Exploratory Applications on Apple Watch Ultra Datasets

[1]

in the Context of the 6-Minute Walk Test

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Contents

- Wearable technology is increasingly important in health monitoring.
- Focusing on the Apple Watch Ultra and its use in the 6-Minute Walk Test (6MWT)

Key research questions:

- How effectively can Apple Watch Ultra data be used in machine learning models?
- Can these models accurately predict health outcomes?

Medical and Technological Background

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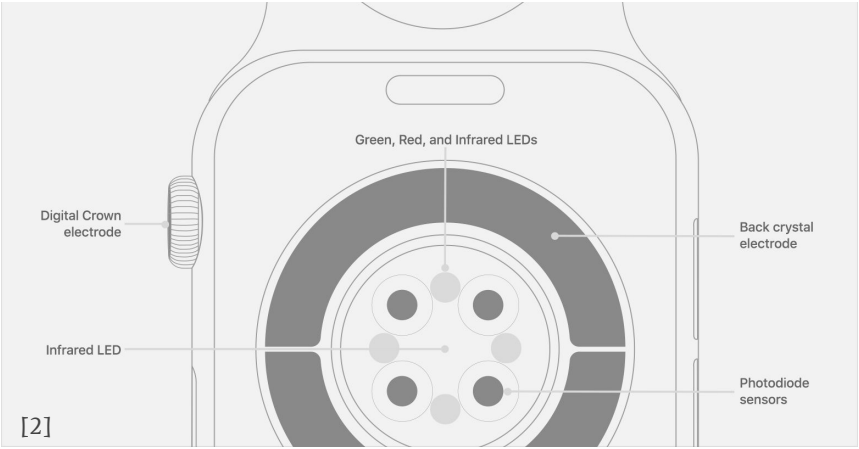
Medical:

HR & 6-MWT:

- resting heart rate ranging from 60 to 100 beats per minute (women's heart rates 8-10 bpm higher) and max. 220 - age
- 6-MWT widely used measure of functional exercise capacity (measures how far a patient can walk)

BMI	nutritional status
< 18.5	underweight
18.5 - 24.9	normal weight
25.0 - 29.9	pre-obesity
30.0 – 34.9	obesity class I
35.0 – 39.9	obesity class II
> 39.9	obesity class III

Technological:

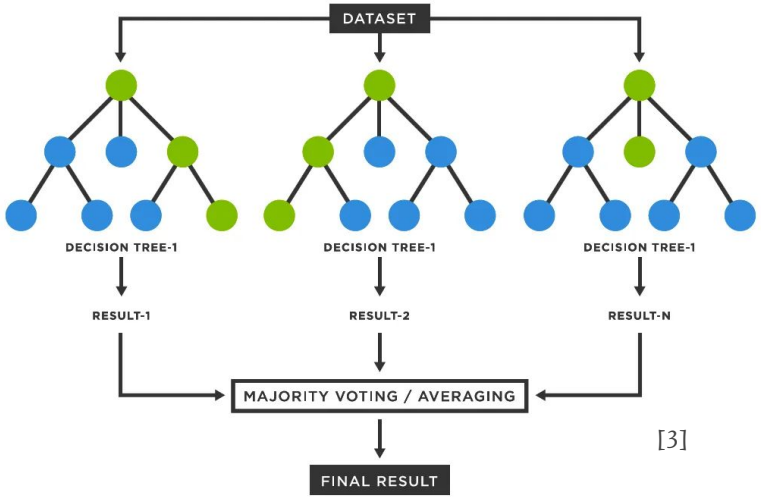


[2]

- works with photoplethysmography (principle that blood reflects red light and absorbs green light)
- green LED lights and light-sensitive photodiodes detect blood flow in the wrist
- green LEDs flash hundreds of times per second (measures heart rate by observing changes in light absorption)
- optical heart sensor can measure heart rates between 30 to 210 beats per minute

Methodology

Random Forest

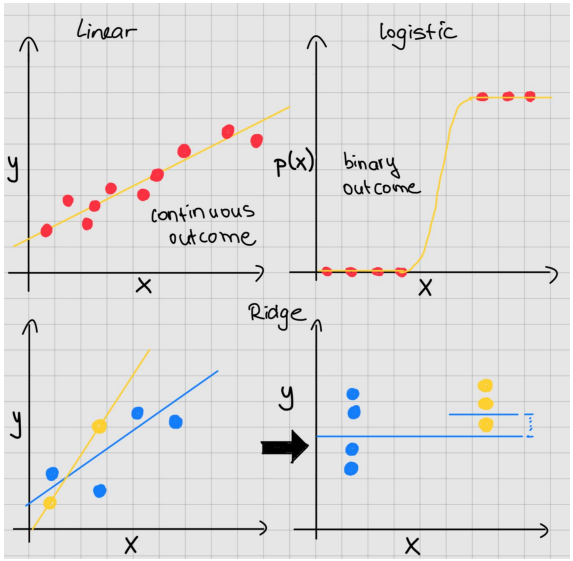


[3]

$$f(x) = \frac{1}{M} \sum_{m=1}^{M} f_m(x)$$

$$\hat{y} = \arg\max_{y} \sum_{i=1}^{M} 1\,(y_i = y)$$

Regression



[4]

