G. ADEN-BUIE, A. YALCIN, C. VANDEWEERD. Unsupervised behavior change detection using passive sensor systems in the homes of older adults. Gerontechnology 2018;17(Suppl):107s; https://doi.org/10.4017/gt.2018.17.s.104.00 **Purpose** Globally and within the United States, we face well-known and documented challenges driven by growth within the elderly segments of our population. The majority of adults over 65 are healthy but managing one or more chronic illnesses, and older adults and their informal caregivers—such as family members and friends—require supportive technologies that assist in monitoring and managing these conditions[1] as they strive to maintain independence at home. An important goal of lifestyle reassurance monitoring is to alert older adults and their caregivers to changes in behavior or routine. In contrast with traditional activity recognition algorithms that require labelled activity data that is both difficult and expensive to collect[2], we present a method for unsupervised behavior change detection that does not require explicit, higher-level activity labels and is effective when applied to real-world, natural, smart home activity data. **Method** In this project, we developed a passive sensor system that has been installed to date in the homes of 14 community-dwelling, older adults (aged 68 and above) who live alone and were of good health at the time of installation. Participants responded to a bi-weekly survey tracking the occurrence of health changes. Included in the sensor network are motion sensors for the generalized detection of presence throughout the home, and magnetic contact sensors for detection of interaction with entrance and exit doors and routinely used objects. All sensors are wireless, use the Z-Wave protocol, and are readily available commercially. The basis of the behavior change algorithm is the use of a bag of event sequence n-grams representation[3] to summarize daily activity patterns in an activity profile and a permutation-based change detection algorithm[4] to compare activity profiles of multiple days (e.g. a baseline period of activity) and individual or grouped activity profiles. **Results & Discussion** The bag of event *n*-grams method was first validated as a supervised classification problem in which activity profiles were used to identify occupants from 6 homes with identical layouts. Activity profiles based on 4 and 6 weeks of activity led to correct identification of a given occupant for unlabelled days of activity with high accuracy (0.9593, 0.9624) and F1 (0.9590, 0.9621). The algorithm for unsupervised behavior change was applied to the activity data from four participants over a period of one year (one participant) or two years (three participants) who reported health changes ranging from acute episodes of illness to mobility restrictions leading to major surgery. Preliminary results reveal that comparison of activity profiles over time windows of 1 to 4 weeks reliably detects major shifts in behavior or other systematic disturbances such as guests in the home or sensor reliability issues. Linking the output of the algorithm to a notification system will alert family members, caregivers, and system administrators to trigger follow-up and review when such issues arise.

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