IoT system for Autonomous Realtime Patient Monitoring and Its Application
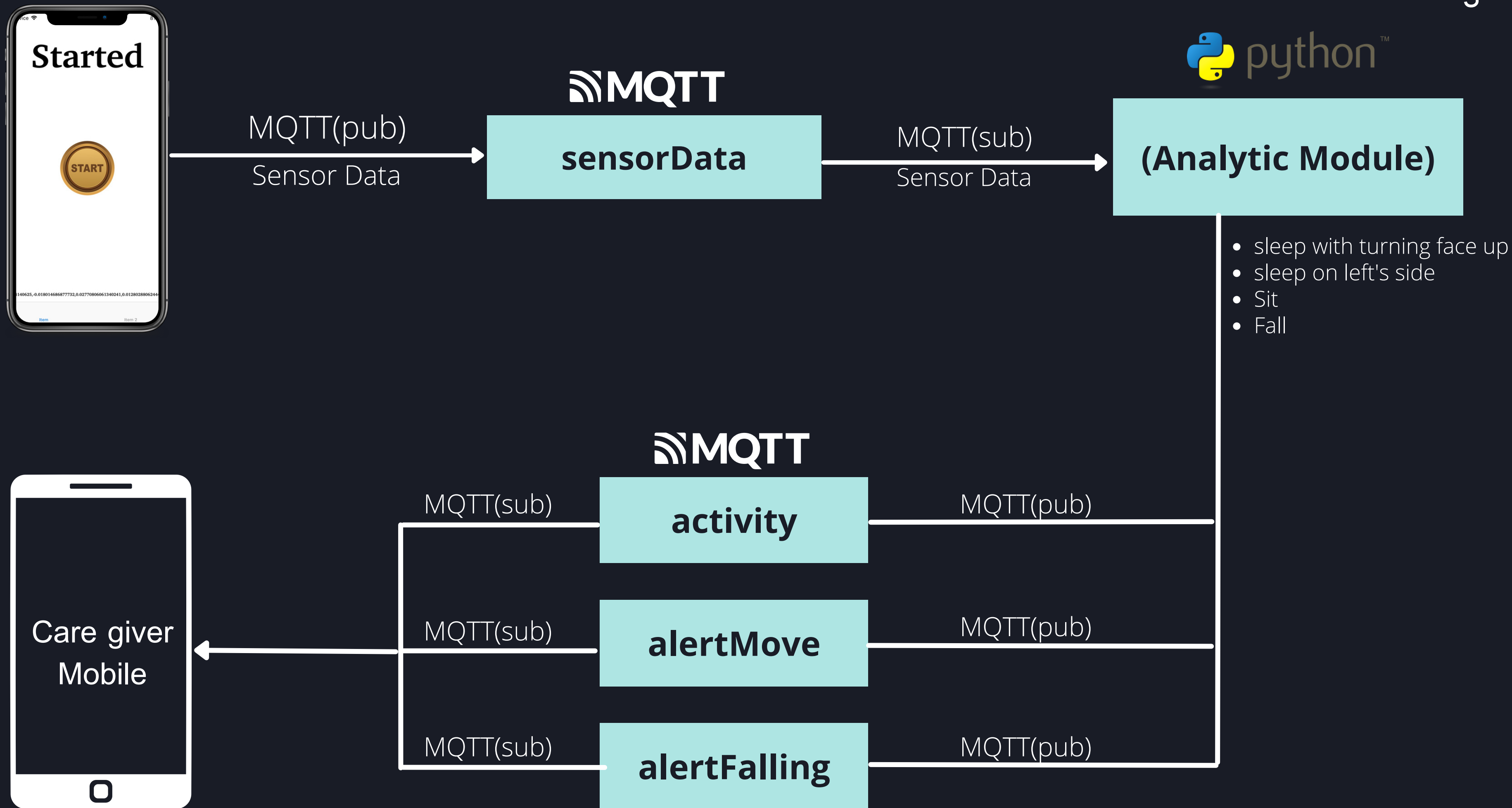
Unavailable & Espresso Team

Objective

- Using Moblie Sensors
  - Accelerometers
  - Gyroscopes
- Activity classification
  - sleep with turning face up
  - sleep on left's side
  - Sit
  - Fall
- Records
- Alert
  - Idle
  - Fall

Started

MQTT

MQTT(pub)
Sensor Data

sensorData

MQTT(sub)
Sensor Data

python™

(Analytic Module)

- sleep with turning face up
- sleep on left's side
- Sit
- Fall

MQTT

MQTT(sub)

activity

MQTT(pub)