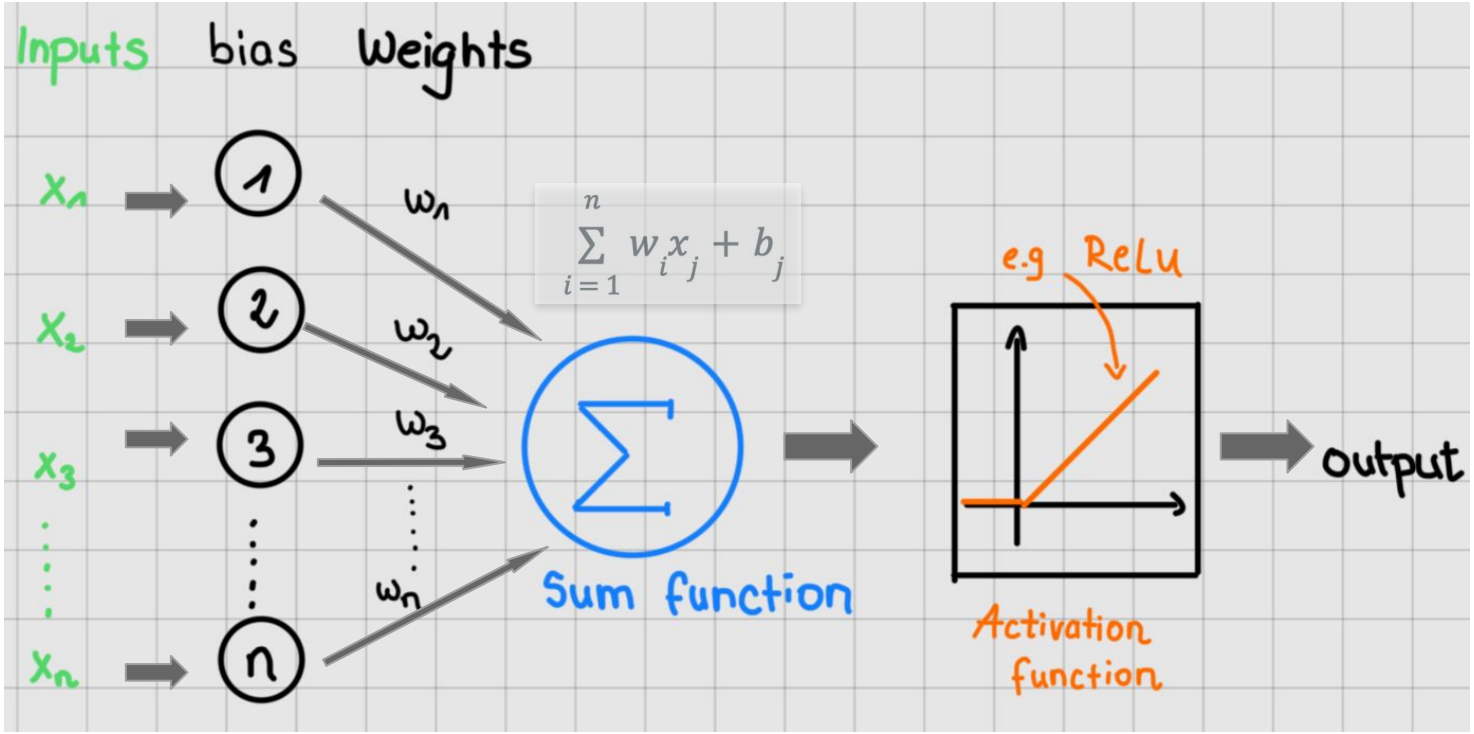
logistic: $f(x) = \frac{1}{1 + e^{-w^T x}}$

ridge: $f(x) = w^T x + \lambda ||w||^2$

linear: $f(x) = w^T x + \varepsilon$

Methodology

Neural Networks



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Methodology

Metrics

Performance

$$accuracy = \frac{correct\ predictions}{all\ predictions}$$

$$p = \frac{TP}{TP + FP}$$

$$r = \frac{TP}{TP + FN}$$

$$f_\beta = (1 + \beta^2)\frac{p \cdot r}{(r + \beta^2 p)}, \beta \in [0, 1]$$

Regression

$$residual_i = y_i - \hat{y}_i$$

$$SS_{res} = \sum_{i=1}^{n} \left(y_i - \hat{y}_i\right)^2$$

$$SS_{tot} = \sum_{i=1}^{n} \left(y_i - \bar{y}\right)^2$$

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}}$$

Error

$$MSE = \frac{1}{n}\sum_{i=1}^{n} \left(y_i - \hat{y}_i\right)^2$$

$$RMSE = \sqrt{MSE}$$

Dataset

Data Sources:

- Two XML files: 'export.xml' and 'export_cda.xml'
- Google shared document: '6MWT_Test_Runs'

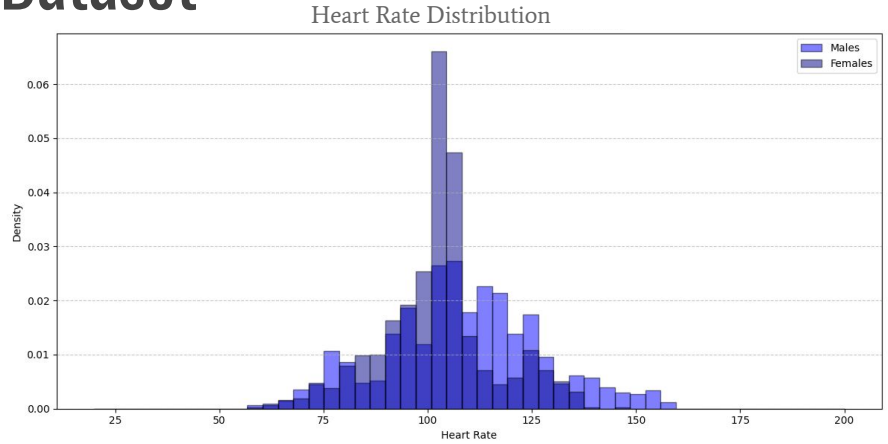
Data Preparation:

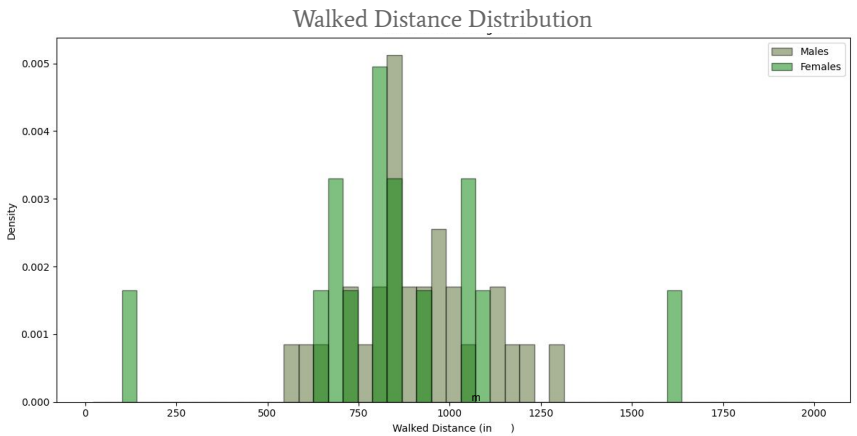
- Conversion of XML files to CSV format
- Filtering and merging relevant columns
- Manual merging based on height, weight and timestamp (due to differences in data formats)

