

# README

## Dataset of continuous human activities performed in arbitrary directions collected with a distributed radar network of five nodes

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### Referencing the dataset

Guendel, R.G., Unterhorst, M., Fioranelli, F., Yarovoy, A.. *'Dataset of continuous human activities performed in arbitrary directions collected with a distributed radar network of five nodes'*. (4TU.ResearchData, 2021 [Online]. doi: <https://doi.org/10.4121/16691500.v2>. Available from: [https://data.4tu.nl/articles/dataset/Dataset\\_of\\_continuous\\_human\\_activities\\_performed\\_in\\_arbitrary\\_directions\\_collected\\_with\\_a\\_distributed\\_radar\\_network\\_of\\_five\\_nodes/16691500/2](https://data.4tu.nl/articles/dataset/Dataset_of_continuous_human_activities_performed_in_arbitrary_directions_collected_with_a_distributed_radar_network_of_five_nodes/16691500/2)

```
@misc{guendel_unterhorst_fioranelli_yarovoy_2021,  
  author={Guendel, Ronny Gerhard and Unterhorst, Matteo and Fioranelli, Francesco and Yarovoy, Alexander},  
  title={Dataset of continuous human activities performed in arbitrary directions collected with a distributed radar network of five nodes},  
  url={https://data.4tu.nl/articles/dataset/Dataset_of_continuous_human_activities_performed_in_arbitrary_directions_collected_with_a_distributed_radar_network_of_five_nodes/16691500/2},  
  DOI={doi.org/10.4121/16691500.v2},  
  publisher={4TU.ResearchData},  
  year = {2021 [Online]. doi:\url{https://doi.org/10.4121/16691500.v2}},  
  month={Nov} }
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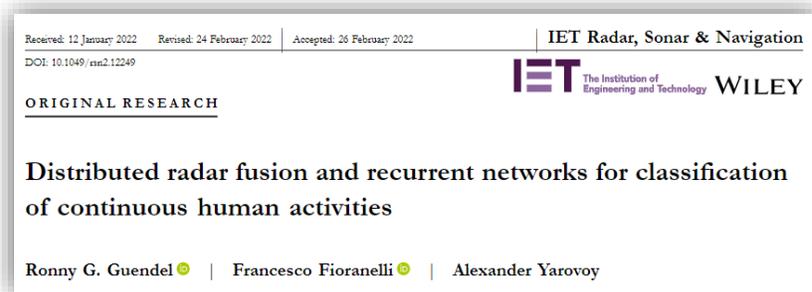
## References and background reading material for the used dataset:

### Distributed radar fusion and recurrent networks for classification of continuous human activities

Guendel, R.G., Fioranelli, F., Yarovoy, A.: *Distributed radar fusion and recurrent networks for classification of continuous human activities*. IET Radar Sonar Navig. 1–18 (2022).

<https://doi.org/10.1049/rsn2.12249>

Link: <https://doi.org/10.1049/rsn2.12249>



### Evaluation Metrics for Continuous Human Activity Classification Using Distributed Radar Networks

R. G. Guendel, F. Fioranelli and A. Yarovoy, "Evaluation Metrics for Continuous Human Activity Classification Using Distributed Radar Networks," 2022 IEEE Radar Conference (RadarConf22), 2022, pp. 1-6, doi: 10.1109/RadarConf2248738.2022.9764181.

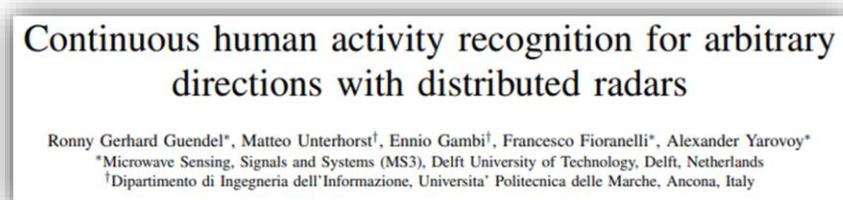
Link: <https://ieeexplore.ieee.org/abstract/document/9764181>



### Continuous human activity recognition for arbitrary directions with distributed radars

R. G. Guendel, M. Unterhorst, E. Gambi, F. Fioranelli and A. Yarovoy, "Continuous human activity recognition for arbitrary directions with distributed radars," 2021 IEEE Radar Conference (RadarConf21), 2021, pp. 1-6, doi: 10.1109/RadarConf2147009.2021.9454972.

