```
begin
    import Pkg
    Pkg.activate("..")
    using Revise
    using NormalizedRadonCDT.TestImages
    using NormalizedRadonCDT
end
```

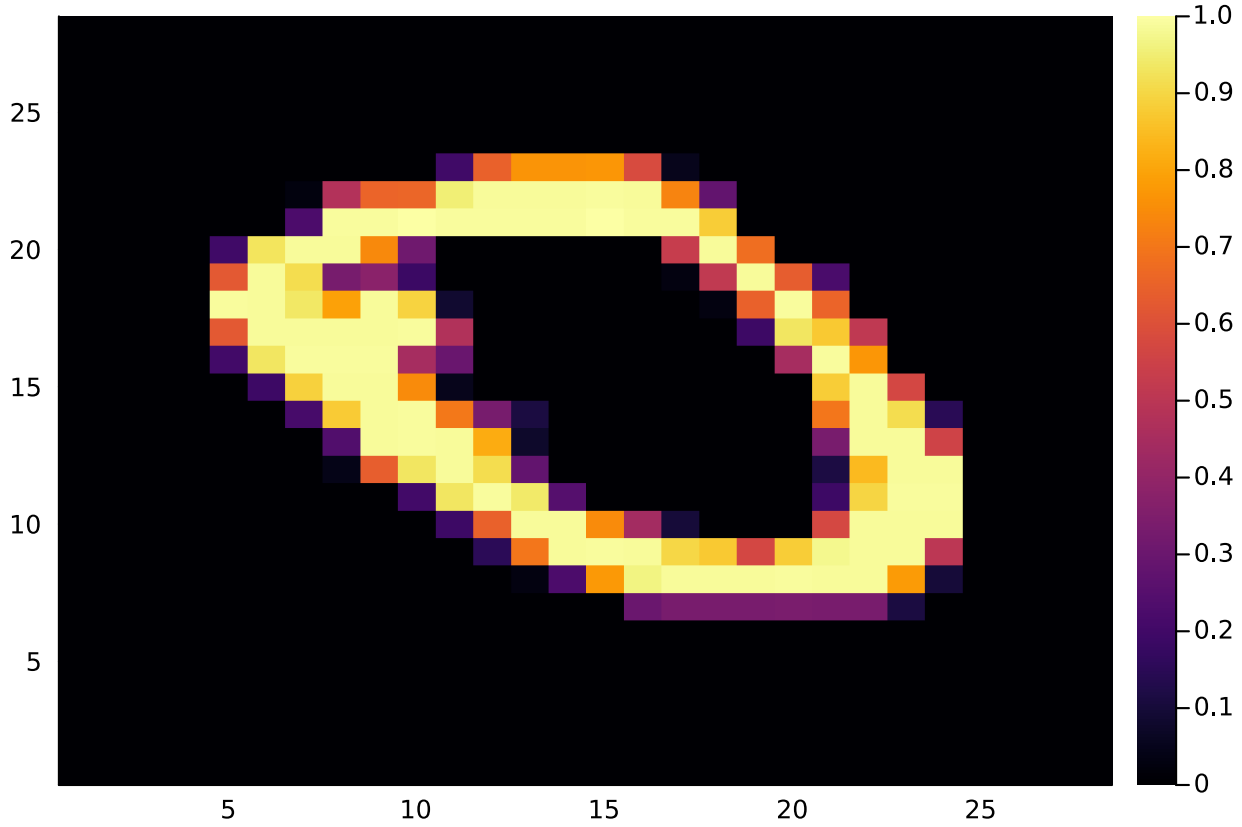
```
  Activating project at `~/Desktop/radon_OT/Neuer Ordner/Radon_OT`
```

```
using MLDatasets, Plots, Random;
```

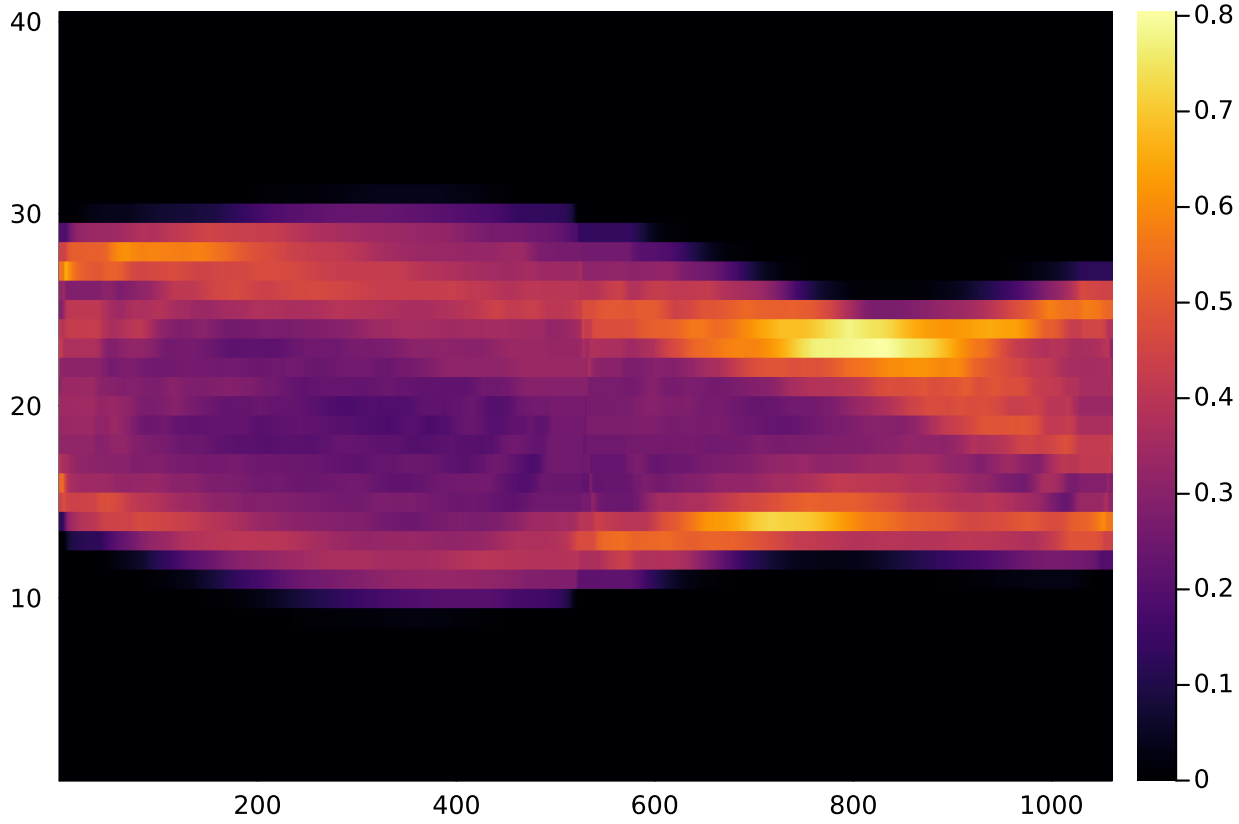
```
trainset = dataset MNIST:
            metadata   =>    Dict{String, Any} with 3 entries
            split      =>    :train
            features   =>    28×28×60000 Array{Float32, 3}
            targets    =>    60000-element Vector{Int64}
```

```
trainset = MNIST(:train)
```

```
Null = trainset[2].features;
```




```
heatmap(Null)
```




```
heatmap(NormalizedRadonCDT.RadonTransform.radon(Float64.(Null), 40, 1060, 0.0))
```

number_mnist_1 = [1, 7]

```
number_mnist_1 = [1,7]
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_1, 10000, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [1, 7]
Size of data:    10000
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=20000}
================================================================================
==
Acc. of Euclidean :     0.9442222689960008
--------------------------------------------------------------------------------
--
Acc. of RCDT with   1    inst.(s) :     0.7129025468322459
--------------------------------------------------------------------------------
--
Acc. of RCDT with   2    inst.(s) :     0.7156388128814987
--------------------------------------------------------------------------------
--
Acc. of RCDT with   3    inst.(s) :     0.7224794780046306
--------------------------------------------------------------------------------
--
Acc. of RCDT with   4    inst.(s) :     0.8226689118080404
--------------------------------------------------------------------------------
--
Acc. of RCDT with   5    inst.(s) :     0.8368764470637761
--------------------------------------------------------------------------------
--
Acc. of max-NRCDT :     0.9719006524942118  Acc. of mean-NRCDT :    0.66964
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_1, 1000, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [1, 7]
Size of data:    1000
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=2000}
================================================================================
Acc. of Euclidean :     0.8214285714285714
--------------------------------------------------------------------------------
Acc. of RCDT with   1    inst.(s) :     0.6922268907563025
--------------------------------------------------------------------------------
Acc. of RCDT with   2    inst.(s) :     0.7016806722689075
--------------------------------------------------------------------------------
Acc. of RCDT with   3    inst.(s) :     0.7069327731092437
--------------------------------------------------------------------------------
Acc. of RCDT with   4    inst.(s) :     0.7878151260504201
--------------------------------------------------------------------------------
Acc. of RCDT with   5    inst.(s) :     0.792016806722689
--------------------------------------------------------------------------------
Acc. of max-NRCDT :     0.9611344537815126  Acc. of mean-NRCDT :    0.66701
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_1, 500, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [1, 7]
Size of data:    500
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=1000}
================================================================================
Acc. of Euclidean :     0.6813417190775681
--------------------------------------------------------------------------------
Acc. of RCDT with   1    inst.(s) :     0.6918238993710691
--------------------------------------------------------------------------------
Acc. of RCDT with   2    inst.(s) :     0.6834381551362684
