Gaussian Classifiers report:

Apply K-Folds where K=7

>> RAW

Full-Covariance

- with prior = 0.5 -> minDCF = 0.113

- with prior = 0.1 -> minDCF = 0.297

- with prior = 0.9 -> minDCF = 0.350

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.463

- with prior = 0.1 -> minDCF = 0.771

- with prior = 0.9 -> minDCF = 0.777

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.109

- with prior = 0.1 -> minDCF = 0.299

- with prior = 0.9 -> minDCF = 0.342

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.457

- with prior = 0.1 -> minDCF = 0.770

- with prior = 0.9 -> minDCF = 0.781

# PCA m = 11

Full-Covariance

- with prior = 0.5 -> minDCF = 0.122

- with prior = 0.1 -> minDCF = 0.312

- with prior = 0.9 -> minDCF = 0.358

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.124

- with prior = 0.1 -> minDCF = 0.312

- with prior = 0.9 -> minDCF = 0.349

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.118

- with prior = 0.1 -> minDCF = 0.299

- with prior = 0.9 -> minDCF = 0.356

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.123

- with prior = 0.1 -> minDCF = 0.294

- with prior = 0.9 -> minDCF = 0.355

# PCA m = 10

Full-Covariance

- with prior = 0.5 -> minDCF = 0.187

- with prior = 0.1 -> minDCF = 0.407

- with prior = 0.9 -> minDCF = 0.538

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.184

- with prior = 0.1 -> minDCF = 0.435

- with prior = 0.9 -> minDCF = 0.546

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.183

- with prior = 0.1 -> minDCF = 0.428

- with prior = 0.9 -> minDCF = 0.535

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.179

- with prior = 0.1 -> minDCF = 0.421

- with prior = 0.9 -> minDCF = 0.543

# PCA m = 9

Full-Covariance

- with prior = 0.5 -> minDCF = 0.220

- with prior = 0.1 -> minDCF = 0.500

- with prior = 0.9 -> minDCF = 0.578

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.208

- with prior = 0.1 -> minDCF = 0.486

- with prior = 0.9 -> minDCF = 0.597

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.212

- with prior = 0.1 -> minDCF = 0.476

- with prior = 0.9 -> minDCF = 0.577

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.210

- with prior = 0.1 -> minDCF = 0.482

- with prior = 0.9 -> minDCF = 0.589

# PCA m = 8

Full-Covariance

- with prior = 0.5 -> minDCF = 0.267

- with prior = 0.1 -> minDCF = 0.551

- with prior = 0.9 -> minDCF = 0.677

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.264

- with prior = 0.1 -> minDCF = 0.521

- with prior = 0.9 -> minDCF = 0.673

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.261

- with prior = 0.1 -> minDCF = 0.508

- with prior = 0.9 -> minDCF = 0.667

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.262

- with prior = 0.1 -> minDCF = 0.507

- with prior = 0.9 -> minDCF = 0.667

# PCA m = 7

Full-Covariance

- with prior = 0.5 -> minDCF = 0.265

- with prior = 0.1 -> minDCF = 0.545

- with prior = 0.9 -> minDCF = 0.675

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.260

- with prior = 0.1 -> minDCF = 0.524

- with prior = 0.9 -> minDCF = 0.667

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.260

- with prior = 0.1 -> minDCF = 0.510

- with prior = 0.9 -> minDCF = 0.658

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.261

- with prior = 0.1 -> minDCF = 0.502

- with prior = 0.9 -> minDCF = 0.664

Single-Split

>> RAW

Full-Covariance

- with prior = 0.5 -> minDCF = 0.263

- with prior = 0.1 -> minDCF = 0.494

- with prior = 0.9 -> minDCF = 0.631

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.251

- with prior = 0.1 -> minDCF = 0.501

- with prior = 0.9 -> minDCF = 0.596

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.257

- with prior = 0.1 -> minDCF = 0.461

- with prior = 0.9 -> minDCF = 0.584

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.257

- with prior = 0.1 -> minDCF = 0.433

- with prior = 0.9 -> minDCF = 0.614

# PCA m = 11

Full-Covariance

- with prior = 0.5 -> minDCF = 0.115

- with prior = 0.1 -> minDCF = 0.223

- with prior = 0.9 -> minDCF = 0.309

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.119

- with prior = 0.1 -> minDCF = 0.211

- with prior = 0.9 -> minDCF = 0.246

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.114

- with prior = 0.1 -> minDCF = 0.217

- with prior = 0.9 -> minDCF = 0.317

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.115

- with prior = 0.1 -> minDCF = 0.175

- with prior = 0.9 -> minDCF = 0.291

# PCA m = 10

Full-Covariance

- with prior = 0.5 -> minDCF = 0.200

- with prior = 0.1 -> minDCF = 0.386

- with prior = 0.9 -> minDCF = 0.552

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.176

- with prior = 0.1 -> minDCF = 0.368

- with prior = 0.9 -> minDCF = 0.575

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.182

- with prior = 0.1 -> minDCF = 0.369

- with prior = 0.9 -> minDCF = 0.561

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.174

- with prior = 0.1 -> minDCF = 0.348

