18550495 (from Milestone 5)
 - W1: 41.73728844 (from Milestone 5)
 - W2: 16.29751196 (from Milestone 5)
 - W3: 553.50462998 (from Milestone 5)
 - W4: 1
- Retrieved today's weather and step count data from Android App. This became our feature set for training new model i.e. X
- Used model from Milestone 5 to predict the step counts for today. This becomes our training label.
- Trained our new model on the following sample obtained from last two steps i.e.

X1	X2	X3	X4	Y
High_Temp from openweatherm ap API	Low_Temp from openweatherm ap API	Humidity from openweatherm ap API	Actual steps from microbit	Predicted steps from Milestone 5 model

- Computed new weights for these four features plus offset and then used the new model with these new weights to predict the step counts for the next day.

(2) If a user wants to improve, i.e., increase their daily step counts gradually, is your approach a good mechanism to use for setting goals? Why or why not? If not, what would be a better way to generate a “goal” that would encourage the user to improve?

We are applying an ordinary linear regression formula to predict the step counts:

$$y = W_0 + W_1X_1 + W_2X_2 + W_3X_3 + W_4X_4.$$

Where X_1 is high temperature, X_2 is low temperature, X_3 is precipitation level and X_4 is actual step count. This finds the coefficients that best fit (actually overfit!) the data considering that all features are equally important. But that is not the case. User's previous day actual step count is more likely to influence their future step counts vs influence of weather on future step count. In other words, actual step count is a more important feature than weather feature set.

To build a model which would generate a user-friendly goal,

- we could introduce a bias in the model via L1 or L2 regularization. This would give a bias to important features, in this case, actual step count, for predicting future step count. This way, a more realistic step count could be recommended to a potential user.
- Use log function to generate step predictions. This would taper the growth in step predictions.

Moreover, this model does not take into account the individual fitness levels of the user. As such, the daily step count of a not-fit person vs a fit person would be the same despite the fact that they are at different levels of fitness and exercise. This could demotivate either user by overestimating for certain users and underfitting for others.

(3) Briefly (one paragraph or less) describe (again) your plans for Milestone 7 and briefly update us as to your progress and/or plans.

Our plan for Milestone 7 involves implementing a rock-paper-scissors game that is playable between the microbit(Player 1) and the Android device(Player 2). Essentially these devices will be communicating with each other via Bluetooth. As of now, we plan for Button A to signal rock, Button B to signal paper, and Button A + B to signal scissors from the microbit. On the other hand, the Android device will have buttons inside the UI that represent every move the player can make. One challenge we foresee is the speed at which the Bluetooth communication will pass the data. If it takes too long, it could potentially affect the game experience and wouldn't be beneficial for the game. Ideally, it should take only a few seconds, at most, to properly determine who won the game. For now, we have only mapped the idea and built the basic makecode for the microbit. Full development will start post Milestone 6 demo.