--------------------------------------------------------------------------------
Acc. of RCDT with   3    inst.(s) :     0.6561844863731656
--------------------------------------------------------------------------------
Acc. of RCDT with   4    inst.(s) :     0.7127882599580713
--------------------------------------------------------------------------------
Acc. of RCDT with   5    inst.(s) :     0.740041928721174
--------------------------------------------------------------------------------
Acc. of max-NRCDT :     0.9685534591194969  Acc. of mean-NRCDT :    0.48218
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_1, 100, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [7, 1]
Size of data:    100
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=200}
================================================================================
Acc. of Euclidean :     0.5360824742268041
--------------------------------------------------------------------------------
Acc. of RCDT with   1    inst.(s) :     0.5567010309278351
--------------------------------------------------------------------------------
Acc. of RCDT with   2    inst.(s) :     0.711340206185567
--------------------------------------------------------------------------------
Acc. of RCDT with   3    inst.(s) :     0.6288659793814433
--------------------------------------------------------------------------------
Acc. of RCDT with   4    inst.(s) :     0.6288659793814433
--------------------------------------------------------------------------------
Acc. of RCDT with   5    inst.(s) :     0.7010309278350515
--------------------------------------------------------------------------------
Acc. of max-NRCDT :     0.7216494845360825  Acc. of mean-NRCDT :    0.62886
```

number_mnist_2 = [1, 3]

```
number_mnist_2 = [1,3]
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_2, 10000, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [3, 1]
Size of data:    10000
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=20000}
================================================================================
==
Acc. of Euclidean :     0.9419069669543254
--------------------------------------------------------------------------------
--
Acc. of RCDT with   1    inst.(s) :     0.7299515891391286
--------------------------------------------------------------------------------
--
Acc. of RCDT with   2    inst.(s) :     0.7477373184592717
--------------------------------------------------------------------------------
--
Acc. of RCDT with   3    inst.(s) :     0.82750999789518
--------------------------------------------------------------------------------
--
Acc. of RCDT with   4    inst.(s) :     0.8157230056830141
--------------------------------------------------------------------------------
--
Acc. of RCDT with   5    inst.(s) :     0.8483477162702588
--------------------------------------------------------------------------------
--
Acc. of max-NRCDT :     0.969480109450642   Acc. of mean-NRCDT :    0.81730
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_2, 1000, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [1, 3]
Size of data:    1000
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=2000}
================================================================================
Acc. of Euclidean :     0.8088235294117647
--------------------------------------------------------------------------------
Acc. of RCDT with   1    inst.(s) :     0.707983193277311
--------------------------------------------------------------------------------
Acc. of RCDT with   2    inst.(s) :     0.7153361344537815
--------------------------------------------------------------------------------
Acc. of RCDT with   3    inst.(s) :     0.7289915966386554
--------------------------------------------------------------------------------
