Lifestreams Dashboard: an interactive visualization platform for mHealth data exploration

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1. Introduction

Participatory mHealth incorporates a variety of new techniques, such as continuous activity traces, active reminders and prompted inputs [1,2] to personalize improve and disease management. The collected data streams are intended to allow individuals and care givers to systematically monitor chronic conditions outside the clinical settings, to identify the lifestyle factors that may aggravate these conditions, and to support personalized patient self management. One of the key challenges in realizing this vision, is turning these diverse, noisy, and evolving data streams into actionable information. Ultimately we need to identify data stream features that can be automatically extracted and fed back to apps and interventions in order to increase the effectiveness, autonomy and scalability of patient self-care.

As part of a six-month pilot study in Los Angeles, we developed an end to end system to support health services researchers and other domain experts to data generated during an mHealth pilot with young mothers who collectively generated 15,599 survey responses and 3,834 days' worth of continuous mobility. In this poster, we present *Lifestreams Dashboard*, the interactive visualization platform designed to facilitate the exploration of mHealth data streams, and to aid the discussions with the participants.

Lifestreams Dashboard is a module residing in the visualization layer of Lifestreams Data Analysis Software Stack [3], which supports a pipeline of personal analysis modules. It is intended to support identification and evaluation of datastream features in support of iterative design processes in which the developers build a prototype based on the requirements specified by the health researchers who evaluate the efficacy and usefulness through the interviews with real-world mHealth study participants. We use data acquired during our 6-month pilot in which the 44 young mothers recorded both self-reports and passive data about their diet, stress and exercise to demonstrate the functions of Lifestreams Dashbaord. These functions include:

a. a change-detection-based filtering function that helps pinpoint the features that have been changed during the study

b. a color-coded correlation matrix that helps select the features that possess correlations higher than a controllable threshold with other features

c. a selective correlation analysis tool that helps the study of the correlations and the correlation changes between a group of heterogeneous features

d. a location trace analysis module that helps discover patterns in participants' daily trajectories using wifi-signature clustering techniques (See Figure 1).

Figure 1 Lifescreams Dashboard Screenshots. (a) Change-detection-based feature filtering function (the solid black lines in the plots represent the estimated change time). (b) Adjustable correlation matrix. (c) Location trace analysis module, and d) location cluser tool.[1]

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References

[1] S. Consolvo, D.W. McDonald, et al. Activity sensing in the wild: a field trial of ubifit garden. In *Proceedings of the twenty-sixth annual SIGCHI conference on Human factors in computing systems*, pages 1797–1806. ACM, 2008.

[2] D. Estrin and I. Sim. Open mhealth architecture: an engine for health care innovation. *Science*, 330(6005):759–760, 2010.

[3] Cheng-Kang et al., Lifestreams: a modular software toolset for exploring patterns from everyday life, *CENS Technical Report* #105.

[1] The geo-information in the map has been obfuscated to protect the participant privacy.