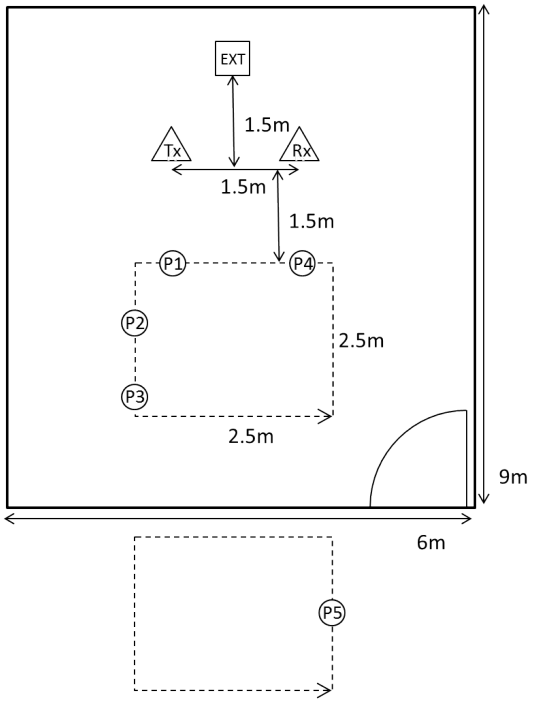

Figure 1: floor plan

1 Setup

We collected training samples for 10 different activities in our lab, which is 9m of length and 6m in width, as show in figure 1. We collected total 2640 samples for the testing activities from 6 research participants. The participants included 5 males and 1 female graduate students with ages in the range of 25-34.

We evaluated the recognition accuracy of *B-CSI* through two sets of experiments, one is in the trained environments and the other is in the untrained environments. We use the lab where we collected the training environments.

The activities for which we collected training samples are listed in figure 2, along with abbreviations and number of samples for each activity. We collected samples for each activity. For walking on path and running on path, our participants followed the path with a dashed line at the center of the lab. Other activities were conducted at the five different locations which marked as circle. The location five is exceptionally conducted outside the lab. Tx and Rx represent the location of the tag node and sink node. EXT represent the location of exciter. The total time for our activity dataset with 2640 samples was data collection 1 hour 50 min on a desktop with Intel i5-3470 CPU, as shown in figure 2.

Activity	Samples	Dataset time
(FA) Falling	300	12m30s
(RP) Running on path	120	5m
(RS) Running on spot	300	12m30s
(SI) Sitting	300	12m30s
(SD) Sitting down	300	12m30s
(ST) Standing	300	12m30s
(TX) Texting	300	12m30s
(WP) Walking on path	120	5m
(WS) Walking on spot	300	12m30s
(WR) Writing	300	12m30s

Figure 2: Summary of activity dataset

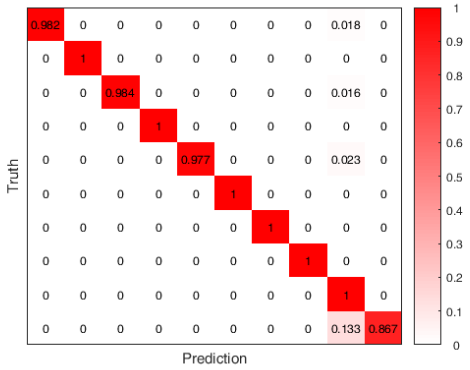

Figure 3: SVM confusion matrix for *B-CSI*

2 experiments

The Support Vector Machine (SVM) [] with a linear kernel function for mapping input samples into high dimensional space is used. *B-CSI* achieves an across validation accuracy of 98.1% across all activities. Figure 3 shows the confusion matrix result of our machine learning based *B-CSI* activity detector. Except for "writing", *B-CSI* achieves close to 100% accuracy.

B-CSI achieves an accuracy of higher than 98.2% for the research participant who is not included on training set. Figure 4 shows the confusion matrix result of our *B-CSI* activity detector.

3 results and analysis

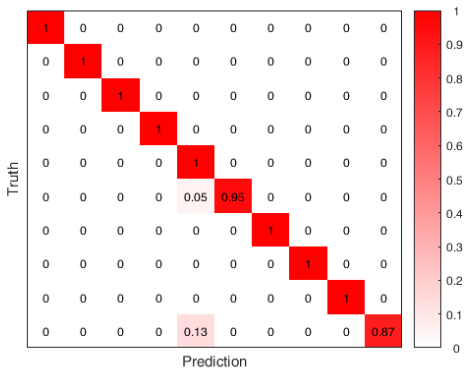

Figure 4: SVM confusion matrix for untrained participant