- with prior = 0.9 -> minDCF = 0.573

# PCA m = 9

Full-Covariance

- with prior = 0.5 -> minDCF = 0.223

- with prior = 0.1 -> minDCF = 0.406

- with prior = 0.9 -> minDCF = 0.615

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.205

- with prior = 0.1 -> minDCF = 0.439

- with prior = 0.9 -> minDCF = 0.612

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.197

- with prior = 0.1 -> minDCF = 0.421

- with prior = 0.9 -> minDCF = 0.607

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.196

- with prior = 0.1 -> minDCF = 0.365

- with prior = 0.9 -> minDCF = 0.603

# PCA m = 8

Full-Covariance

- with prior = 0.5 -> minDCF = 0.265

- with prior = 0.1 -> minDCF = 0.502

- with prior = 0.9 -> minDCF = 0.631

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.251

- with prior = 0.1 -> minDCF = 0.502

- with prior = 0.9 -> minDCF = 0.600

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.257

- with prior = 0.1 -> minDCF = 0.452

- with prior = 0.9 -> minDCF = 0.588

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.257

- with prior = 0.1 -> minDCF = 0.433

- with prior = 0.9 -> minDCF = 0.614

# PCA m = 7

Full-Covariance

- with prior = 0.5 -> minDCF = 0.263

- with prior = 0.1 -> minDCF = 0.494

- with prior = 0.9 -> minDCF = 0.631

Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.251

- with prior = 0.1 -> minDCF = 0.501

- with prior = 0.9 -> minDCF = 0.596

Tied Full-Covariance

- with prior = 0.5 -> minDCF = 0.257

- with prior = 0.1 -> minDCF = 0.461

- with prior = 0.9 -> minDCF = 0.584

Tied Diagonal-Covariance

- with prior = 0.5 -> minDCF = 0.257

- with prior = 0.1 -> minDCF = 0.433

- with prior = 0.9 -> minDCF = 0.614

------ END ------

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

Logistic Regression report:

Plotting minDCF graphs

Traceback (most recent call last):

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 199, in <module>

logistic\_regression\_report(data\_train, labels\_train)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 150, in logistic\_regression\_report

utils.plot\_minDCF\_lr(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\utils.py", line 333, in plot\_minDCF\_lr

plt.savefig(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\pyplot.py", line 1023, in savefig

res = fig.savefig(\*args, \*\*kwargs)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\figure.py", line 3378, in savefig

self.canvas.print\_figure(fname, \*\*kwargs)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\backend\_bases.py", line 2366, in print\_figure

result = print\_method(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\backend\_bases.py", line 2232, in <lambda>

print\_method = functools.wraps(meth)(lambda \*args, \*\*kwargs: meth(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\backends\backend\_agg.py", line 526, in print\_jpg

self.\_print\_pil(filename\_or\_obj, "jpeg", pil\_kwargs)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\backends\backend\_agg.py", line 458, in \_print\_pil

mpl.image.imsave(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\image.py", line 1689, in imsave

image.save(fname, \*\*pil\_kwargs)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\PIL\Image.py", line 2410, in save

fp = builtins.open(filename, "w+b")

FileNotFoundError: [Errno 2] No such file or directory: 'img/minDCF/lr\_minDCF\_raw\_5-folds.jpg'

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

Logistic Regression report:

Plotting minDCF graphs

Traceback (most recent call last):

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 199, in <module>

logistic\_regression\_report(data\_train, labels\_train)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 150, in logistic\_regression\_report

utils.plot\_minDCF\_lr(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\utils.py", line 333, in plot\_minDCF\_lr

plt.savefig(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\pyplot.py", line 1023, in savefig

res = fig.savefig(\*args, \*\*kwargs)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\figure.py", line 3378, in savefig

self.canvas.print\_figure(fname, \*\*kwargs)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\backend\_bases.py", line 2366, in print\_figure

result = print\_method(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\backend\_bases.py", line 2232, in <lambda>

print\_method = functools.wraps(meth)(lambda \*args, \*\*kwargs: meth(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\backends\backend\_agg.py", line 526, in print\_jpg

self.\_print\_pil(filename\_or\_obj, "jpeg", pil\_kwargs)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\backends\backend\_agg.py", line 458, in \_print\_pil

mpl.image.imsave(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\matplotlib\image.py", line 1689, in imsave

image.save(fname, \*\*pil\_kwargs)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\PIL\Image.py", line 2410, in save

fp = builtins.open(filename, "w+b")