Acc. of RCDT with   4    inst.(s) :     0.75
--------------------------------------------------------------------------------
Acc. of RCDT with   5    inst.(s) :     0.7741596638655462
--------------------------------------------------------------------------------
Acc. of max-NRCDT :     0.9590336134453782  Acc. of mean-NRCDT :    0.73004
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_2, 500, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [3, 1]
Size of data:    500
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=1000}
================================================================================
==
Acc. of Euclidean :     0.7589098532494759
--------------------------------------------------------------------------------
--
Acc. of RCDT with   1    inst.(s) :     0.6708595387840671
--------------------------------------------------------------------------------
--
Acc. of RCDT with   2    inst.(s) :     0.6939203354297694
--------------------------------------------------------------------------------
--
Acc. of RCDT with   3    inst.(s) :     0.7295597484276729
--------------------------------------------------------------------------------
--
Acc. of RCDT with   4    inst.(s) :     0.7127882599580713
--------------------------------------------------------------------------------
--
Acc. of RCDT with   5    inst.(s) :     0.7316561844863732
--------------------------------------------------------------------------------
--
Acc. of max-NRCDT :     0.9538784067085954  Acc. of mean-NRCDT :    0.63522
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_2, 100, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [3, 1]
Size of data:    100
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=200}
================================================================================
==
Acc. of Euclidean :     0.5257731958762887
--------------------------------------------------------------------------------
--
Acc. of RCDT with   1    inst.(s) :     0.6907216494845361
--------------------------------------------------------------------------------
--
Acc. of RCDT with   2    inst.(s) :     0.5670103092783505
--------------------------------------------------------------------------------
--
Acc. of RCDT with   3    inst.(s) :     0.5979381443298969
--------------------------------------------------------------------------------
--
Acc. of RCDT with   4    inst.(s) :     0.6185567010309279
--------------------------------------------------------------------------------
--
Acc. of RCDT with   5    inst.(s) :     0.6185567010309279
--------------------------------------------------------------------------------
--
Acc. of max-NRCDT :     0.9072164948453608  Acc. of mean-NRCDT :    0.60824
```

```
number_mnist_3 =   [1, 3, 7]
```

```
number_mnist_3 = [1,3,7]
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_3, 10000, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [1, 3, 7]
Size of data:    10000
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=20000}
================================================================================
Acc. of Euclidean :     0.8583605177312428
--------------------------------------------------------------------------------
Acc. of RCDT with   1    inst.(s) :     0.5480374618541514
--------------------------------------------------------------------------------
Acc. of RCDT with   2    inst.(s) :     0.5596127538671999
--------------------------------------------------------------------------------
Acc. of RCDT with   3    inst.(s) :     0.6050720825002631
--------------------------------------------------------------------------------
Acc. of RCDT with   4    inst.(s) :     0.7057771230137851
--------------------------------------------------------------------------------
