Deep Learning Proofs and Results

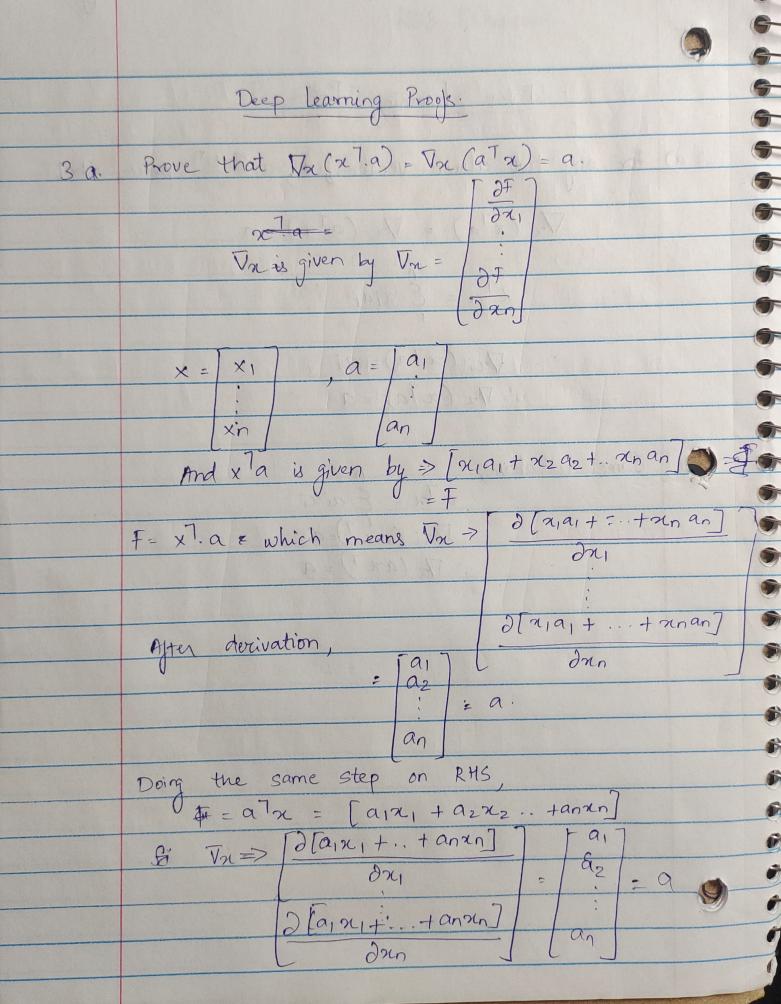
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PS C:\Users\Sumeet\OneDrive - Worcester Polytechnic Institute (wpi.edu)\WPI Sem 2\Dee p Learning\Homework> & C:/Users/Sumeet/AppData/Local/Programs/Python/Python311/python
.exe "c:/Users/Sumeet/OneDrive - Worcester Polytechnic Institute (wpi.edu)/WPI Sem 2/
Deep Learning/Homework/homework1_shanbhag_code.py"
Mean Squared Error for the testing set: 206.79647491430478
Mean Squared Error for the training set: 39.242962989290696
PS C:\Users\Sumeet\OneDrive - Worcester Polytechnic Institute (wpi.edu)\WPI Sem 2\Dee p Learning\Homework> []
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As we can see, we get the following values for testing and training set

Mean Squared Error for the testing set: 206.79647491430478

Mean Squared Error for the training set: 39.242962989290696



This shows that LHS = RHS = a. Prove that Voc (SCTAX) = (A+AT)X 3.6) Since Ais anxn matrix & x EIRn x. A = | x1 x2 .. xn | a11 ... a1n any ...an - (2) air + 22 agr + ... 12 agr + ... + (a) pain = [21a11 + 22 a21) ... + xnan1) \$... = (21a112 ... + xnann) 0 27. A. 2 = [(21a11...+2nan1) \$. * (x1a1nt.+2nann) | 21 0 0 0 f = |x1(x1a11..+ xnan1)+..+(xn(x1am..+ xnann))1x1. --Now Tix (x) Ax) = [27/2x, -0 -0 = 27 mm (1 = 6 = 10 mm) -9 2 (x1(x1a11+..+ xndn1)+..+ xn(x1ain+..+xnann) 1 2 f/2 nn [(2 x1a11 + 22a21 + ... + 2nani) + 212a12 + ... + 2nain 999 (a) and + 22 ap + ... + 22 nan) + 21 an 1 + ...