FileNotFoundError: [Errno 2] No such file or directory: 'LRresults/lr\_minDCF\_raw\_5-folds.jpg'

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

Logistic Regression report:

Plotting minDCF graphs

Done.

# # 5-folds

# RAW

LogReg(λ = 1e-5, πT = 0.5)

- with prior = 0.5 -> minDCF = 0.182

- with prior = 0.1 -> minDCF = 0.420

- with prior = 0.9 -> minDCF = 0.534

LogReg(λ = 1e-5, πT = 0.1)

- with prior = 0.5 -> minDCF = 0.181

- with prior = 0.1 -> minDCF = 0.399

- with prior = 0.9 -> minDCF = 0.557

LogReg(λ = 1e-5, πT = 0.9)

- with prior = 0.5 -> minDCF = 0.185

- with prior = 0.1 -> minDCF = 0.471

- with prior = 0.9 -> minDCF = 0.513

# PCA m = 11

LogReg(λ = 1e-5, πT = 0.5)

- with prior = 0.5 -> minDCF = 0.121

- with prior = 0.1 -> minDCF = 0.307

- with prior = 0.9 -> minDCF = 0.355

LogReg(λ = 1e-5, πT = 0.1)

- with prior = 0.5 -> minDCF = 0.127

- with prior = 0.1 -> minDCF = 0.307

- with prior = 0.9 -> minDCF = 0.377

LogReg(λ = 1e-5, πT = 0.9)

- with prior = 0.5 -> minDCF = 0.117

- with prior = 0.1 -> minDCF = 0.314

- with prior = 0.9 -> minDCF = 0.356

# PCA m = 10

LogReg(λ = 1e-5, πT = 0.5)

- with prior = 0.5 -> minDCF = 0.182

- with prior = 0.1 -> minDCF = 0.420

- with prior = 0.9 -> minDCF = 0.534

LogReg(λ = 1e-5, πT = 0.1)

- with prior = 0.5 -> minDCF = 0.181

- with prior = 0.1 -> minDCF = 0.399

- with prior = 0.9 -> minDCF = 0.557

LogReg(λ = 1e-5, πT = 0.9)

- with prior = 0.5 -> minDCF = 0.185

- with prior = 0.1 -> minDCF = 0.471

- with prior = 0.9 -> minDCF = 0.513

------ END ------

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

Support Vector Machine report:

Plotting minDCF graphs ...

Done.

5-folds

# RAW

Linear SVM(C = 1e-2)

- with prior = 0.5 -> minDCF = 0.261

- with prior = 0.1 -> minDCF = 0.495

- with prior = 0.9 -> minDCF = 0.663

Linear SVM(C = 1e-2, πT = 0.5)

- with prior = 0.5 -> minDCF = 0.263

- with prior = 0.1 -> minDCF = 0.504

- with prior = 0.9 -> minDCF = 0.664

Linear SVM(C = 1e-2, πT = 0.1)

- with prior = 0.5 -> minDCF = 0.275

- with prior = 0.1 -> minDCF = 0.545

- with prior = 0.9 -> minDCF = 0.686

Linear SVM(C = 1e-2, πT = 0.9)

- with prior = 0.5 -> minDCF = 0.263

- with prior = 0.1 -> minDCF = 0.535

- with prior = 0.9 -> minDCF = 0.667

# PCA m = 11

Linear SVM(C = 1e-2)

- with prior = 0.5 -> minDCF = 0.138

- with prior = 0.1 -> minDCF = 0.327

- with prior = 0.9 -> minDCF = 0.423

Linear SVM(C = 1e-2, πT = 0.5)

- with prior = 0.5 -> minDCF = 0.138

- with prior = 0.1 -> minDCF = 0.339

- with prior = 0.9 -> minDCF = 0.445

Linear SVM(C = 1e-2, πT = 0.1)

- with prior = 0.5 -> minDCF = 0.152

- with prior = 0.1 -> minDCF = 0.357

- with prior = 0.9 -> minDCF = 0.475

Linear SVM(C = 1e-2, πT = 0.9)

- with prior = 0.5 -> minDCF = 0.140

- with prior = 0.1 -> minDCF = 0.339

- with prior = 0.9 -> minDCF = 0.410

------ END ------

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

Support Vector Machine report:

Plotting minDCF graphs ...

