

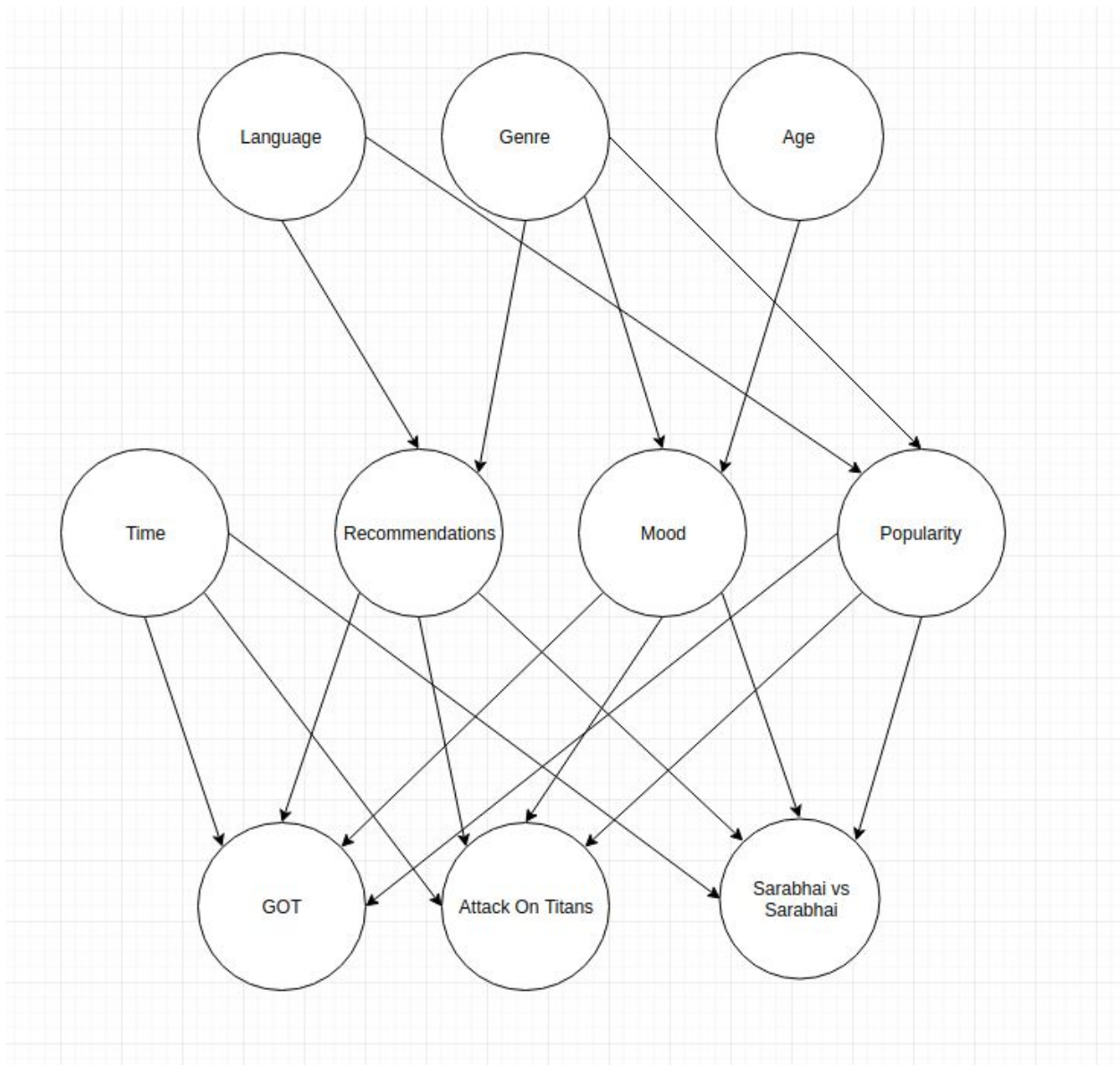
Assignment 3: Bayes' Net

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Question 9:

Most of like to watch TV series like Friends, GOT. A lot of times it so happens that they don't do as well as we expect them to. Wouldn't it be nice to have an algorithm that can tell how good a TV series will be?