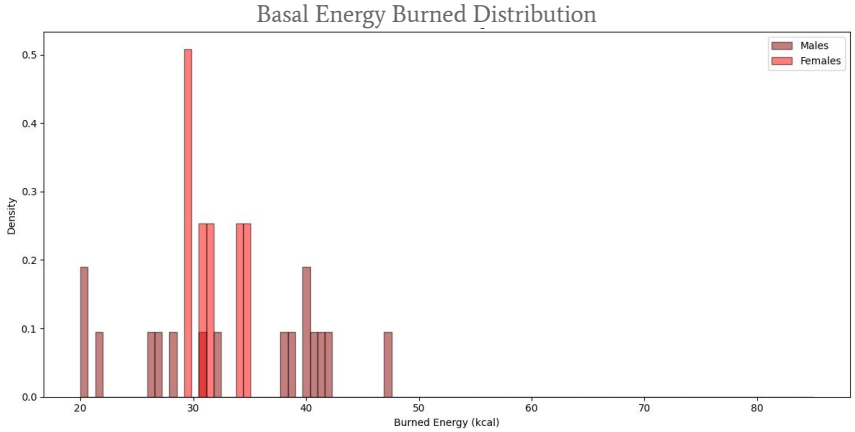
Key Features & Information:

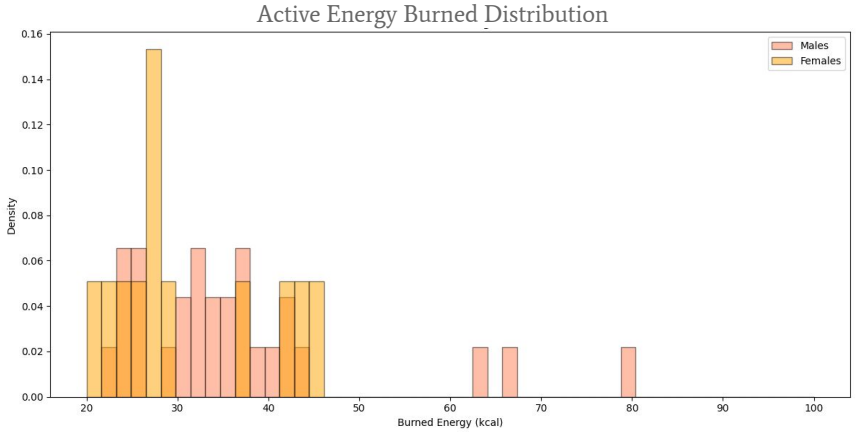
- Heart rate (min, max, average, 10 heart rate values per subject, later 100 values per subject)
- sex
- BMI calculation for better categorization
- Distance walked, steps before/after 6MWT
- 45 subjects (45 rows and and 169 columns) ; later 57 subjects
- 25 healthy subjects and 20 patients; later 27 healthy subjects and 30 patients

Dataset


Heart Rate Distribution
Males
Females
Density
Heart Rate


Walked Distance Distribution
Males
Females
Density
Walked Distance (in)


Basal Energy Burned Distribution
Males
Females
Density
Burned Energy (kcal)


Active Energy Burned Distribution
Males
Females
Density
Burned Energy (kcal)

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Implementation and Results

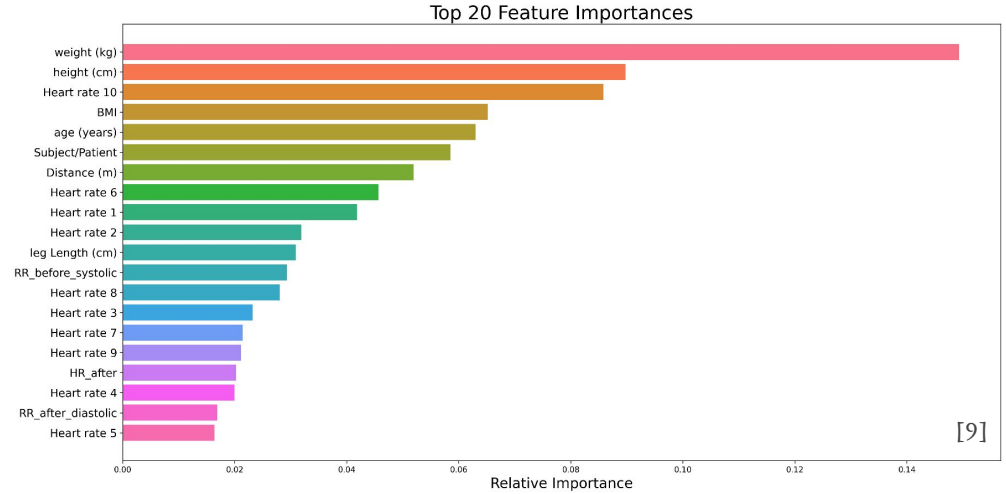
1. Random Forest

- **Tasks:**
  - Sex Classification
  - Subject/Patient Classification
- **Results:**
  - **Sex Prediction:**
    - Achieved high accuracy (100%) with key features like age, height, weight, and 10 heart rates
    - Feature importance showed height and weight as the most significant factors
    - Without weight, height and BMI: 78%
  - **Subject/Patient Classification:**
    - Achieved 100% accuracy with additional heart rate measurements (100 per subject)
    - Age and heart rate measurements were crucial predictors
    - Without age: 100%