Traceback (most recent call last):

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 306, in <module>

linear\_svm\_report(data\_train, labels\_train)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 216, in linear\_svm\_report

utils.kfolds(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\utils.py", line 292, in kfolds

computeLLR = model.trainClassifier(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\SVM.py", line 46, in trainClassifier

alphaStar = dual\_wrapper(D, H, self.bounds)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\SVM.py", line 13, in dual\_wrapper

alphaStar, \_x, \_y = scipy.optimize.fmin\_l\_bfgs\_b(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_lbfgsb\_py.py", line 199, in fmin\_l\_bfgs\_b

res = \_minimize\_lbfgsb(fun, x0, args=args, jac=jac, bounds=bounds,

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_lbfgsb\_py.py", line 361, in \_minimize\_lbfgsb

f, g = func\_and\_grad(x)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 285, in fun\_and\_grad

self.\_update\_fun()

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 251, in \_update\_fun

self.\_update\_fun\_impl()

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 155, in update\_fun

self.f = fun\_wrapped(self.x)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 137, in fun\_wrapped

fx = fun(np.copy(x), \*args)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_optimize.py", line 77, in \_\_call\_\_

self.\_compute\_if\_needed(x, \*args)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_optimize.py", line 71, in \_compute\_if\_needed

fg = self.fun(x, \*args)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\SVM.py", line 8, in LDual

Ha = numpy.dot(H, utils.vcol(alpha))

KeyboardInterrupt

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

Support Vector Machine report:

Plotting minDCF graphs ...

Traceback (most recent call last):

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 306, in <module>

linear\_svm\_report(data\_train, labels\_train)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 207, in linear\_svm\_report

utils.kfolds(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\utils.py", line 292, in kfolds

computeLLR = model.trainClassifier(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\SVM.py", line 46, in trainClassifier

alphaStar = dual\_wrapper(D, H, self.bounds)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\SVM.py", line 13, in dual\_wrapper

alphaStar, \_x, \_y = scipy.optimize.fmin\_l\_bfgs\_b(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_lbfgsb\_py.py", line 199, in fmin\_l\_bfgs\_b

res = \_minimize\_lbfgsb(fun, x0, args=args, jac=jac, bounds=bounds,

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_lbfgsb\_py.py", line 361, in \_minimize\_lbfgsb

f, g = func\_and\_grad(x)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 285, in fun\_and\_grad

self.\_update\_fun()

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 251, in \_update\_fun

self.\_update\_fun\_impl()

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 155, in update\_fun

self.f = fun\_wrapped(self.x)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 137, in fun\_wrapped

fx = fun(np.copy(x), \*args)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_optimize.py", line 77, in \_\_call\_\_

self.\_compute\_if\_needed(x, \*args)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_optimize.py", line 71, in \_compute\_if\_needed

fg = self.fun(x, \*args)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\SVM.py", line 8, in LDual

Ha = numpy.dot(H, utils.vcol(alpha))

KeyboardInterrupt

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> ^C

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

Support Vector Machine report:

Plotting minDCF graphs ...

Done.

5-folds

# RAW

Linear SVM(C = 1e-2)

- with prior = 0.5 -> minDCF = 0.138

- with prior = 0.1 -> minDCF = 0.327

- with prior = 0.9 -> minDCF = 0.423

Linear SVM(C = 1e-2, πT = 0.5)

- with prior = 0.5 -> minDCF = 0.138

- with prior = 0.1 -> minDCF = 0.339

- with prior = 0.9 -> minDCF = 0.445

Linear SVM(C = 1e-2, πT = 0.1)

- with prior = 0.5 -> minDCF = 0.152

- with prior = 0.1 -> minDCF = 0.357

- with prior = 0.9 -> minDCF = 0.475

Linear SVM(C = 1e-2, πT = 0.9)

- with prior = 0.5 -> minDCF = 0.140

- with prior = 0.1 -> minDCF = 0.339

- with prior = 0.9 -> minDCF = 0.410

# PCA m = 11

Linear SVM(C = 1e-2)

- with prior = 0.5 -> minDCF = 0.138

- with prior = 0.1 -> minDCF = 0.327

- with prior = 0.9 -> minDCF = 0.423

Linear SVM(C = 1e-2, πT = 0.5)

- with prior = 0.5 -> minDCF = 0.138

- with prior = 0.1 -> minDCF = 0.339

- with prior = 0.9 -> minDCF = 0.445

Linear SVM(C = 1e-2, πT = 0.1)

- with prior = 0.5 -> minDCF = 0.152

- with prior = 0.1 -> minDCF = 0.357

- with prior = 0.9 -> minDCF = 0.475

Linear SVM(C = 1e-2, πT = 0.9)

- with prior = 0.5 -> minDCF = 0.140

- with prior = 0.1 -> minDCF = 0.339

- with prior = 0.9 -> minDCF = 0.410

------ END ------

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

RBF SVM, Poly SVM report:

Plotting minDCF graphs ...

