# AI Assignment 3 : Bayesian Networks

**Team Members:**

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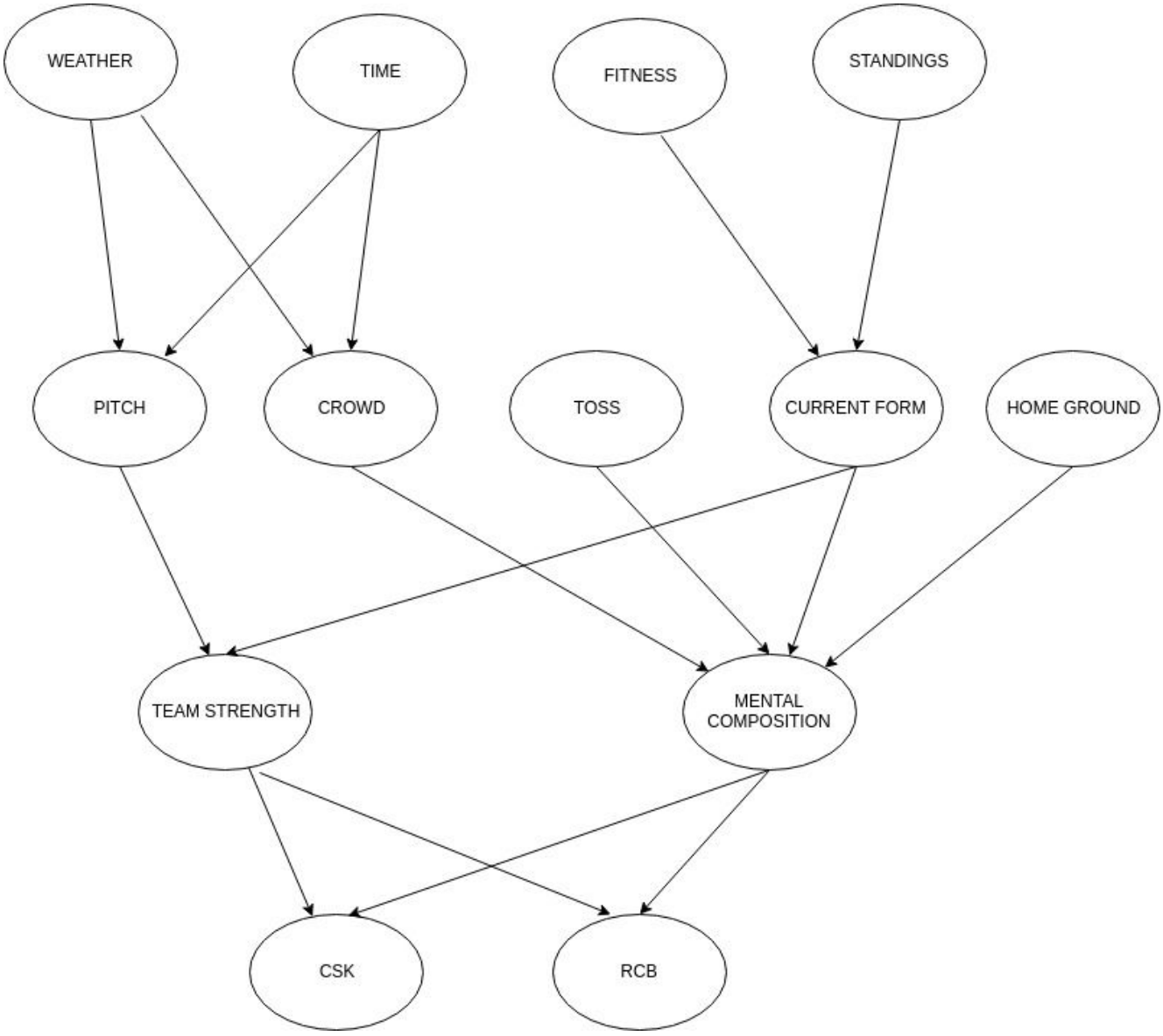
**Flow Diagram :**



**Key:**

| | | |
|---|---|---|
| W | Weather | Sunny, Rainy, Other |
| Tm | Time | Day, Night |
| H | Home Ground | RCB |
| F | Fitness | Fit, Unfit |
| S | Standings | Top, Bottom, Middle |
| P | Pitch | Batting, Bowling |
| C | Crowd | High, Low |
| T | Toss | CSK, RCB |
| CF | Current Form | Good, Bad |
| TS | Team Strength | High, Low, Average |
| MC | Mental Composition | Good, Bad |