Implementation and Results

1. Random Forest

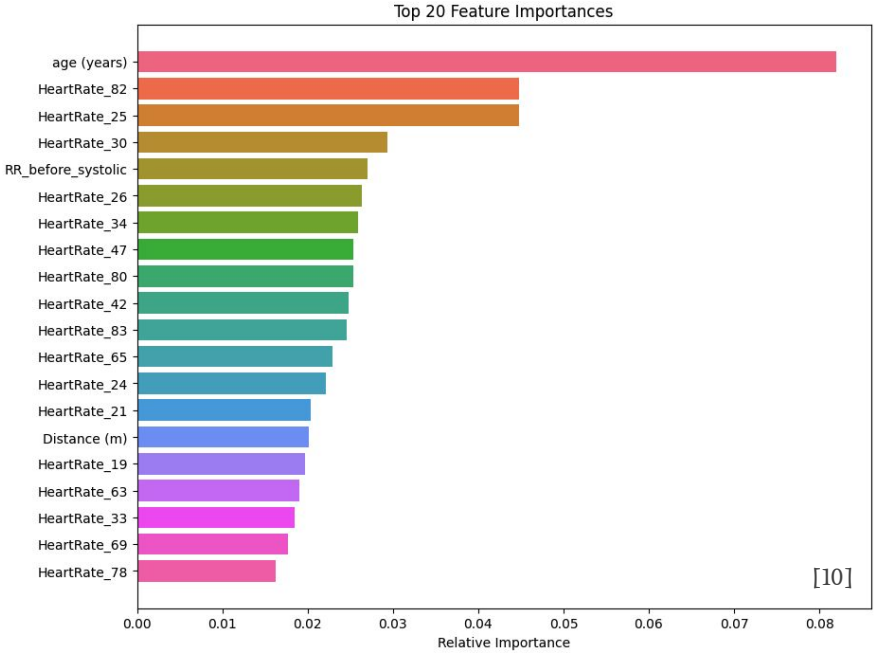
Sex Classification



[9]

vs.

Subject/Patient Classification



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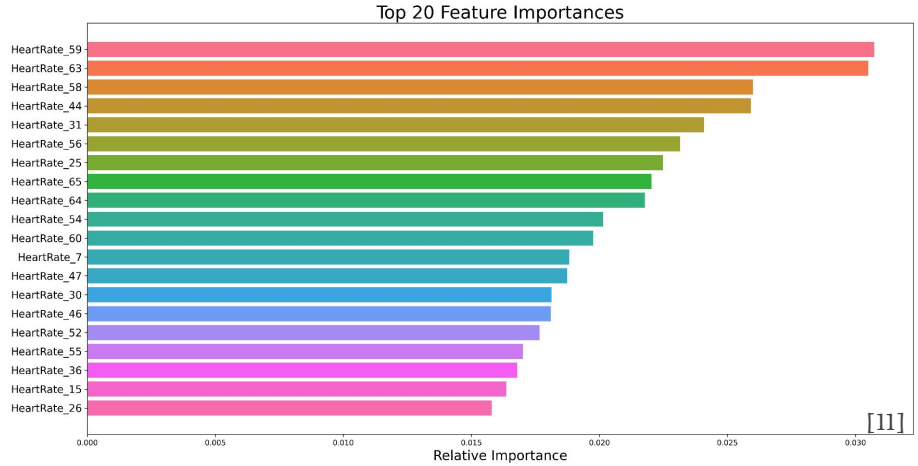
Implementation and Results

1. Random Forest (with just Apple Watch measured Data)

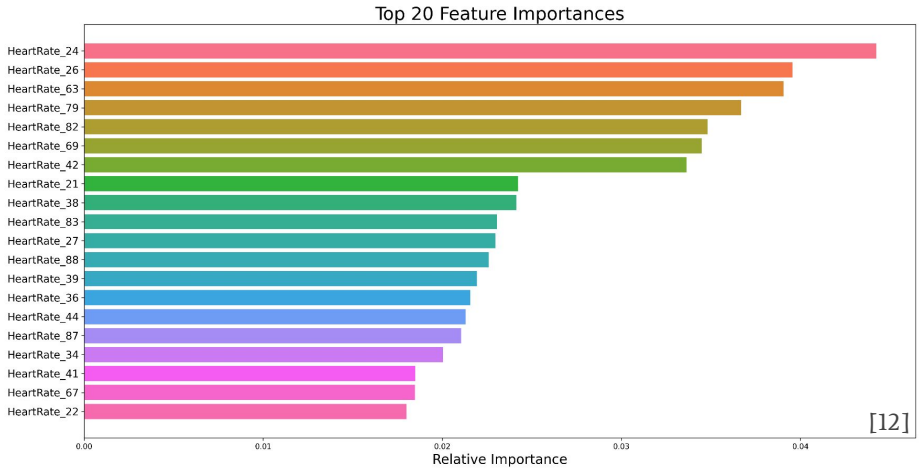
Sex Classification
(accuracy: 78%/ male 80% , female 75%)

vs.

Subject/Patient Classification
(accuracy: 100%)



[11]



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Implementation and Results

2. Linear, Logistic, and Ridge Regression

- **Tasks:**
  - Predicting Weight, Height and BMI
- **Results:**
  - **Weight and BMI Prediction:**
    - Ridge regression outperformed linear regression, achieving high R^2 values (up to 0.99) with low RMSE

prediction task	features / metrics	linear regression	ridge regression
weight (kg)	age, 100 heart rates, blood pressure, energy burned, distance, height		
	R^2	0.84	0.99
	MSE	26.66	1.21
	RMSE	**5.16**	**1.10**
height (cm)	age, 100 heart rates, blood pressure, energy burned, distance, weight		
	R^2	0.61	0.98
	MSE	41.14	2.27
	RMSE	**6.41**	**1.51**
BMI	age, 100 heart rates, blood pressure, energy burned, distance		
	R^2	0.91	0.99
	MSE	0.78	0.11
	RMSE	**0.88**	**0.34**

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Implementation and Results

3. Neural Networks

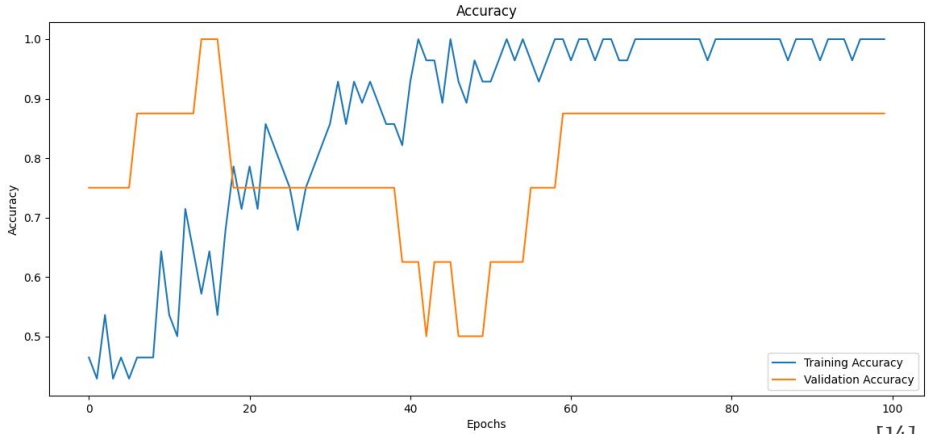
- **Architecture:**
  - Multiple dense and dropout layers with ReLU activation
  - 100 - 150 Epochs
  - Used L2 regularization (Ridge Regression) to prevent overfitting (penalty for the loss function in model)
- **Results:**
  - **Subject/Patient Prediction:**
    - Achieved perfect accuracy (1.0) on the test set, but showed signs of overfitting
  - **Risk Prediction (BMI > 25):**
    - Achieved an R^2 of 0.78 with relatively low MSE (0.22)
    - Model needs improvement to generalize better

