i	matplotlib in mport numpy a mport matplot mport matplot	.mean(axis=a :	axis) u)/data.std(alues, V = n eigenvalues ectors, axis dot(data, ei	axis=axis p.linalg. =0): genvector) svd(data.			False)		
d	ef pca(data, mu = data, if center; data = if normal; data = eigenvecto return eig	= (data - mu ors, eigenva genvectors,	dot(data, ei	genvector	- 1	Γ, full_m	natrices=			
d	sigma = pr	_data = np.c rojected_data ojected_data PCA as		applications	ssing and	s of PCA. T	The first two			
	rom numpy imp	with PCA as structure via a 4.1 Prep (a) Load the the data in	a method for p kernel PCA. Processing dataset pca2.com the coordinate	(2 points)	and the third	l one illustra	ates how to	find nonline	ear	
# d p p p # e p	rom numpy impladen: ata = genfrom rint data.sha lt.scatter(dat lt.title("dat lt.show() calc PCA igenvectors, rint eigenvec	mtxt('pca2.dape ata[:,0], da ta") eigenvalues	csv',delimit ata[:,1])		ip_header=	=1)				
# p p p	project data rojected_data rojected_data lt.scatter(pro lt.title("pro lt.show() 500L, 2L)	a, sigma = projected_dat	ta[:,0], pro a")			1)				
	10 - 5 - 0 - -5 -		Ministr	•						
	-156 -4 -0.88773892 -	-2 0 -0.46034728] 0.88773892] projected		6 8						
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d c p	elete = [16,1 lean_data = r	156] np.delete(da	Observations 17			wo steps. W	hat is the di	fference?		
p p # c p #	498L, 2L) lt.scatter(club) lt.title("club) lt.show() calc PCA lean_eigenvect rint clean_eigenvect project data	ean data") ctors, clear igenvectors igenvectors	n_eigenvalue [0] [1]	s = pca(c	lean_data					
c p	lean_projecte lt.scatter(cl lt.title("cle lt.show()	ed_data, cle lean_project	ted_data[:,0 ed data")		_	_		ors[0,1])		
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iff	mport pandas rom pandas.to rom numpy imp	(a) Load the coas pd	ening (3 point	s) sv and check	for outliers i	n the individ	ual variable	S.		
d p d # s	<pre>laden: ata = genfrom rint data.sha f = pd.DataFi make a scatt catter_matrix ass</pre>	ape rame(data[:, ter plot	,:])		ip_header=	=1)				
	4 - 2 - 0 - 2 - 4 - 6									
	2 - 0			_	Continue of the Continue of th		.7.			
	-5 - -10 - 10 - 5 -			** .						
	-5 -10 -	ier check, there		rs in the dat		the third v	ariable and			
Vá	ef outlier(da outliers = for n in 1	(b) Do PCA orepresent ata, m=6): = [] range(0, dat	on a reasonable s the data well. ta.shape[0])	subset of this						
p		f(abs(data[r outliers tliers tlier(data) s	n,m])>8): append(n)		=0)					
p [! [ata.shape , 211] ctors, clear igenvalues ,3,4], clear	n_eigenvalue n_eigenvalue 96 7.08142	s = pca(c s) 664 6.7						
3 3 2	60 45 40 - 85 -	Line2D	JA0†195							
1	20 - 5 - 10 15 ne scree plot indi			ponents repr			gažus:		ر د	
		The new vectors of	the data, i.e. creequal to 1. This evariables z_i form the covariance recorresponding of	can be done of Z the columns of the matrix Σ of the second of the s	e.g. using the thick $\tilde{Z} = \tilde{X}ED^{-1/2}$ of Z , E is a m	transformati	on	nalized eiger	1-	
X p # E p # D	<pre>center data</pre>	igenvectors envectors / atrix	clean_eigen	vectors.s	um(axis=1	, keepdim	ns=True)			
Z (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4 (4	TODO whats the X*E*D 496L, 4L) 4L, 4L) 4L, 4L) alueError ipython-input 8 D = np	t-53-01bc03c		module>()		ost recen	t call la	ast)		
V	9 print> 10 Z = X* alueError: op	E*D Derands coul (d) Make 3 ho projected clean_data.1	eat plots of the (i onto PC1-PC4, a) 4x4 covaria	ance matrix Σ	, (ii) the cov			ta	
p p p p	<pre>lt.pcolor(cov lt.title('cov lt.show() ov_projected lt.pcolor(cov lt.title('pro lt.show()</pre>	<pre>variance mat = np.cov(p v_projected)</pre>	trix')			nvectors)	[0].T)			
3	TODO WHILEHED	d data matix) ariance matr		lean_eige					
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separated the clusters of just focus on one of them. This probably makes them good for reconstruction of the original data, but is

not that useful for classification

Machine Intelligence II

Groupname: Gruppe 5

SS 2016, Obermayer/Augustin

Exercise Sheet 4

due: 2016-05-26 at 10:00