Care giver
Mobile

MQTT(sub)

alertMove

MQTT(pub)

MQTT(sub)

alertFalling

MQTT(pub)

Our process

1. Sensors

2. Collect data

3. Cleansing data

4. Model

5. Alert

Sensors

Accelerometer

Gyroscope

Sensors
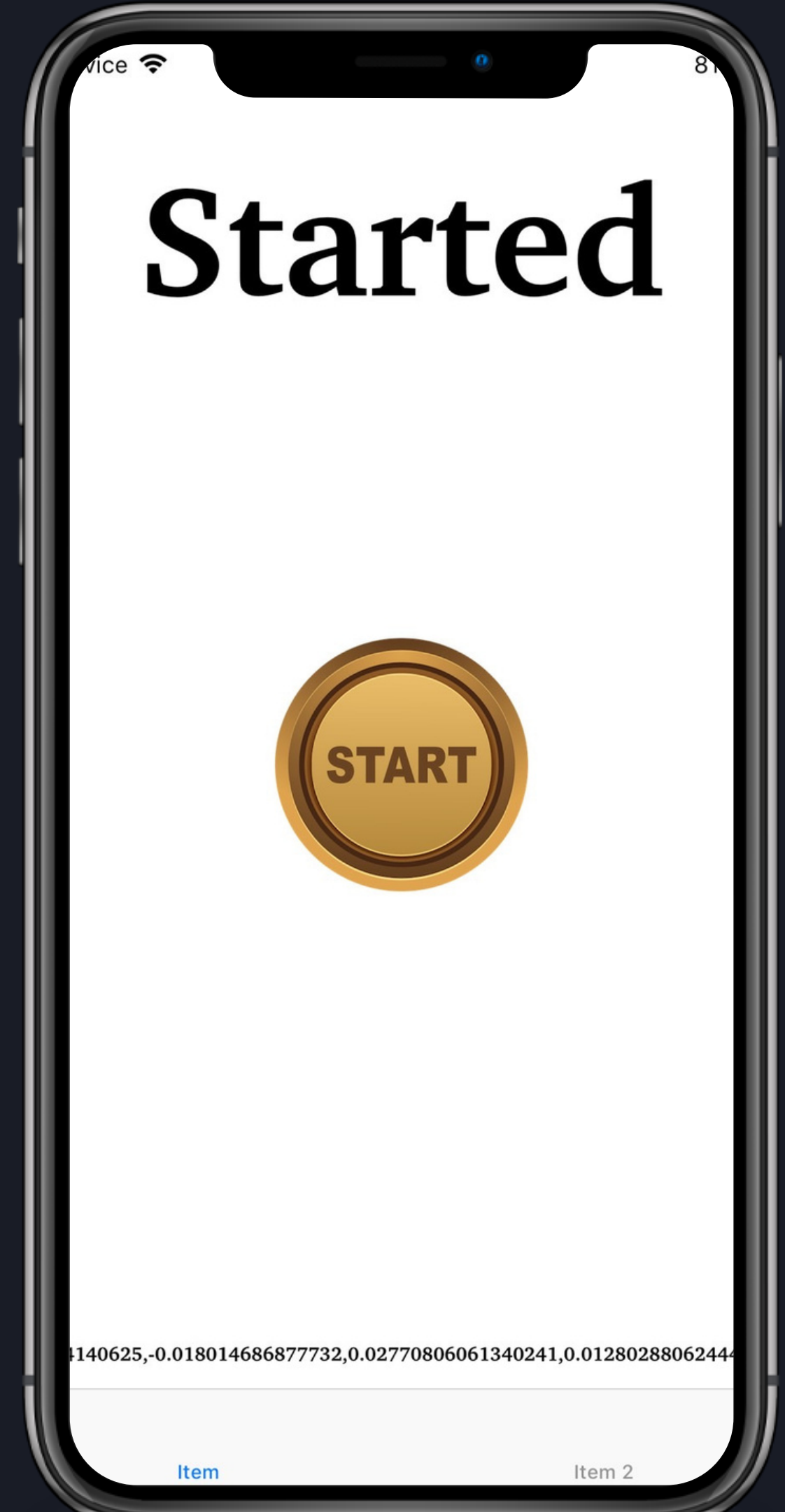
Collect data

	timestamp	accX	accY	accZ	gyroX	gyroY	gyroZ	pitch	yaw	roll	answer
0	1.637594e+09	0.076492	-0.028275	-1.025864	0.083753	0.020969	-0.069271	0.084725	-0.004381	0.083138	0
1	1.637594e+09	0.069962	-0.116333	-1.000702	0.039438	0.027808	0.023531	0.096635	-0.023273	0.078887	0
2	1.637594e+09	0.066223	-0.074051	-0.969040	-0.024988	0.029181	-0.024695	0.137557	-0.036107	0.099456	0
3	1.637594e+09	0.096603	-0.146362	-0.982025	-0.010441	0.003999	0.007406	0.150668	-0.032262	0.097191	0
4	1.637594e+09	0.100342	-0.147705	-0.982132	-0.012069	-0.001667	0.007258	0.149083	-0.031601	0.101344	0