Done.

# # 5-folds

# RAW

RBF SVM(C = 1e-1, γ = 1e-3)

- with prior = 0.5 -> minDCF = 0.207

- with prior = 0.1 -> minDCF = 0.431

- with prior = 0.9 -> minDCF = 0.615

Poly SVM(C = 1e-3, c = 1, d = 2)

- with prior = 0.5 -> minDCF = 0.205

- with prior = 0.1 -> minDCF = 0.542

- with prior = 0.9 -> minDCF = 0.568

# PCA m = 11

RBF SVM(C = 1e-1, γ = 1e-3)

- with prior = 0.5 -> minDCF = 0.207

- with prior = 0.1 -> minDCF = 0.431

- with prior = 0.9 -> minDCF = 0.615

Poly SVM(C = 1e-3, c = 1, d = 2)

- with prior = 0.5 -> minDCF = 0.205

- with prior = 0.1 -> minDCF = 0.542

- with prior = 0.9 -> minDCF = 0.568

------ END ------

PS C:\Users\ans\_k\PycharmProjects\pythonProject2\code> python main.py

Loading data

--------------------------------------------------

Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

RBF SVM, Poly SVM report:

Plotting minDCF graphs ...

Traceback (most recent call last):

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 433, in <module>

quadratic\_svm\_report(data\_train, labels\_train)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\main.py", line 316, in quadratic\_svm\_report

utils.kfolds(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\utils.py", line 292, in kfolds

computeLLR = model.trainClassifier(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\SVM.py", line 59, in trainClassifier

self.w = dual\_wrapper(D, H, self.bounds)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\code\SVM.py", line 13, in dual\_wrapper

alphaStar, \_x, \_y = scipy.optimize.fmin\_l\_bfgs\_b(

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_lbfgsb\_py.py", line 199, in fmin\_l\_bfgs\_b

res = \_minimize\_lbfgsb(fun, x0, args=args, jac=jac, bounds=bounds,

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_lbfgsb\_py.py", line 361, in \_minimize\_lbfgsb

f, g = func\_and\_grad(x)

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 286, in fun\_and\_grad

self.\_update\_grad()

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 256, in \_update\_grad

self.\_update\_grad\_impl()

File "C:\Users\ans\_k\PycharmProjects\pythonProject2\venv\lib\site-packages\scipy\optimize\\_differentiable\_functions.py", line 166, in update\_grad

def update\_grad():

KeyboardInterrupt

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Loading data

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Data Shapes

Train Data and Labels shape: (12, 2400) (2400,)

Test Data and Labels shape: (12, 8400) (8400,)

--------------------------------------------------

Done.

GMM report:

Plotting minDCF graphs ...

Done.

# # 5-folds

# RAW

GMM Full (8 components)

- with prior = 0.5 -> minDCF = 0.091

- with prior = 0.1 -> minDCF = 0.256

- with prior = 0.9 -> minDCF = 0.258

GMM Diag (16 components)

- with prior = 0.5 -> minDCF = 0.137

- with prior = 0.1 -> minDCF = 0.389

- with prior = 0.9 -> minDCF = 0.346

GMM Tied (32 components)

- with prior = 0.5 -> minDCF = 0.085

- with prior = 0.1 -> minDCF = 0.260

- with prior = 0.9 -> minDCF = 0.249

# PCA m = 11

GMM Full (8 components)

- with prior = 0.5 -> minDCF = 0.091

- with prior = 0.1 -> minDCF = 0.256

- with prior = 0.9 -> minDCF = 0.258

GMM Diag (16 components)

- with prior = 0.5 -> minDCF = 0.137

- with prior = 0.1 -> minDCF = 0.389

- with prior = 0.9 -> minDCF = 0.346

GMM Tied (32 components)

- with prior = 0.5 -> minDCF = 0.085

- with prior = 0.1 -> minDCF = 0.260

- with prior = 0.9 -> minDCF = 0.249