→a combination of none Apple Watch measured values and Apple Watch measured values recommended

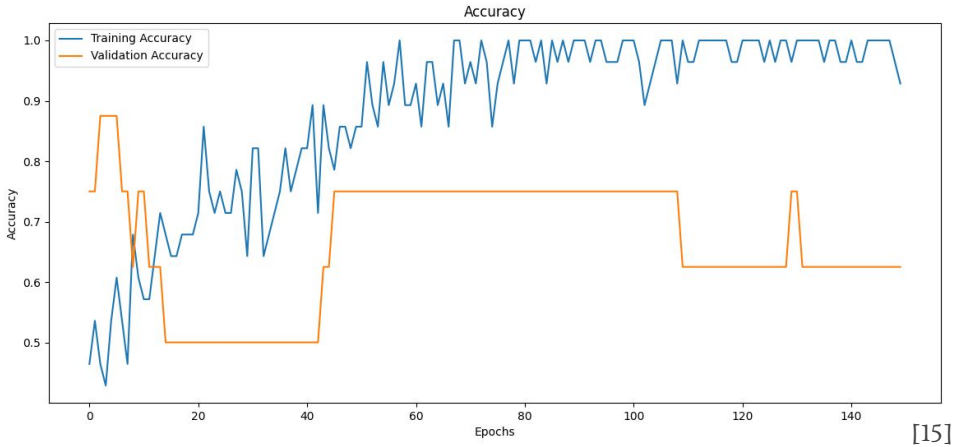
Implementation and Results

1. Neural Networks

Patient / Subject Classification vs. Risk Classification



[14]



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Discussion and Further Work

1. Random Forest:

- Performance Highlights:
  - Good in binary classification tasks, particularly in predicting subject/patient status and sex
  - Achieved high accuracy, precision, recall, and f1-scores
- Limitations:
  - Overfitting noted in some cases, suggesting the need for more diverse datasets
  - Performance dropped when relying solely on Apple Watch Ultra data, though still better than random predictions

2. Ridge Regression:

- Successes:
  - Outperformed other regression models, particularly in predicting weight and BMI
  - High accuracy and reliability in these areas
- Challenges:
  - Struggled with age prediction due to insufficient distinguishing features, such as weight or height, which did not effectively mark the age range

Discussion and Further Work

3. Neural Networks:

- **Improvements with Expanded Dataset:**
  - Showed a clear improvement in predicting risks, like identifying if someone has a BMI over 25 (a risk)
  - Although the model performed well during training, it overfitted the data, leading to inconsistent accuracy and loss during validation
- **Challenges:**
  - Struggled to generalize well to new data, highlighting the need for regularization and more complex architectures

4. Further directions:

- **Expand and Balance Dataset:**
  - Collect larger and more diverse datasets, including younger patients and healthy older subjects
  - Use advanced techniques like hyperparameter tuning and cross-validation
- **Refine Neural Network Architectures:**
  - Experiment with more complex NN models and ensemble methods to improve generalization and reduce overfitting
- **Leverage Wearable Data:**
  - Consider longer wear times for better calibration and integration of real-time data for dynamic health monitoring
- **More Unsupervised Learning:**
  - Further methods and improvements like outlier detection, dimensionality reduction ...

Conclusion

- **ML Models:** Showed promising results in health predictions, especially with RF classifiers
- **Apple Watch Data:** Valuable but needs additional data for better accuracy
- **Challenges:** Certain metrics need better datasets and methods
- **Future:** Wearable technologies hold potential but requires good data integration

References

[1] https://support.apple.com/de-ch/guide/watch-ultra/welcome/watchos (15.08.2024)

[2] https://support.apple.com/en-us/120277 (15.08.2024)

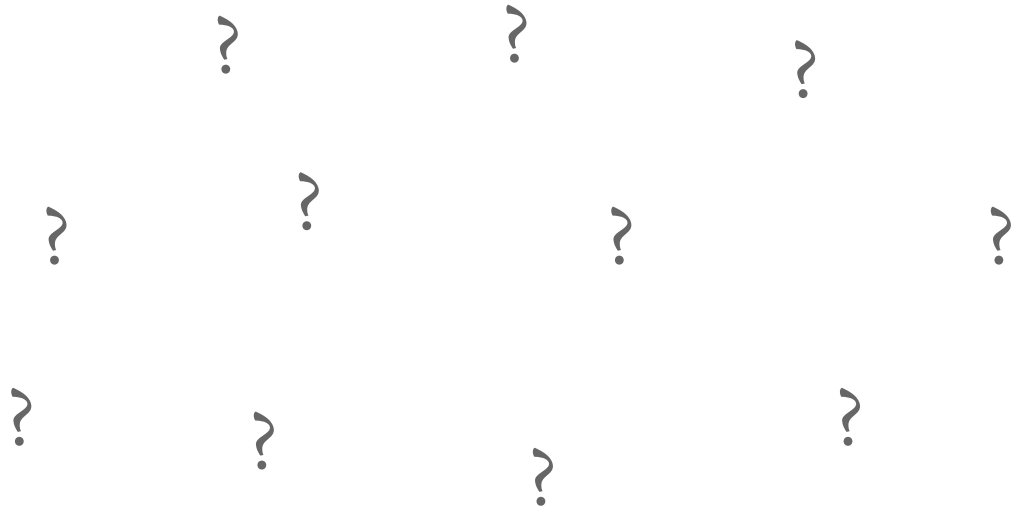
[3] https://medium.com/@denizgunay/random-forest-af5bde5d7e1e (15.08.2024)

[4] Original illustration by Tanja Zast, inspired by
https://blog.gopenai.com/linear-and-logistic-regression-same-regression-but-different-purpose-f6ff5f93b7ef &
https://www.shiksha.com/online-courses/articles/understanding-ridge-regression-using-python/ (15.08.2024)

