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Conference: PREVIEW OF EXAMINATIONS ON DOCTORAL DISSERTATION
Topic: ASSISTIVE TECHNOLOGIES FOR SMART HOUSING OF SENIOR CITIZEN
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1. INTRODUCTION:

Main purpose: Help in the housing of senior citizens
Benefits include lowering of care cost and improving self-reliance of senior citizen
The issue to be tackled: Falling application, medical schedule remainder, security for data access for remainder manipulation, and falling alert notification. Hardware manipulation as per rules for each housemate, Security Physical and security data access
Technologies:
Machine Learning in Python- Activity Recognition and Falling detector
Fuzzy Logic- Rules and shortcuts-Remainder
HTML- Device recognition for data checking and remainder possibility
Algorithms for machine learning:
1. K-Neighbors Classifier
2. Support Vector Machines (SVC)
3. Decision Tree Classifier
4. Random Forest Classifier
5. Gaussian
6. Ridge Classifier
7. Logistic Regression

Datasets: 1). MobileFall,2) tFall, and 3) DLR
Programming Languages: Python, HTML, JavaScript, PostgreSQL

2. OBJECTIVES:

Problem to be solved: Incorporate activity recognition and security protocol. Security involves physical property and data integrity. Physical security discusses the intruder in the house and how the intruder affects the effectiveness of the training data. We should be able to differential the intruder from the subject. Data security entitles the data packages to have integrity. Data ear-dropping would not be an issue as the data is pseudonymized. However, the correct and uncorrupted data must be transmitted. The integrity and accessibility are more important than someone in the middle intercepting the data. Activities in the house must be accurately identified to avoid mistakes. Seven traditional algorithms are tested, and the best is used in the given scenario. Priority of sending messages is organized in this order

1. Fall detection
2. Grooming and toileting
3. Security detection
4. Normal activity detection
5. Schedule and medicine remainder

3. STATE OF THE ART SMART HOUSE:

Algorithm1- Activity detection
Algorithm2 -Fall detection
Algorithm3 -Schedule remainders
Algorithm4 - Grooming and toileting
Algoririthm5 - security and privacy concerns
Algoritthm6 - Combination of above five algorithms
Technologies- PostgreSQL Database, JavaScript, and Python for Machine learning recognition

4. PROPOSED CONTRIBUTION:

The thesis has two parts 1) activity recognition algorithm and two 2) security algorithms
Mixed security for physical security
Missed security for data records access by finger-pointing devices
Recognition algorithm for data detection.
Activity recognition would be able to identify the deviation from the normal schedule.
Employ the use of the Hidden Markov model.

5. METHODOLOGY:

Methodology: The architectural concept and the prototype were developed using a Coziness One sensor, an Android application, and a Python server. The selected MLAs for anomaly detection are Local Outlier Factor, Isolation Forest, One-Class Support Vector Machine, and Autoencoder. A 72 hour-long data sample was recorded for assessment by use of these algorithms (N = 1). Since the generation of irregular health data is not possible at the push of a button, the measurements during the activities (sport, metro, and eating) were regarded as artificial anomalies. All the remaining measurements were considered normal. The MLAs were finally evaluated using confusion matrices to calculate the metrics accuracy, sensitivity, and specificity.

Datasets: Differences in results because of the dataset. In our case, we shall have an experiment using three different data set and then cross-reference the results. This performance would be the benchmark. and then the bench march would be improved with the chosen client. The datasets are MobiFall, tFall, and DRL. The performance of using these three would be better than using one. They are all available public datasets.

Architectural design: The architectural concept and prototype is to develop an application for two purposes 1) fall detection and remainder systems and 2) security physical and data protection

A. Selected MLA algorithms. Develop an algorithm that can be more effective in differentiating between normal and abnormal data. Data would be collected using a watch and phone. Scenarios of falling would be defined. Scenarios of not falling would be defined. Rules and MLA would then be implemented to detect an abnormality. Intruders would be identifying if physically in the house by identifying any other person who comes in the house.
B. Access to this data would be given to devices of caregivers and family. Each device's DNA would be collected and DNA on every request for data would be required. A blacklist and a whitelist of uses would be generated. A person in the whitelist is allowed and anybody not in the list would be enlisted in the blacklist of the attempts to access data.

The solution would in three separation tasks forming one implementation.

6. EXPERIMENT AND ITS EVALUATION:

The system architecture of Prototype

1. The power subsystem
2. The sensor
3. The computing subsystem
4. Wireless

Bracelet=>Bus-Station=>Emergency contact

Sensors and algorithm data

Sensors or vision-based
Three-axis acceleration -XYZ-Accelerometer
A=SQL(X+Y+Z)

Evaluation formulas

TPR=100*TP/(TP+FN) – sensitivity formula
TNR=100*TN/(TN+FP) - sensitivity formula

Accuracy=100*(TP+TN)/TP+TN+FN+FP - Hit rate formular

7. RESULTS:

The final prototype would include the following two main components:
Security protocol and Activity detection protocol.
ADL- Activity Recognition
1. Standing
2. Sitting
3. Laying
4. Walking
5. Walking
6. Walking downstairs
7. Walking Upstairs

Falling Activities- Activity Recognition
1. Backward fall
2. Forward fall
3. Instant fall

Bridge activities and their eliminations
Threshold of 50% -+05
Threshold of 15% +-15
Special algorithms
Detected intruder and actions
Record the intruder in the database and forward for authentication and research

8. PICTURES AND GRAPHS:

1. Schema of component of tasks
2. Schema of activity recognition visualization
3. Schema of ADL, Fall activities, and Border activities
4. Schema of remainder architecture and communication
5. Schema of data access and fingerprinting algorithm

9. CONCLUSION:

Performace in Bad/good activity recognition is at 89%. Good compare with five papers. Performance of remainder is improved because of security. Performance is logic activity is easier because it has a notification and monitoring component. Performance is better than previous trials results.
A. Activity detection
B. Fall detection
C. Security detection.
Therefore, this plan would execute and solve the problem.

References:

1. Ienca, Marcello, and Eduard Fosch Villaronga. "Privacy and security issues in assistive technologies for dementia." *Intelligent Assistive Technologies for Dementia: Clinical, Ethical, Social, and Regulatory Implications* (2019): 221.
2. Sucerquia, Angela, José David López, and Jesús Francisco Vargas-Bonilla. "SisFall: A fall and movement dataset." *Sensors* 17, no. 1 (2017): 198.