LINEAR ALGEBRA INTRODUCTION

BEGINNING TOPICS

~~MATRICES~~

- MULTIPLICATION (BY DOT PRODUCT) OF VECTORS + MATRICES
- DOT PRODUCT
- EIGENVALUES
- EIGENVECTORS
- DIAGONAL MATRICES
- SQUARE MATRICES
- UPPER/LOWER TRIANGULAR
- TRIDIAGONAL
-

LIN ALG BOOK

pg 4 — LINEAR SYSTEMS CAN BE DESCRIBED BY AN AUGMENTED MATRIX

pg. 22 — VECTORS — DOT PRODUCT AND CROSS PRODUCT (INTRODUCE $\hat{x}$ $\hat{y}$ NOTATION AND $\hat{i}$ $\hat{j}$ $\hat{k}$ NOTATION) also e_1 e_2 e_3...

pg. 53 > A VECTOR IS SIMPLY A 1-ROW OR 1-COLUMN MATRIX. A SCALAR IS A 1X1 MATRIX

pg. 8 — GAUSS-JORDAN ELIMINATION TO SOLVE AN AUGMENTED SYSTEM
[reduced-row echelon form] [rref]

pg. 27 — RANK, ADDING MATRICES, SUBTRACTING MATRICES, MULTIPLYING MATRICES.
MATRIX-VECTOR PRODUCT (IN VECTOR NOTATION)

pg. 49 — WHAT IS A <u>LINEAR</u> OPPERATOR OR TRANSFORMATION?
OBEYS THE FOLLOWING TWO RULES (SAY T IS THE OPPERATOR)
$T(\vec{x})$ IS A LINEAR OPPERATOR IF:
1. $T(\vec{x}+\vec{y}) = T(\vec{x}) + T(\vec{y}) \quad \forall \vec{x}, \vec{y} \in \text{Domain}(T)$
2. $c * T(\vec{x}) = T(c\vec{x}) \quad \forall c \in \mathbb{R}, \forall \vec{x} \in \text{Domain}(T)$

(c = constant)

examples: $f(x)=x^2$ $f(x)=x^2+2$ $f(x)=x+2$ $f(x)=0$ $f(x)=2x$ $f(x)=2$

pg. 45 — IF T IS A LINEAR TRANSFORMATION, THEN THERE IS A MATRIX TO DESCRIBE WHAT IT DOES (NOT A LINEAR OPPERATOR).
> HOW TO FIND SAID MATRIX $A = [T(e_1)\ T(e_2)\ T(e_3) \dots T(e_n)]$

pg. 48

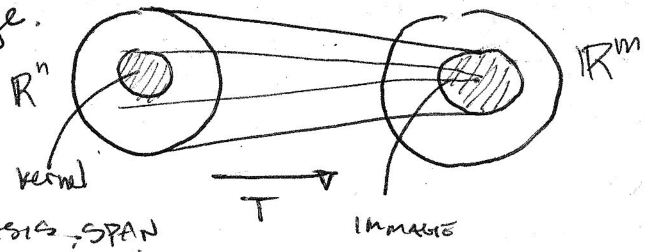
pg 89 — VECTOR PROJECTIONS, REFLECTIONS

pg 73 — INVERTABLE MATRICES (n×n and rank=n) $AA^{-1} = I$ ← identity

isomorphism

pg 105 INTRODUCE kernel (ker = #col − rank) it is the dimension of the space that all maps to the zero vector.

introduce image. ← pg 104



INTRODUCE BASIS, SPAN
115 104

$A \in \mathbb{R}^{n \times m}$

$$\dim(\ker(A)) + \dim(\operatorname{im}(A)) = m$$

$$\Downarrow \qquad \Downarrow$$

$$\text{nullity}(A) + \text{rank}(A) = m$$

pg 144 — SIMILAR MATRICES (TRANSFORM, CHANGE OF BASIS) pg 144 $AS = SB$

pg 188 — ORTHOGONAL, ORTHONORMAL, CREATING AN ORTHONORMAL BASIS WITH THE GRAM-SCHMIDT ALGORITHM ← pg. 205

(NEED TO UNDERSTAND NORM) ← pg 186

ORTHOGONAL MATRIX

not yet — ~~EIGENVALUES AND EIGENVECTORS~~ ← pg 297, pg 217

— MATRIX TRANSPOSE AND CONJUGATE TRANSPOSE

— INDEX NOTATION FOR MATRICES AND MATRIX OPERATIONS. CAN BE USEFUL, WHEN WRITING CODE. HARD TO GET THE HANG OF