[5] Original illustration by Tanja Zast, inspired by
https://www.researchgate.net/figure/Figure-A1-Simple-neural-network-ReLU-rectified-linear-unit_fig5_353599391 (15.08.2024)

[6] - [14] Original illustration by Tanja Zast

Questions



Dataset

(before and after)

type	sourceName	value	unit	startDate	endDate	creationDate	BloodType	appleStandHours	activeEnergyBurned	activeEnergyBurnedUnit
Height	Health	175	cm	2024-07-18 12:11:53 +0200	2024-07-18 12:11:53 +0200	20240718121154+0200				
BodyMass	Health	64	kg	2024-07-18 12:11:53 +0200	2024-07-18 12:11:53 +0200	20240718121154+0200				
StepCount	iPhone 13 (6MWT_5_CV)	4	count	2024-07-18 12:01:06 +0200	2024-07-18 12:01:09 +0200	20240718121209+0200				
DistanceWalkingRunning	iPhone 13 (6MWT_5_CV)	0.00188	km	2024-07-18 12:01:06 +0200	2024-07-18 12:01:09 +0200	20240718121209+0200				
FlightsClimbed	iPhone 13 (6MWT_5_CV)	1	count	2024-07-17 14:19:21 +0200	2024-07-17 14:19:23 +0200	20240717143056+0200				
WalkingStepLength	iPhone 13 (6MWT_5_CV)	67	cm	2024-07-17 14:17:46 +0200	2024-07-17 14:18:08 +0200	20240717145140+0200				
WalkingSpeed	iPhone 13 (6MWT_5_CV)	4.5	km/hr	2024-07-17 14:17:46 +0200	2024-07-17 14:18:08 +0200	20240717145140+0200				
WalkingDoubleSupportPercentage	iPhone 13 (6MWT_5_CV)	297	%	2024-07-17 14:17:46 +0200	2024-07-17 14:18:08 +0200	20240717145140+0200				
WalkingAsymmetryPercentage	iPhone 13 (6MWT_5_CV)	0	%	2024-07-17 14:17:46 +0200	2024-07-17 14:18:08 +0200	20240717145140+0200				
HeartRate	Apple Watch von Rüdiger	127	count/min	2024-07-17 14:16:56 +0200	2024-07-17 14:16:56 +0200	20240717141659+0200				
HeartRate	Apple Watch von Rüdiger	127	count/min	2024-07-17 14:16:50 +0200	2024-07-17 14:16:50 +0200	20240717141654+0200				
HeartRate	Apple Watch von Rüdiger	125	count/min	2024-07-17 14:16:46 +0200	2024-07-17 14:16:46 +0200	20240717141649+0200				
HeartRate	Apple Watch von Rüdiger	125	count/min	2024-07-17 14:16:39 +0200	2024-07-17 14:16:39 +0200	20240717141644+0200				
HeartRate	Apple Watch von Rüdiger	125	count/min	2024-07-17 14:16:35 +0200	2024-07-17 14:16:35 +0200	20240717141639+0200				
HeartRate	Apple Watch von Rüdiger	124	count/min	2024-07-17 14:16:31 +0200	2024-07-17 14:16:31 +0200	20240717141634+0200				
HeartRate	Apple Watch von Rüdiger	124	count/min	2024-07-17 14:16:22 +0200	2024-07-17 14:16:22 +0200	20240717141624+0200				
HeartRate	Apple Watch von Rüdiger	123	count/min	2024-07-17 14:16:17 +0200	2024-07-17 14:16:17 +0200	20240717141619+0200				
HeartRate	Apple Watch von Rüdiger	131	count/min	2024-07-17 14:16:04 +0200	2024-07-17 14:16:04 +0200	20240717141609+0200				
HeartRate	Apple Watch von Rüdiger	132	count/min	2024-07-17 14:16:03 +0200	2024-07-17 14:16:03 +0200	20240717141604+0200				
ActiveEnergyBurned	Apple Watch von Rüdiger	62	kcal	2024-07-17 14:15:56 +0200	2024-07-17 14:15:59 +0200	20240717141609+0200				
BasalEnergyBurned	Apple Watch von Rüdiger	0.1	kcal	2024-07-17 14:15:56 +0200	2024-07-17 14:15:59 +0200	20240717141609+0200				
BasalEnergyBurned	Apple Watch von Rüdiger	0.1	kcal	2024-07-17 14:15:54 +0200	2024-07-17 14:15:56 +0200	20240717141607+0200				
PhysicalEffort	Apple Watch von Rüdiger	2.4	kcal/hr·kg	2024-07-17 14:15:54 +0200	2024-07-17 14:16:32 +0200	20240717141640+0200				
HeartRate	Apple Watch von Rüdiger	135	count/min	2024-07-17 14:15:54 +0200	2024-07-17 14:15:54 +0200	20240717141559+0200				
ActiveEnergyBurned	Apple Watch von Rüdiger	479	kcal	2024-07-17 14:15:54 +0200	2024-07-17 14:15:56 +0200	20240717141607+0200				
BasalEnergyBurned	Apple Watch von Rüdiger	0.1	kcal	2024-07-17 14:15:51 +0200	2024-07-17 14:15:54 +0200	20240717141556+0200				
ActiveEnergyBurned	Apple Watch von Rüdiger	479	kcal	2024-07-17 14:15:51 +0200	2024-07-17 14:15:54 +0200	20240717141556+0200				
HeartRate	Apple Watch von Rüdiger	136	count/min	2024-07-17 14:15:49 +0200	2024-07-17 14:15:49 +0200	20240717141554+0200				
ActiveEnergyBurned	Apple Watch von Rüdiger	479	kcal	2024-07-17 14:15:48 +0200	2024-07-17 14:15:51 +0200	20240717141556+0200				
BasalEnergyBurned	Apple Watch von Rüdiger	0.1	kcal	2024-07-17 14:15:48 +0200	2024-07-17 14:15:51 +0200	20240717141556+0200				
ActiveEnergyBurned	Apple Watch von Rüdiger	479	kcal	2024-07-17 14:15:46 +0200	2024-07-17 14:15:48 +0200	20240717141551+0200				
BasalEnergyBurned	Apple Watch von Rüdiger	0.1	kcal	2024-07-17 14:15:46 +0200	2024-07-17 14:15:48 +0200	20240717141551+0200				

[6]

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Dataset

(before and after)

