APPM – 5720 Fast Algorithms for Big Data

Reference Homework Problem HW: 4 Question: 2

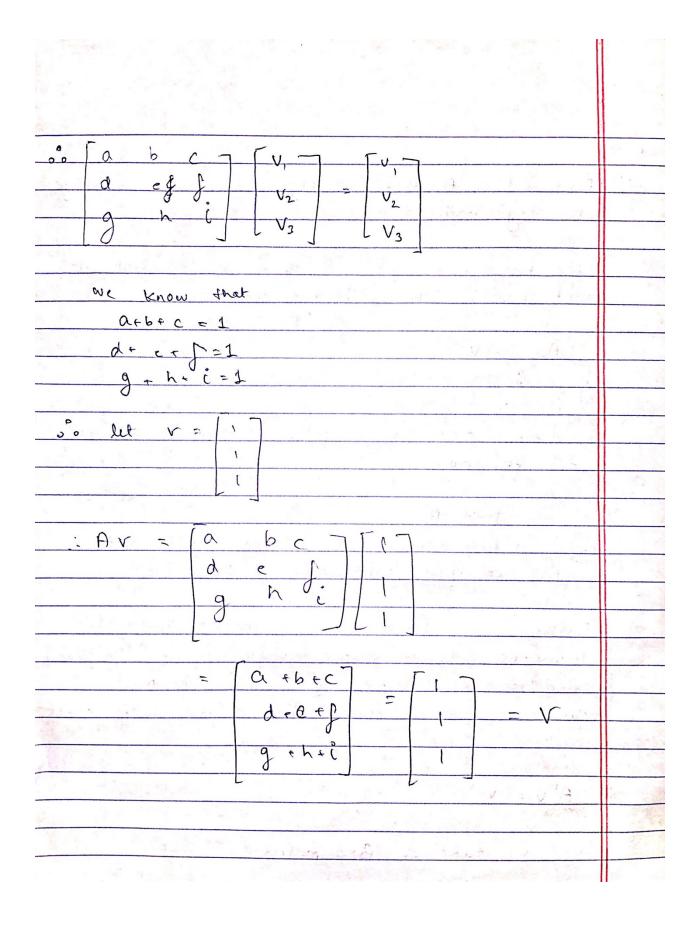
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Q2·	A is an nxn matrix
9 9 9	A is an nxn matrix A(i,j)>0 \(\forall i,j\)
	$\sum_{i=1}^{\infty} A(i,j) = 1$ $\forall j$
	C=1 0
(a)	Z P(j) = 1 ; p is a vector of non-negative
	numbers.
	rumbers. i p'= AP : P.T. \(\frac{2}{2}\) p'(j) = 1
	Let us start with a 2x2 matrix
	$P'(j) = A \cdot P(j)$
	[a] [a b] [r]
	[a] = [a] b] [c]
	we know, a+c=1.
to the second	b+d=1
	e * f = 1
	we must prove; ney=1
September 1	
	u = ae + b f
A Party of	y = ce tag
	O O
,	nty = ae + bf + ce + dj
	= e(a+c) + f(b+d)
	= e+f

$\therefore n+y = e+f$	2 %
0 - 1	
we can show the same for a 3x3 matrix and so on.	
Thus, $\sum P(j) = \sum \sum A(i,j) P(j)$	1 34
$= \sum_{j=1}^{2} f(j) \sum_{j=1}^{2} A(i,j)$ $= \sum_{j=1}^{2} f(j) \cdot 1$	j a les s
V21 V21	-
- Zpc;).1	
3=1	

1.	3
0	
0° Z p'(j) = 1	
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Hence Proved.	March
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(b)	Prove that A how an eigenvector corresponding
	to eigenvalue = 1.
	0
	We know that for an eigenvalue to exist, it
	must satisfy the following condition
	Av= Av
	y = 1
614	. U Av = V
	We have to prove there exists a v which satisfies
	this equation.
	let us take AT
	now, A had dim i, g to, AT will be g, i and
	each to tow will can to 1.
	Further, we know that a matrix and its
	transpose have same evals, hence, of the
	Condition is satisfied for AT, 1=1 must be
Control of the Contro	an eval of A and hence an ever must
	exist.
1	aT.
	$A^{T} \mathbf{v} = \mathbf{v}$
	Let us take a 3x3 matrix



	we can generalize this to a matrix of any size.
	any size.
	y A is of size f, i; we need to take
	V of size 1,j
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	V= (1,1,1,1,1)
	j
	AV = V
· · ·	1=1 is an eval of At
	=> 1=1 must be an eval of A
	=> A rust have an eigenvector with
k	=> A rust have an eigenvector with corresponding eval = 1
	=> A must have an eigenvector with
	=> A must have an eigenvector with
	=> A must have an eigenvector with corresponding eval = 1
	=> A noist have an eigenvector with corresponding eval = 1 Hence Proved.
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