Link: <https://ieeexplore.ieee.org/document/9454972>



## Matlab read file

The data can be read with <dataread.mlx>.

## Radar setup

The radar setup is shown in Figure 1.

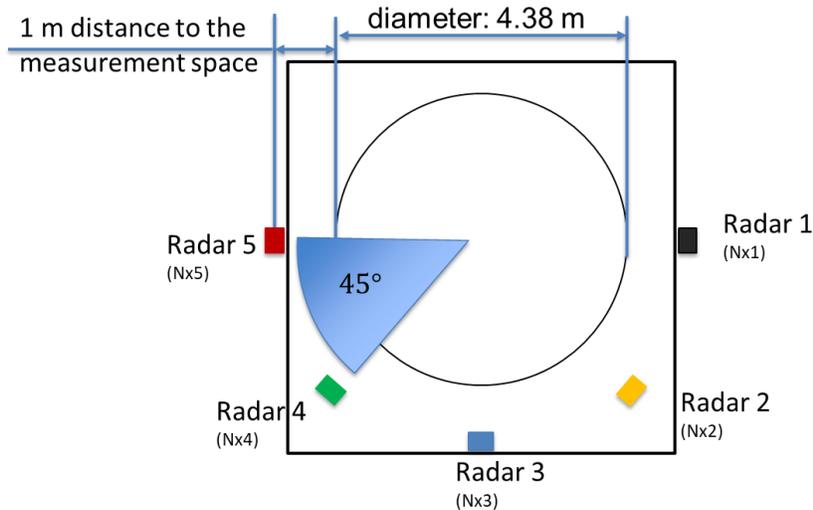


Figure 1: Distributed radar setup.

The radarsystem as shown in Figure 2 of the type PulsON P410 - Time Domain (Humatics) is a Ultra Wideband radar with the following parameters:

Center frequency:	4.3 GHz
Bandwidth:	2.2GHz
Oeration mode:	Monostatic
Pulse integration Index:	10 (1024 coherent integrations)
PRI/PRF:	8.2ms / 122Hz
Antennae:	Omnidirectional broadband antennas

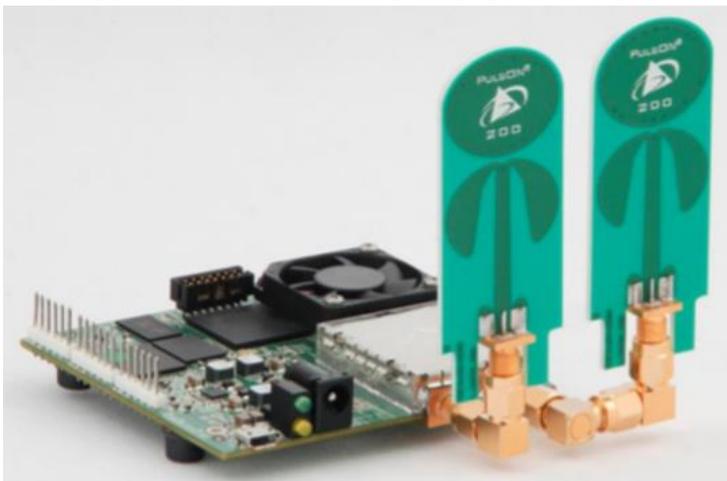


Figure 2: The PulsON P410 - Time Domain (Humatics) radar.

**The data file contains the following information:**

## Folder description

The 15 folders from 1.7z to 15.7z are assigned to the 15 participants.

## File description

Example: 005\_mon\_WandS\_1.mat

seq. 005 ... number | mon ... monostatic | WandS ... Walking and stationary | 1 ... participant 1

## Description and Notification

**(a)** the sequence numbers between 1 and 28 contain the training data typically and

**(b)** sequence number (Example: 029\_mon\_Mix\_1.mat) contains the test sequence with all classes performed on the locations where the training data was collected.

**(c)** sequence number (Example: 030\_mon\_Mix\_1.mat) contains the test sequence with all classes performed in random locations.