Acc. of RCDT with   5    inst.(s) :     0.7291381668946648
--------------------------------------------------------------------------------
Acc. of max-NRCDT :     0.9096074923708303  Acc. of mean-NRCDT :    0.59675
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_3, 1000, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [7, 3, 1]
Size of data:    1000
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=2000}
================================================================================
Acc. of Euclidean :     0.6988457502623295
--------------------------------------------------------------------------------
Acc. of RCDT with   1    inst.(s) :     0.46065057712486884
--------------------------------------------------------------------------------
Acc. of RCDT with   2    inst.(s) :     0.4648478488982162
--------------------------------------------------------------------------------
Acc. of RCDT with   3    inst.(s) :     0.521511017838405
--------------------------------------------------------------------------------
Acc. of RCDT with   4    inst.(s) :     0.5550891920251836
--------------------------------------------------------------------------------
Acc. of RCDT with   5    inst.(s) :     0.5687303252885625
--------------------------------------------------------------------------------
Acc. of max-NRCDT :     0.8709338929695698  Acc. of mean-NRCDT :    0.52046
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_3, 500, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [3, 7, 1]
Size of data:    500
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=1000}
================================================================================
Acc. of Euclidean :     0.5334728033472803
--------------------------------------------------------------------------------
Acc. of RCDT with   1    inst.(s) :     0.497907949790795
--------------------------------------------------------------------------------
Acc. of RCDT with   2    inst.(s) :     0.4811715481171548
--------------------------------------------------------------------------------
Acc. of RCDT with   3    inst.(s) :     0.4769874476987448
--------------------------------------------------------------------------------
Acc. of RCDT with   4    inst.(s) :     0.4916317991631799
--------------------------------------------------------------------------------
Acc. of RCDT with   5    inst.(s) :     0.49372384937238495
--------------------------------------------------------------------------------
Acc. of max-NRCDT :     0.8138075313807531  Acc. of mean-NRCDT :    0.44769
```

```
@time NormalizedRadonCDT.classify_mnist_NRCDT(number_mnist_3, 100, 42, 32, 128, 5, 2, 0, 0)
```

```
Choise of labels:    [3, 7, 1]
Size of data:    100
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=9}
Plot{Plots.GRBackend() n=200}
================================================================================
Acc. of Euclidean :     0.336734693877551
--------------------------------------------------------------------------------
Acc. of RCDT with   1    inst.(s) :     0.45918367346938777
--------------------------------------------------------------------------------
Acc. of RCDT with   2    inst.(s) :     0.35714285714285715
--------------------------------------------------------------------------------
Acc. of RCDT with   3    inst.(s) :     0.3469387755102041
--------------------------------------------------------------------------------
Acc. of RCDT with   4    inst.(s) :     0.32653061224489793
--------------------------------------------------------------------------------
Acc. of RCDT with   5    inst.(s) :     0.32653061224489793
--------------------------------------------------------------------------------
Acc. of max-NRCDT :     0.5816326530612245  Acc. of mean-NRCDT :    0.33673
```