9

9

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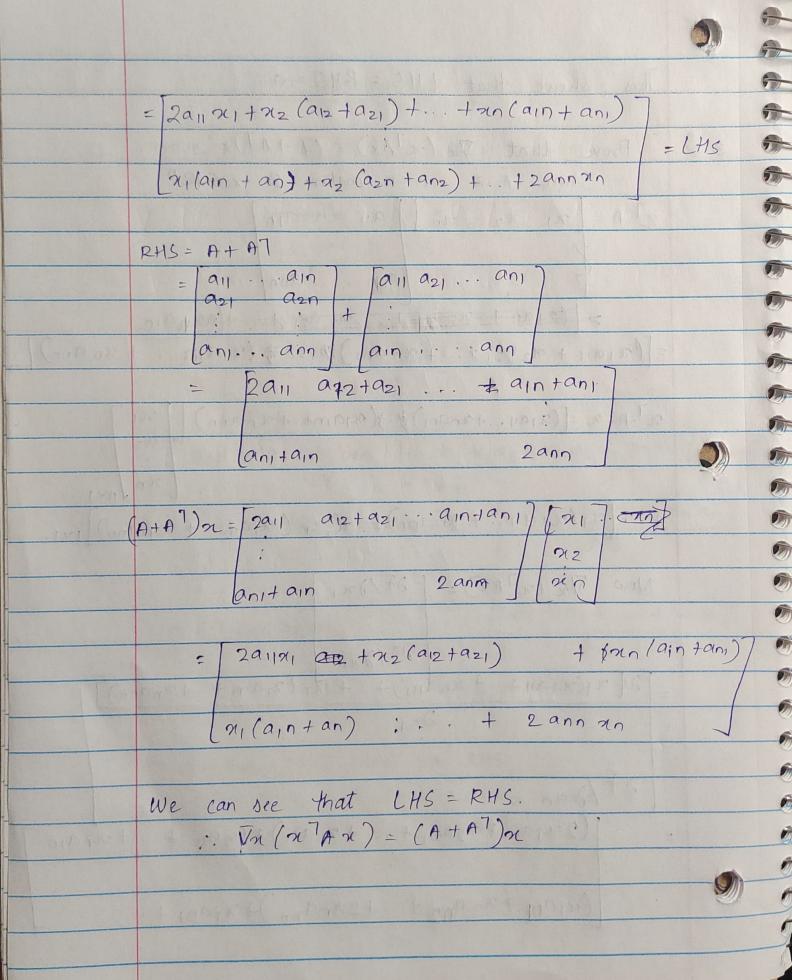
0

4

1

0

0



3.c) Prove that $\sqrt{x}(x^{T}Ax) = 2Ax$. We know that for a symmetrie matrix, $A = A^{T}$ which mean $A+A^{7}=A+A=2A$ (i) 17 In the previous descivation, we proved that 17 7 $\nabla x \left(x^7 A x\right) = \left(A + A^7\right) x$ 1 From (i), we can substitute Hence proved. 7 3.d) Prove that $V_{n}T(A_{n}+b)^{7}.(A_{n}+b)=2A^{7}(A_{n}+b)$ (Ax+b) 7= (Ax)7+b7 => x7A7+b7 (Ax+b)7. (Ax+B) => (x7A7+b7). (Ax+b) => x7A7A2+27A7b+b7A2+67b. We know that A7 = 4

7

19

The expression becomes.

927 AARC + 267 Ab + b7 ARC + b7b

927 AARC + 267 Ab + (Ab) PRC + b7b. Vn[(Ax+b)]. (An+b)] => Vn[27AA2+27Ab+(Ab)/2+b7b] = Vn (x 7 A AM) - Vn (n 1 Ab) + Vn (Ab) 7 m) + Vn (b7b) the break of the special to From the derived proofs, we can rewrite the expression as. = [AA-1(AA)] x + Ab -1Ab + 0 = (AA+AA)x + Ab + Ab $= A(24\pi + 2b)$ = A (Ax + An + b + b) = 2A (AOL+b) = RHS .: LHS: Henre Proved.