**(d)** the activities can be indicated as follows with [x] as the individual participant:

- training data of "Walking" -- '001\_mon\_wal\_[x].mat'
- training data of "Walking" -- '002\_mon\_wal\_[x].mat'
- training data of "Walking" -- '003\_mon\_wal\_[x].mat'
- training data of "Walking" -- '004\_mon\_wal\_[x].mat'
- training data of "Walking and Stationary" -- '005\_mon\_WandS\_[x].mat'
- training data of "Walking and Stationary" -- '006\_mon\_WandS\_[x].mat'
- training data of "Walking and Stationary" -- '007\_mon\_WandS\_[x].mat'
- training data of "Walking and Stationary" -- '008\_mon\_WandS\_[x].mat'
- training data of "Sitting down and Standing up" -- '009\_mon\_sit\_[x].mat'
- training data of "Sitting down and Standing up" -- '010\_mon\_sit\_[x].mat'
- training data of "Sitting down and Standing up" -- '011\_mon\_sit\_[x].mat'
- training data of "Sitting down and Standing up" -- '012\_mon\_sit\_[x].mat'
- training data of "Bending from Sitting" -- '013\_mon\_BfSi\_[x].mat'
- training data of "Bending from Sitting" -- '014\_mon\_BfSi\_[x].mat'
- training data of "Bending from Sitting" -- '015\_mon\_BfSi\_[x].mat'
- training data of "Bending from Sitting" -- '016\_mon\_BfSi\_[x].mat'
- training data of "Bending from Standing" -- '017\_mon\_BfSt\_[x].mat'
- training data of "Bending from Standing" -- '018\_mon\_BfSt\_[x].mat'
- training data of "Bending from Standing" -- '019\_mon\_BfSt\_[x].mat'
- training data of "Bending from Standing" -- '020\_mon\_BfSt\_[x].mat'
- training data of "Falling while walking with Standing up from the ground" -- '021\_mon\_WandF\_[x].mat'
- training data of "Falling while walking with Standing up from the ground" -- '022\_mon\_WandF\_[x].mat'
- training data of "Falling while walking with Standing up from the ground" -- '023\_mon\_WandF\_[x].mat'
- training data of "Falling while walking with Standing up from the ground" -- '024\_mon\_WandF\_[x].mat'
- training data of "Falling from Sationary position with Standing up from the ground" -- '025\_mon\_FandS\_[x].mat'
- training data of "Falling from Sationary position with Standing up from the ground" -- '026\_mon\_FandS\_[x].mat'

- training data of "Falling from Sationary position with Standing up from the ground" -- '027\_mon\_FandS\_[x].mat'
- training data of "Falling from Sationary position with Standing up from the ground" -- '028\_mon\_FandS\_[x].mat'
- test data of "Mixed Sequence (predefined locations)" -- '029\_mon\_Mix\_[x].mat'
- test data of "Mixed Sequence (randomly locations)" -- '030\_mon\_Mix\_[x].mat'

## Plot the corresponding range maps with units and label vector

### The corresponding classes

All classes in the label vector are associated as:

1. 'Walking'
2. 'Nothing (stationary)'
3. 'Sitting down'
4. 'Standing up from sitting'
5. 'Bending from Sitting'
6. 'Bending from Standing'
7. 'Falling from Walking'
8. 'Standing up from the ground'
9. 'Falling from Standing'
0. Undefined class and should not being used (i.e., people changed locations while 'Falling from Standing')

### Range maps example

The range maps are with the corresponding label vector are shown in Figure 3.

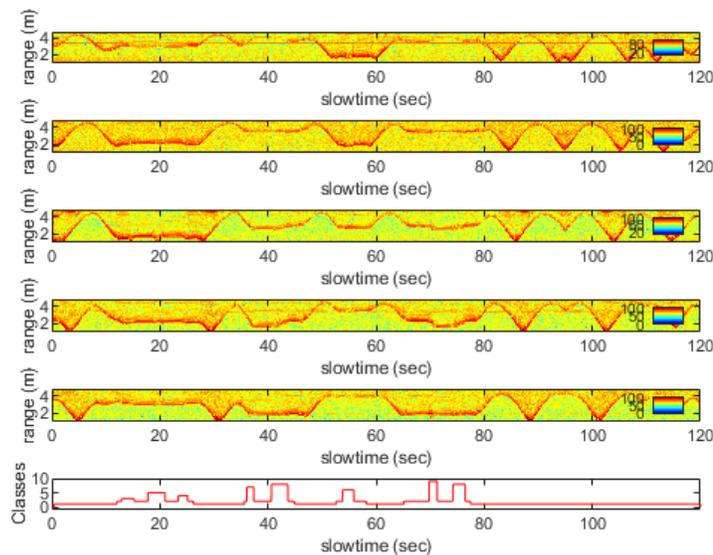


Figure 3: Example of the range maps and label vector.