Woodneday YEA in high dimension In last sesson we've gove through the steps

of he pack alogorthum. to compute, Inoder to do PRA, we weld he data covariance matrix In d'demeisons, me data Co-voriance waters a dxd matrix. All dis very high, so in very high dimensions, the Computing the eigenvalues ad eigenvectors Their matrix can be guite expensive of the Steward of cubically in number of rows and Stages Steward on his case he number of Dimenas.
Columns, in his case he number of Dimenas En lus session we provide a solution to the problem, for the coefure home Substantially fliver data point ton demorsas

We now, assure that N is significantly smaller han B which means that I he number of data points is significantly smaller has be demonsionally of he data "Then he ronk of the Co-voidine matrix is N," $S = \frac{1}{N} \times T_X \Rightarrow rank(S) = N$ hat also means it has D-8+1 many leignervolue, which are 300 that means that the watery is not Full Rock, and raws and Columns are linearly dependent. 1. e there are same redudon cres. In west flow minutes, we'll exploit his and turn he boxb co-varance matry Surbaglell Park MXN Covorance makes what Regen volues O.

 $X_1, \dots X_N \in \mathbb{R}^D$, $S = \frac{1}{N} \times T_X \otimes$ Just move the Co-varance difinution up here. In PCA we ended up with the following eigen value/vector egnation, 'we had I times by equals hi times by where bi's a basis vector of the orthogenal Complement of principal ful space." Sbi = libi het reunte the equation: we now going to replace I with the definition up the Howell get " I for N how X transpore X, which is S, times bi equals to times bio"

and now we muchpay X from left hard side, sowe will get: X time X transpose X Si time I over N equals ti times X times Si $\frac{1}{N} X X T X 5 = \lambda X 5$ Nouve have a veux eigen vector/value equation So lis Still on Eigenvalue, and now we , which we call " howe eigenvector X5°, u Ci'y of he matrix 1 XXT

The mean that TXXT has the same nongeneous values as he data coverance matrix, But he is now an NXN matrix, so hat we can compute he ligen vectors/values much quicker than flor the original data co voiance matrix. · NXXT ERNXN ulareas Saed to be a DXD matrix So flaw we can Compute the eigenvectors

of his matrix of txT, and we use his
to recover the original eigenvectors, that we still need to do PCA

Corrently we we know he eigenvectors of fixXXT. >
and we want to recover he eigenvectors of S. If we left multiply ar Cignvouse I vector agration, but X transpose we get the flollang! " lover N times x transpie the x transpie times Ci equal di time X transpose timo ci" MXXCi = hi X Tci Now we flid or Smatry again. This is S = N xTx, and this also Means we recover X transpere time C: as an Eigenvector of S hat belongs to be man Cignivature I i

In this session we reflormedated PCA, such as host we can efficiently on PCA an alataset hat he dinersonally of data is abstantially hager has he do data ponts

TIMMESOME

1. The Parent/Grandian will be required to complete and sign the Indemnity Form, before the

EXTRA MURAL ACTICITIES

- in could participate in extra-mural activities, on additional fee will be charged
- The parent must provide such a toster well in advande, so the amount can be added to next
 the parent must be paid in advance.
- 3. Please note such a fee will also apply where a unid needs to be picked up from afterdare or time after normal school departure times (i.e. 14h20), as it means coming back for the child causing additional permit costs.
- The driver is not allowed to exict the vehicle while driefe are children in the car. This means the driver to be watting in the designation area, and on time. The driver torinot go off the child has to be watting in the designation of the call the call the call of the call the call
 - o companie have to well seat belts at all time.

CODE OF COMBUST

- Abusive and disruptive behaviour will not be trierated, children will be warned once, and that such behaviour must cease.
- We reserve the right to terminate the shuttle service, if the child engages in rough play on upon the behavior considered excessive

ROUTE CHANGES

- 1. The route schedule is subject to alterations at any time without prior notice and at the sole
- 2. However, we will make every either to notify the parent/guardian of any cancellations or
- 3. We will not be liable for any damages whatsoever arising from such alterations and