StepCount	AppleExerciseTime	PhysicalEffort	WalkingAsymmetryPercentage	WalkingDoubleSupportPercentage	WalkingSpeed	WalkingStepLength	OxygenSaturation	HeartRate_1	HeartRate_2	HeartRate_3	HeartRate_4
1093.0	6.0	42.1	0.0	481	11.304	162.0	0.0	132.0	131.0	130.0	128.0
1456.0	6.0	24.700000000000003	0.0	507	10.728	133.0	0.0	131.0	132.0	126.0	129.0
1252.0	7.0	66.6	0.0	2.09	53.712	614.0	0.0	132.0	135.0	133.0	138.0
1458.0	6.0	22.6	0.0	578	10.116	143.0	0.0	95.0	95.0	95.0	95.0
737.0	7.0	34.8	0.0	734	18.108	252.0	0.0	102.0	101.0	101.0	110.0
1763.0	6.0	45.1	0.0	849	15.048	205.0	0.0	102.0	102.0	102.0	101.0
1169.0	5.0	18.7	0.01	1.22	17.28	283.0	0.0	98.0	97.0	97.0	99.0
1455.0	7.0	22.4	0.0	558	10.332	147.0	0.0	95.0	96.0	96.0	98.0
933.0	6.0	32.4	0.0	0.53	11.448	167.0	0.0	85.0	85.0	87.0	89.0
1346.0	6.0	21.7	0.0	0.0	0.0	0.0	0.0	134.0	133.0	129.0	129.0
1084.0	6.0	40.2	0.0	0.0	0.0	0.0	0.0	106.0	105.0	110.0	107.0
905.0	4.0	38.1	0.0	0.8160000000000001	15.408	244.0	0.0	110.0	112.0	113.0	111.0
938.0	4.0	18.200000000000003	0.01	617	8.424	140.0	0.0	113.0	113.0	115.0	113.0
13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.93	74.0	72.0	79.0	79.0
1443.0	6.0	32.6	0.0	589	9.792000000000002	143.0	0.0	77.0	77.0	77.0	77.0
1238.0	6.0	46.50000000000001	0.01	1.115	19.044	307.0	0.0	101.0	108.0	105.0	104.0
1513.0	7.0	52.00000000000001	0.0	0.8290000000000001	14.112000000000002	209.0	0.0	100.0	101.0	99.0	99.0
1129.0	6.0	29.8	0.0	534	12.096	147.0	0.0	115.0	118.0	117.0	120.0
1322.0	6.0	66.10000000000001	0.0	296	3.708	65.0	0.0	154.0	151.0	149.0	147.0
759.0	6.0	62.8	0.0	437	13.608	172.0	0.0	130.0	132.0	131.0	136.0
949.0	6.0	40.9	0.17	1.142	18.252	290.0	0.0	111.0	108.0	103.0	104.0
1253.0	6.0	33.8	0.01	0.8170000000000001	14.328	239.0	0.0	106.0	105.0	95.0	94.0
1093.0	7.0	31.2	0.0	0.8500000000000001	16.163999999999998	205.0	0.0	111.0	111.0	111.0	109.0
1215.0	6.0	18.7	0.0	0.27	5.652	80.0	0.0	105.0	103.0	104.0	105.0
1061.0	6.0	38.8	0.0	526	9.828	139.0	0.0	82.0	86.0	86.0	96.0
1394.0	7.0	37.0	0.0	765	16.308	254.0	0.0	107.0	107.0	101.0	100.0
1192.0	6.0	42.5	0.0	515	11.052	173.0	0.0	81.0	72.0	71.0	73.0
1584.0	7.0	31.1	0.0	701	17.676	248.0	0.0	87.0	102.0	103.0	106.0
1094.0	6.0	27.500000000000004	0.01	0.8300000000000001	15.156	248.0	0.0	93.0	95.0	98.0	97.0
1086.0	6.0	14.0	0.18	567	8.496	133.0	0.0	106.0	107.0	106.0	106.0
1120.0	6.0	13.3	0.01	284	6.66	119.0	0.0	92.0	90.0	91.0	92.0
1148.0	6.0	14.3	0.07	309	3.708	64.0	0.0	91.0	88.0	88.0	89.0
1278.0	6.0	14.4	0.0	653	7.344	115.0	0.0	77.0	78.0	79.0	79.0
1266.0	6.0	22.0	0.0	571	9.36	148.0	0.0	91.0	91.0	90.0	90.0
1490.0	6.0	43.7	0.1	0.6819999999999999	16.919999999999998	242.0	0.0	128.0	127.0	120.0	120.0
1514.0	6.0	24.800000000000004	0.0	736	17.316	241.0	0.0	74.0	61.0	60.0	64.0
1348.0	7.0	26.9	0.0	804	14.508	214.0	0.0	79.0	74.0	74.0	74.0
1220.0	5.0	21.3	0.01	1.424	21.528	353.0	0.0	128.0	130.0	126.0	126.0

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[7]

