**Project**: Healthactivity recognition using active learning.

**Area:** Active Learning, Machine Learning.

**Date:** September 18, 2018

**People:** Vivya Kalidindi, Dr. Pradeep Chowriappa

**Objective:** A deeper look into physical activity [1] and food intake [2] data can reveal patterns of both healthy and unhealthy behavior that could be leveraged for personalized feedback [7] by using smartphones sensors [1]. To detect the health-care for humans ranging from personal fitness to elder care[6] by providing calorie deficit by way of decreased food intake and increasing physical activity through sending automated personalized feedback without human interpretation through MyBehavior [4][5] app. It will automatically learn a user’s physical activity and dietary behavior and strategically suggests changes to those behaviors for a healthier lifestyle. MyBehavior app will not just suggest “Continue or increase your existing behaviors”, but it will also find where a user’s existing walking behaviors happen and tell the user specifically to walk at those locations. In order to achieve such personalization,user behaviors must be extracted in a principled wayof reinforcement learning [2][9], capacity for adaptive decision making is implemented using the explore-exploit principle using Multi Armed Bandit (MAB) [4][5] models. This can be done by clustering the behaviors through Frechet distance [10].

**Hypothesis:** Yes, It is possible to get automated personalized feedback by using MAB model.

**Alternative Hypothesis**

**Keywords:** Active learning, Activity recognition, Machine learning, Mobile phone sensing, Reinforcement learning, Multi-armed Bandit, Frechet distance.

**Specific Aim:**

1. **Data Collection:** It can be done by using The MATLAB [5] Support Package for Apple iOS Sensors enables you to collect sensor data from your iOS device.
2. **Data Preprocessing:**
3. **Features of Interest:**
4. **Methodology**:
5. **Validation of Results**:

**Specific Aim worked during this report:**

**Key Accomplishment:**

**Red Flags:**

1. Problem in understanding of Frechet distance

**Future Work:**

1. Need to find out more papers on Frechet distance.

**Time Line:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **AIM** | **September 1st – September 8th** | **September 9th – September 15th** | **September 16th – September 22nd** | **September 23rd – September 28th** |
| **Data Collection and preprocessing** |  |  |  |  |
| **Feature Extraction** |  |  |  |  |
| **Proof of Concept** |  |  |  |  |
| **Additional Work** |  |  |  |  |

**References:**

[1] Lu, H., Yang, J., Liu, Z., Lane, N.D., Choudhury, T., Campbell, A.T., 2010. The Jigsaw continuous sensing engine for mobile phone applications, in: Proceedings of the 8th ACM Conference on Embedded Networked Sensor Systems - SenSys ’10. ACM Press, New York, New York, USA, p. 71. doi:10.1145/1869983.1869992

[2] Noronha, J., Hysen, E., Zhang, H., Gajos, K.Z., 2011. Platemate: Crowdsourcing Nutritional Analysis from Food Photographs, in: Proceedings of the 24th Annual ACM Symposium on User Interface Software and Technology. ACM, New York, NY, USA, pp. 1–12. doi:10.1145/2047196.2047198

[3] Anjum, A., & Ilyas, M. U. (2013). Activity recognition using smartphone sensors. In *2013 IEEE 10th Consumer Communications and Networking Conference, CCNC 2013* (pp. 914–919). https://doi.org/10.1109/CCNC.2013.6488584.

[4] Mashfiqui Rabbi, Min Hane Aung, and Tanzeem Choudhury. Towards Health Recommendation Systems: An Approach for Providing Automated Personalized Health Feedback from Mobile Data. *In: Rehg J., Murphy S., Kumar S. (eds) Mobile Health: Sensors, Analytic Methods, and Applications, July 2017, pp 519-542, Springer International Publishing.*

[5] Mashfiqui Rabbi, Min Hane Aung, Mi Zhang and Tanzeem Choudhury. [Automatic Personalized Health Feedback from User Behavior and Preference using Smartphones.](http://pac.cs.cornell.edu/pubs/ubicomp_mybehavior.pdf) *The 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing* ([Ubicomp 2015](http://ubicomp.org/ubicomp2015/)).

[6] Mashfiqui Rabbi, Angela Pfammatter, Mi Zhang, Bonnie Spring, and Tanzeem Choudhury. [Automated Personalized Feedback for Physical Activity and Dietary Behavior Change With Mobile Phones: A Randomized Controlled Trial on Adults.](http://mhealth.jmir.org/article/viewFile/mhealth_v3i2e42/2) *JMIR mHealth uHealth 2015;3(2):e42.*

[7] Fogg, B.J., Eckles, D., 2007. Mobile Persuasion: 20 Perspectives on the Future of Behavior Change., Mobile Persuasion.

[8] <https://www.mathworks.com/help/supportpkg/iossensor/ug/get-started-with-apple-ios-sensors.html>

[9] Sutton, R.S., Barto, A.G., 2012. Reinforcement learning. Learning 3, 322. doi:10.1109/MED.2013.6608833

[10] E. Sriraghavendra, K. K. and C. Bhattacharyya, "Fréchet Distance Based Approach for Searching Online Handwritten Documents," Ninth International Conference on Document Analysis and Recognition (ICDAR 2007), Parana, 2007, pp.461-465. IEEE (2007)