Keys:

L	Language	English, Japanese, Hindi
G	Genre	Gore, Comedy, Action
A	Age	0-15, 15-30, 30+
T	Time	1:00-8:00, 8:00-10:00, 10:00-20:00, 20:00-1:00
R	Recommendation	Boring, Epic
M	Mood	Bored, Busy, High
P	Popularity	Low, Medium, High
GOT	Game of Thrones	Yes, No
Aot	Attack on Titans	Yes, No
SvS	Sarabhai vs Sarabhai	Yes, No

Conditional Probability Tables**Time**

Probability of watching TV series in a particular time range

T	1:00 - 8:00	8:00 - 10:00	10:00-20:00	20:00 - 1:10
P(T)	0.5	0.4	0.05	0.05

Languages

Probability of each language being watched

L	English	Japanese	Hindi
P(L)	0.5	0.25	0.25

Genre

Probability of watching a particular genre

G	Gore	Comedy	Action
P(G)	0.1	0.5	0.4

Age

Probability of the user belonging to a particular age group

A	0-15	15-35	35 above
P(A)	0.3	0.5	0.2

Recommendations

Probability of a friend recommending a TV show of specific genre and language

Language	Genre	Boring	Epic
English	Gore	0.2	0.8
English	Comedy	0.3	0.7
English	Action	0.8	0.2
Japanese	Gore	0.3	0.7
Japanese	Comedy	0.6	0.4

Japanese	Action	0.1	0.9
Hindi	Gore	0.9	0.1
Hindi	Comedy	0.4	0.6
Hindi	Action	0.7	0.3

Mood

Probability of each kind of mood of the user depending on the genre and the age of the user

Genre	Age	Bored	Busy	High
Gore	0-15	0.4	0.5	0.1
Gore	15-35	0.35	0.05	0.5
Gore	35+	0.5	0.2	0.3
Comedy	0-15	0.3	0.5	0.2
Comedy	15-35	0.6	0.2	0.2
Comedy	35+	0.4	0.1	0.5
Action	0-15	0.6	0.35	0.05
Action	15-35	0.4	0.1	0.5
Action	35+	0.5	0.05	0.45

Popularity

Popularity of TV show of specific genre and language

Language	Genre	Low	Medium	High
English	Gore	0.2	0.3	0.5

English	Comedy	0.3	0.1	0.6
English	Action	0.5	0.2	0.3
Japanese	Gore	0.3	0.5	0.2
Japanese	Comedy	0.8	0.1	0.1
Japanese	Action	0.3	0.3	0.4
Hindi	Gore	0.8	0.1	0.1
Hindi	Comedy	0.2	0.1	0.7
Hindi	Action	0.3	0.2	0.5

GOT

Probability of a user watching GOT based on the parent factors

P	R	M	T	P(Yes)
High	Epic	Bored	20:00-1:00	0.9
High	Epic	Bored	1.00-8.00	0.5
High	Epic	High	20-1	0.7
High	Epic	High	1-8	0.4
High	Boring	Bored	20-1	0.3
High	Boring	Bored	1-8	0.2
High	Boring	High	20-1	0.1
High	Boring	High	1-8	0.4

Attack on Titans

Probability of a user watching Attack on Titans based on the parent factors

P	R	M	T	P(Yes)
High	Epic	Bored	1:00-8:00	0.9
High	Epic	Bored	10:00-8:00	0.8
High	Epic	High	1:00-8:00	0.7
High	Epic	High	10:00-8:00	0.6
Medium	Boring	Bored	1:00-8:00	0.5
Medium	Boring	Bored	10:00-8:00	0.5
Medium	Boring	High	1:00-8:00	0.6
Medium	Boring	High	10:00-8:00	0.7
Medium	Epic	Bored	1:00-8:00	0.9
Medium	Epic	Bored	10:00-8:00	0.8
Medium	Epic	High	1:00-8:00	0.7
Medium	Epic	High	10:00-8:00	0.6