Sum_ActiveEnergyBurned	Sum_BasalEnergyBurned	Sum_DistanceWalkingRunning	study ID	height (cm)	age (years)	weight (kg)	TimeStamp	leg Length (cm)	Subject/Patient	Distance (m)	Turns	Step Count	Step Count(After 6MWT)	Rounds	Distance (per round)
23.861000000000004	11.302	0.850678	707.0	165.0	21.0	59.0	2024-03-19 14:01:01+01:00	80.0	subject	30.0	2.0	37.0	35	40,8	15,00
30.094	12.742	1.0330199999999998	795.0	171.0	51.0	62.0	2024-03-19 12:51:52+01:00	81.0	patient	40.0	2.0	59.0	60	26,5	20,00
78.97800000000001	47.19399999999999	1.1955011999999998	855.0	176.0	34.0	103.0	2024-03-19 11:53:48+01:00	76.0	subject	30.0	2.0	38.0	39	45,07	15,00
30.477	16.38	1.1629775	707.0	161.0	75.0	82.0	2024-03-18 15:47:45+01:00	67.0	patient	40.0	2.0	59.0	58	23,6	20,00
32.255	30.791999999999987	0.6155900000000001	688.0	168.0	22.0	65.0	2024-03-18 14:56:47+01:00	80.0	subject	40.0	2.0	49.0	49	28,7	20,00
44.935	18.828	1.6143714999999998	808.0	175.0	83.0	90.0	2024-03-18 14:08:55+01:00	71.0	patient	40.0	2.0	59.0	58	27,30	20,00
16.835	9.072	0.6665422999999999	596.0	179.0	80.0	72.0	2024-03-18 12:28:05+01:00	84.0	patient	40.0	2.0	70.0	71	16,30	20,00
32.642	18.002000000000002	0.9612	699.0	180.0	84.0	86.0	2024-03-18 11:38:46+01:00	83.0	patient	40.0	2.0	60.0	58	23,50	20,00
42.453	17.904	0.8134865	660.0	190.0	59.0	89.0	2024-03-18 10:54:32+01:00	95.0	subject	30.0	2.0	33.0	34	35,00	15,00
22.126	8.992	0.8295485	36.0	160.0	25.0	53.0	2024-03-15 11:56:13+01:00	72.0	subject	40.0	2.0	48.0	49	28,9	20,00
29.058	27.972999999999999	0.8366857	11.0	165.0	21.0	59.0	2024-03-15 11:20:24+01:00	80.0	subject	30.0	2.0	37.0	40	37,73	15,00
24.218	18.338	0.6343940000000001	1.0	185.0	22.0		2024-03-15 09:19:51+01:00	90.0	Subject	30.0	2.0	39.0	38	32,2	15,00
23.144	11.765999999999998	0.5819722999999999	33.0	173.0	73.0		2024-03-14 11:40:50+01:00	76.0	Patient	40.0	2.0	61.0	64	16,8	20,00
2.9399999999999995	8.16	0.0091715	32.0	167.0	72.0	63.0	2024-03-14 11:08:23+01:00	83.0	Patient	40.0	2.0	59.0	57	24,9	20,00
36.22	20.592	0.9853245	31.0	174.0	51.0	98.0	2024-03-14 10:46:53+01:00	70.0	Patient	40.0	2.0	61.0	55	24,4	20,00
36.532	39.88099999999999	0.913756	1.0	185.0	22.0		2024-03-14 09:35:51+01:00	90.0	Subject	30.0	2.0	38.0	38	33,13	15,00
25.795	30.996999999999999	1.0422905	30.0	168.0	22.0	65.0	2024-03-13 15:12:24+01:00	80.0	Subject	30.0	2.0	46.0	46	30	15,00
63.051	41.63200000000000005	1.0183075	29.0	196.0	61.0	89.0	2024-03-13 12:57:29+01:00	92.0	Subject	30.0	2.0	38.0	38	43,33	15,00
43.061	13.149999999999997	0.90333765	26.0	181.0	28.0	64.0	2024-03-13 09:39:07+01:00	79.0	Patient	40.0	2.0	76.0	86	16,33	20,00
43.068	34.46600000000001	0.6718619999999999	25.0	173.0	29.0	66.0	2024-03-12 13:47:47+01:00	83.0	Subject	30.0	2.0	38.0	35	46	15,00
42.81100000000001	39.77799999999999	0.736797	1.0	185.0	22.0		2024-03-12 13:11:26+01:00	90.0	Subject	10.0	2.0	15.0	15	77	5,00
28.268	12.765	0.9460165	24.0	168.0	22.0	65.0	2024-03-12 11:20:43+01:00	80.0	Subject	30.0	2.0	43.0	42	28,2	15,00
66.505	41.71299999999999	0.9265426	22.0	178.0	82.0	96.0	2024-03-11 13:28:54+01:00	79.0	Patient	40.0	2.0	61.0	63	24,00	20,00
36.275	12.526	0.8667545	21.0	176.0	74.0	88.0	2024-03-11 13:05:03+01:00	82.0	Patient	40.0	2.0	53.0	51	26,80	20,00
27.001	31.513	0.804005	20.0	162.0	22.0	60.0	2024-03-11 12:43:55+01:00		Subject	30.0	2.0	47.0	42	33,30	15,00
39.777	18.523	0.9890175	1.0	185.0	22.0		2024-03-11 11:29:10+01:00	90.0	Subject	40.0	2.0	50.0	47	25,55	20,00
33.412	38.648	0.8520439999999999	1.0	185.0	22.0		2024-03-08 11:20:51+01:00	90.0	subject	40.0	2.0	50.0	51	24,95	20
26.188	26.63500000000001	1.1162775	11.0	165.0	21.0	59.0	2024-03-07 15:52:59+01:00	80.0	Subject	20.0	1.0	20.0	21	28,05	20
38.319	18.892	0.81752050000000001	1.0	185.0	22.0		2024-03-07 15:40:58+01:00	90.0	Subject	20.0	1.0	25.0	22	25	20
26.000000000000004	32.15800000000001	0.7968004999999999	16.0	179.0	63.0	70.0	2024-03-07 13:55:32+01:00	88.0	Patient	20.0	1.0	25.0	28	20,2	20
10.826	7.984	0.730935	15.0	163.0	56.0	56.0	2024-03-07 10:58:39+01:00	77.0	Patient	20.0	1.0	25.0	27	19,4	20
16.192999999999998	10.317	0.7070764999999999	14.0	168.0	59.0	77.0	2024-03-07 10:38:17+01:00	70.0	Patient	20.0	1.0	27.0	29	16,25	20
25.796	20.018	0.7594375	13.0	174.0	64.0	99.0	2024-03-07 10:16:10+01:00	73.0	Patient	20.0	1.0	39.0	27	18,75	20,00
23.447000000000003	17.479000000000003	0.8313299999999999	12.0	178.0	48.0	88.0	2024-03-07 09:55:14+01:00	81.0	Patient	20.0	1.0	31.0	31	22	20,00
31.972999999999995	26.36699999999999	1.1336885	11.0	165.0	21.0	59.0	2024-03-06 14:57:52+01:00	80.0	Subject	30.0	2.0	40.0	38	-	-
27.291	29.407000000000004	1.0957	3.0	172.0	25.0	64.0	2024-03-06 14:18:23+01:00	81.0	Subject	30.0	2.0	35.0	35	37,5	15,00
20.682	12.446000000000002	0.8541305000000001	10.0	165.0	26.0	60.0	2024-03-06 14:07:27+01:00	73.0	Subject	30.0	2.0	45.0	43	31	15,00
23.922000000000004	12.238	0.794317	9.0	162.0	59.0		2024-03-06 12:57:38+01:00	74.0	Patient	20.0	1.0	22.0	22	20,6	20,00