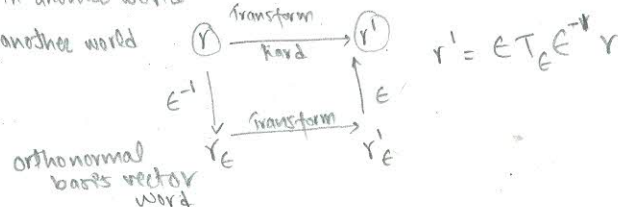


Transformation in another world

another world



Eigen Vector & Eigen Value

↳ German - charakteristisch

Geometry

Linear transformation - vector

every vector in space → shape distort
After transformation, some vector may lie in same line

Characteristic vector } eigen vector
Impact } length → eigen value
direction } direction → eigen value

2D

- Uniform scale - any vector
- Rotation - $\theta \neq 180^\circ$ - no vector
- Horizontal shear & vertical scaling - 2

3D

Rotation axis of rotation = eigen vector

Linear Algebra

definition

$$A x = \lambda x$$

$$(A - \lambda I) x = 0$$

$$\Rightarrow A - \lambda I = 0$$

x - vector

A - transformation

λ = eigen value

$$|A - \lambda I| = 0$$

Changing eigen basis → efficient matrix manipulation + many diagonalization

$$V_n = T(T(T(\dots T(v_0))))$$

$$= T^n v_0$$

↳ computationally expensive if T is not diagonal matrix
↳ change basis where T → diagonal matrix eigen basis

matrix using eigen vectors / value

$$T = C D C^{-1}$$

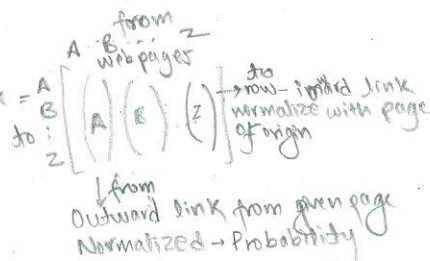
$$T^2 = C D^2 C^{-1}$$

$$T^n = C D^n C^{-1}$$

- Undiagonalizable matrix
- Complex eigen vector

PageRank Algorithm

Link Matrix



Rank of A

- rank of all pages
- link to page A?
- outgoing link from page A

$$Y_A = \sum_{j=1}^n L_{A,j} Y_j$$

weight from link matrix

$$Y = L Y$$

- initial guess for r
- iterate until convergence

Power Method

- only interested eigenvalue = 1
- sparse matrix

Dampening factor

$$r^{i+1} = d(L r^{(i)}) + \frac{1-d}{n}$$

$$d \in (0, 1]$$

$$d = 1 - p \rightarrow \text{random}$$

Stability vs speed

d - probability to follow link