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Single pt (2, 2) Now have to find a unit wech Project vector x on w Since our Theis unit welos projecting x on w, you get unctor you can call to

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There could be any unit vectors But we will choose that unit wester for which our variance is maximum Calculating variance using some example. & for Thire will be other pts love for X; me got utx let's ey this x' is pt x,

Peropertion of x, on w => wtx, Similarly there are other pts x2, x3, x4 for  $X_2 = u^T X_2$ "  $X_3 = u^T X_3$ "  $X_4 = u^T X_4$ UT XY  $X_n = u T X_n$ · Now au hau to calculate uariante Variana=

Xi - each of Individual projections > (100x) for \* i=1 > KI WTX1 ut K2 or scalar & all thise we are trying to calculate vaccion is of this projection centre of projection Variance of projection of all points  $u^T x_1 - u^T x_m$ Now, mathematically une tind a unit in ctor have to our variance of projection maximum Optimization publismes maximizing

Peroblem with variance Variance is calculated for larie yaxis unl Varianu Variance 'will not tell the collection sulationship lectures & 2 or now 9 X18. That's where co variance comes which tells the rulation of w x and y Covanianu have 2 cel x, 8 x2 EXT lle et's covariance will FLOW(XIXI) CON(XIX2) x2 ( collected car (x), x1)

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the relationship b/w 2 axis is - worth EX 5 Find coveriana matrix of 3 dimini. 10ns le x, y, z. ALS varix) cou(2/4) (00 (2/2) couly, x) yourly), courty, cou(2x) cou(2/4) uar(2).