1. time stamp
2. accX - accelerometers axis-X
3. accY - accelerometers axis-Y
4. accZ - accelerometers axis-Z
5. gyroX - gyroscope axis-X

6. gyroY - gyroscope axis-Y
7. gyroZ - gyroscope axis-Z
8. pitch - gyroscope axis-X
9. yaw - gyroscope axis-Y
10. roll - gyroscope axis-Z
11. answer (y)

Cleansing data

	accX	accY	accZ	pitch	yaw	roll	answer
0	-0.034027	-0.972977	-0.240845	1.393136	0.311162	-0.356315	0
1	-0.032669	-0.995636	-0.138977	1.397252	0.108693	-0.142706	0
2	0.008255	-0.977600	-0.208328	1.362467	-0.072950	0.038964	0
3	-0.080521	-0.966339	-0.223251	1.330597	0.203506	-0.327716	0
4	-0.069138	-0.968109	-0.195251	1.358875	0.180678	-0.302742	0

Explore data

Check mean of each column

	accX	accY	accZ	pitch	yaw	roll
answer						
0	-0.094869	-0.985114	-0.039570	1.421308	1.071202	-1.258685
1	-0.940507	-0.158344	0.290293	0.159052	0.430212	-1.870652
2	-0.226873	-0.168395	-0.944931	0.169737	0.062727	-0.236003

**Sit
(class 0)**

**sleep with turning face up
(class 1)**

**sleep on left's side
(class 2)**

	accX	accY	accZ	pitch	yaw	roll
answer						
0	-0.094869	-0.985114	-0.039570	1.421308	1.071202	-1.258685
1	-0.940507	-0.158344	0.290293	0.159052	0.430212	-1.870652
2	-0.226873	-0.168395	-0.944931	0.169737	0.062727	-0.236003

Model

Splitting Data

```python
# Split dataset into training set and test set
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=1) # 70% training and 30% test
```

Building Decision Tree Model

```python
# Create Decision Tree classifer object
clf = DecisionTreeClassifier()

# Train Decision Tree Classifer
clf = clf.fit(X_train,y_train)

#Predict the response for test dataset
y_pred = clf.predict(X_test)
```

Evaluating Model

```python
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

```
Accuracy: 1.0
```

Fall Detection

Fall detection

```python
currentSensor = {}
threshold = 5
```

+ Code   + Markdown

```python
def fallDetection(accX, accY, accZ, gyroX, gyroY, gyroZ):
    global currentSensor
    X = {0:accX, 1:accY, 2:accZ, 3:gyroX, 4:gyroY, 5:gyroZ}

    has_items = bool(currentSensor)
    if has_items == False:
        currentSensor = X
    else:

        diffAccX = abs(accX) - abs(currentSensor[0])
        diffAccY = abs(accY) - abs(currentSensor[1])
        diffAccZ = abs(accZ) - abs(currentSensor[2])
        diffGyroX = abs(gyroX) - abs(currentSensor[3])
        diffGyroY = abs(gyroY) - abs(currentSensor[4])
        diffGyroZ = abs(gyroZ) - abs(currentSensor[5])

        print(f'{diffAccX}, {diffAccY}, {diffAccZ}, {diffGyroX}, {diffGyroY}, {diffGyroZ}')
        if diffAccX > threshold or diffAccY > threshold or diffAccZ > threshold or diffGyroX > threshold or diffGyroY > threshold or diffGyroZ > threshold:
            alertFallingToMobile()

    currentSensor = X
```

THE
TEAM

กรพินธุ์ พิมทาพันธุ์ศรี	6220422056
วัชรวิทย์ ลาพินี	6310422026
วิศัลย์ศยา ทิพย์โรจน์	6310422027
ธนัตถ์กรณ์ ชื่นบรรลือสุข	6310422031
วริศรา บุญยวง	6310422038
รักชนก ทองคำปั้น	6310422039
กวิน สิงหเขตต์	6310422040
ปิยบุญ คุณากรจิตติรักษ์	6310422047

Thank you!