Sarabhai Vs Sarabhai

Probability of a user watching Sarabhai vs Sarabhai based on the parent factors

P	R	M	T	P(Yes)
Medium	Epic	Bored	8:00-10:00	0.9
Medium	Epic	Bored	10:00-20:00	0.7

Medium	Epic	Busy	8:00-10:00	0.3
Medium	Epic	Busy	10:00-20:00	0.2
Medium	Boring	Bored	8:00-10:00	0.2
Medium	Boring	Bored	10:00-20:00	0.2
Medium	Boring	Busy	8:00-10:00	0.3
Medium	Boring	Busy	10:00-20:00	0.1

Justification:

1. The recommendation a person gives to a show largely depends on the genre and the language of the tv show. Same goes for the popularity.
2. The mood of the person depends on the genre of tv shows he is interested in watching and also his age.
3. Time of the day is an independent factor, So are the genre of the tv show and the age of the viewer.
4. The probability of TV shows being watched being during particular time periods are chosen to be 0 according to the genre of those and the age range of the people watching it.

Query:

$P(\text{Aot}=\text{Yes} \mid \text{Recommendation} = \text{Epic}, \text{Genre} = \text{Action})$

This is the form $P(X \mid p(X), p(p(X)))$

By conditioning we have

$$P(\text{Aot}=\text{Yes} \mid \text{Recommendation} = \text{Epic}, \text{Genre} = \text{Action}) = \frac{P(\text{Aot}=\text{Yes}, \text{Recommendation}=\text{Epic}, \text{Genre} = \text{Action})}{P(\text{Recommendation}, \text{Genre})}$$

We know that mood depends on genre and as genre is action, we can calculate the probability of a particular mood.

$$P(\text{mood}=\text{Bored} \mid \text{genre}=\text{action}) = 1.5/4.05 = 0.37$$

$$P(\text{mood}=\text{Busy} \mid \text{genre}=\text{action}) = 0.5/2.05 = 0.24$$

$$P(\text{mood}=\text{High} \mid \text{genre}=\text{action}) = 1.0/2.8 = 0.35$$

We know that popularity depends on genre and as genre is action, we can calculate the probability of a particular popularity.

$$P(\text{popularity}=\text{Low} \mid \text{genre}=\text{action}) = 1.1/3.7 = 0.29$$

$$P(\text{popularity}=\text{Med} \mid \text{genre}=\text{action}) = 0.7/1.8 = 0.38$$

$$P(\text{popularity}=\text{High} \mid \text{genre}=\text{action}) = 1.2/3.4 = 0.35$$

Watching Attack on titans depends on time, mood and popularity as recommendation is already provided

$$P(\text{Aot}=\text{Yes}, \text{Recommendation}=\text{Epic}, \text{Genre}=\text{Action})$$

$$= P(\text{aot}, P=\text{high}, M=\text{bored}, \text{time})$$

$$+ P(\text{aot}, P=\text{high}, M=\text{High}, \text{time})$$

$$+ P(\text{aot}, P=\text{med}, M=\text{bored}, \text{time})$$

$$+ P(\text{aot}, P=\text{med}, M=\text{High}, \text{time})$$

$$\Rightarrow (0.9*0.5 + 0.8*0.4)*0.37*0.35 + (0.7*0.5 + 0.6*0.4)*0.35*0.35 + (0.5*0.5 + 0.5*0.4)*0.37*0.38 + (0.7*0.5 + 0.6*0.4)*0.38*0.35 \\ \Rightarrow 0.33767$$

$$P(\text{Aot}=\text{Yes} \mid \text{Recommendation} = \text{Epic}, \text{Genre} = \text{Action}) = 0.79132$$