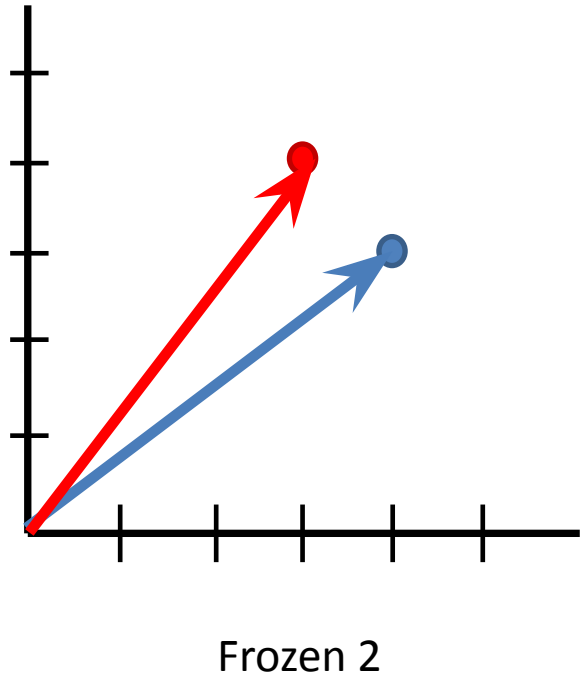
Recommender Systems

Patrick Wales-Dinan

GENERAL ASSEMBLY

Movie/TV Ratings

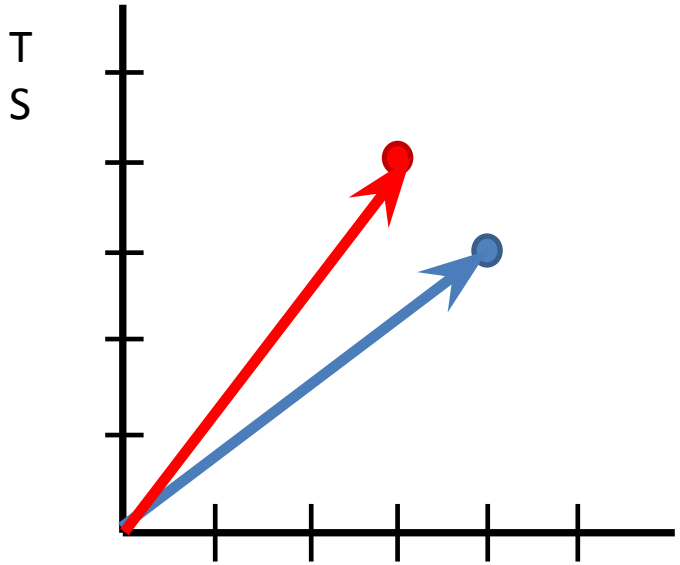
	$\vec{C}$ Carolina	$\vec{A}$ Annalise
Toy Story 4	4	3
Frozen 2	3	4



Cosine Similarity

$$\frac{\vec{C}}{\|C\|} \cdot \frac{\vec{A}}{\|A\|}$$

Vector Magnitude



Frozen 2

$$a^2 + b^2 = c^2$$

$$\Rightarrow \sqrt{4^2 + 3^2}$$
$$\Rightarrow \sqrt{16 + 9}$$
$$\Rightarrow \sqrt{25} \Rightarrow 5 \Rightarrow \ \|C\| \ \& \|A\|$$

Vector Normalization (Unit Vector)

$$\frac{\vec{c}}{\|C\|} = \frac{\begin{bmatrix}4\\3\end{bmatrix}}{5} = \begin{bmatrix}\frac{4}{5}\\\frac{3}{5}\end{bmatrix} = \hat{c}$$

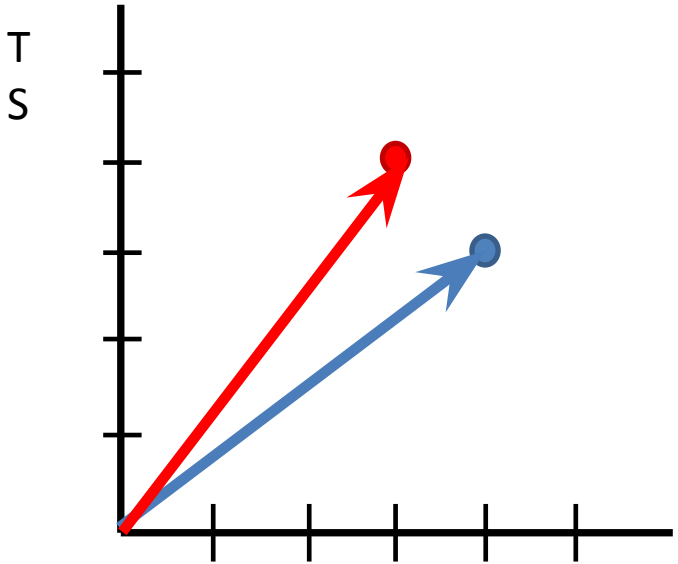
So whenever you take any vector and divide it by its magnitude. Then the result of that new vector is the unit vector (or a vector with magnitude = 1)

Dot Product

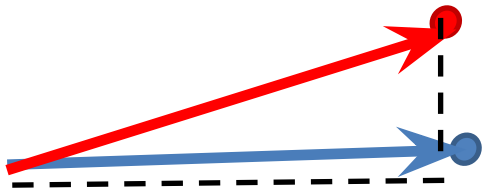
$$\begin{bmatrix} \frac{4}{5} \\ \frac{3}{5} \end{bmatrix} \cdot \begin{bmatrix} \frac{3}{5} \\ \frac{4}{5} \end{bmatrix}$$

$$\frac{4}{5} * \frac{3}{5} + \frac{3}{5} * \frac{4}{5} = \sim 0.96$$

Dot Product Intuition



Frozen 2

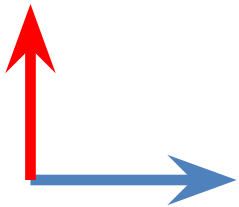


0.96

Why Do We Normalize?

Cosine Sim = 1

Cosine Sim = -1



Cosine Sim = 0

Content-Based Recommenders

Based on **product features**

Title	Year	Genre	Director	MPAA Rating
Elf	2003	Christmas/Comedy	Jon Favreau	PG
Die Hard	1988	Christmas/Action	John McTiernan	R
How to Train Your Dragon	2010	Animation/Action	Dean DeBlois Chris Sanders	PG

Collaborative Recommenders: User-Based

Recommendations from **users** with similar **ratings**

	Movie 1	Movie 2	Movie 3
User 1	5	1	Not Watched
User 2	4	1	4
User 3	1	5	1

Collaborative Recommenders: User-Based

Recommendations from **users** with similar **purchases**

	Movie 1	Movie 2	Movie 3
User 1	1	0	Not Watched
User 2	1	0	1
User 3	0	1	0

Collaborative Recommenders: Item-Based

Recommendations from **products** with similar **ratings/purchases**

	User 1	User 2	User 3
Movie 1	4	5	2
Movie 2	2	1	5
Movie 3	5	4	2