## Conditional Probability Tables :-

**Home(given the ground is chinnaswamy):**

| **H** | **CSK** | **RCB** |
|---|---|---|
| P(H) | 0 | 1 |

**Time:**

| **Tm** | **Day** | **Night** |
|---|---|---|
| P(T) | 0.2 | 0.8 |

**Weather:**

| W | Sunny | Rainy | Other |
|---|---|---|---|
| P(W) | 0.7 | 0.1 | 0.2 |

**Standings:**

| S | Top | Bottom | Middle |
|---|---|---|---|
| P(S) | 0.6 | 0.1 | 0.3 |

**Fitness:**

| F | Fit | Unfit |
|---|---|---|
| P(F) | 0.8 | 0.2 |

**Toss:**

| T | yes | no |
|---|---|---|
| P(T) | 0.5 | 0.5 |

**Home:**

| H | yes | no |
|---|---|---|
| P(H\|CSK) | 0 | 1 |
| P(H\|RCB) | 1 | 0 |

**Pitch:**

| Tm | W | P.Batting | P.Bowling |
|---|---|---|---|
| Day | Sunny | 0.8 | 0.2 |
| Day | Rainy | 0.6 | 0.4 |
| Day | Other | 0.7 | 0.3 |

| | | | |
|---|---|---|---|
| Night | Sunny | 0.85 | 0.15 |
| Night | Rainy | 0.65 | 0.35 |
| Night | Other | 0.75 | 0.25 |

**Crowd:**

| **Tm** | **W** | **C.High** | **C.Low** |
|---|---|---|---|
| Day | Sunny | 0.4 | 0.6 |
| Day | Rainy | 0.3 | 0.7 |
| Day | Other | 0.5 | 0.5 |
| Night | Sunny | 0.8 | 0.2 |
| Night | Rainy | 0.6 | 0.4 |
| Night | Other | 0.9 | 0.1 |

**Current Form:**

| **F** | **S** | **CF.Good** | **CF.Bad** |
|---|---|---|---|
| Fit | Top | 0.95 | 0.05 |
| Fit | Bottom | 0.2 | 0.8 |
| Fit | Middle | 0.6 | 0.4 |
| Unfit | Top | 0.75 | 0.25 |
| Unfit | Bottom | 0.1 | 0.9 |
| Unfit | Middle | 0.4 | 0.6 |

**Team Strength:**

| **P** | **CF** | **TS.High** | **TS.Low** | **TS.Average** |
|---|---|---|---|---|
| Batting | Good | 0.7 | 0.1 | 0.2 |

| | | | | |
|---|---|---|---|---|
| Batting | Bad | 0.5 | 0.25 | 0.25 |
| Bowling | Good | 0.8 | 0.1 | 0.1 |
| Bowling | Bad | 0.4 | 0.4 | 0.2 |

**Mental Composition:**

| **C** | **T** | **CF** | **H** | **MC.Good** | **MC.Bad** |
|---|---|---|---|---|---|
| High | yes | Good | yes | 0.95 | 0.05 |
| High | yes | Good | no | 0.8 | 0.2 |
| High | yes | Bad | yes | 0.6 | 0.4 |
| High | yes | Bad | no | 0.4 | 0.6 |
| High | no | Good | yes | 0.8 | 0.2 |
| High | no | Good | no | 0.95 | 0.05 |
| High | no | Bad | yes | 0.3 | 0.7 |
| High | no | Bad | no | 0.6 | 0.4 |
| Low | yes | Good | yes | 0.9 | 0.1 |
| Low | yes | Good | no | 0.7 | 0.3 |
| Low | yes | Bad | yes | 0.4 | 0.6 |
| Low | yes | Bad | no | 0.3 | 0.7 |
| Low | no | Good | yes | 0.8 | 0.2 |
| Low | no | Good | no | 0.65 | 0.35 |
| Low | no | Bad | yes | 0.3 | 0.7 |
| Low | no | Bad | no | 0.2 | 0.8 |

**CSK:**

| TS | MC | CSK.win | CSK.lose |
|---|---|---|---|
| High | Good | 0.9 | 0.1 |
| High | Bad | 0.6 | 0.4 |
| Low | Good | 0.55 | 0.45 |
| Low | Bad | 0.3 | 0.7 |
| Average | Good | 0.75 | 0.25 |
| Average | Bad | 0.4 | 0.6 |

**RCB:**

| TS | MC | RCB.win | RCB.lose |
|---|---|---|---|
| High | Good | 0.8 | 0.2 |
| High | Bad | 0.5 | 0.5 |
| Low | Good | 0.45 | 0.55 |
| Low | Bad | 0.2 | 0.8 |
| Average | Good | 0.6 | 0.4 |
| Average | Bad | 0.3 | 0.7 |

## Justifications:-

1. The pitch is usually prepared to keep the home team's needs in mind. So the home team has a definite advantage here.
2. The time of the match and the weather greatly impact the pitch conditions and thus the outcome of the game.
3. The crowd will be more if the weather is pleasant and the match is in the evening(night) as most people have jobs/classes in the morning.
4. The team which has won more matches before and is more fit definitely is in the better form.
5. The pitch conditions are hugely dependent on weather and time(dew factor comes into play).
6. The team/player form and crowd support can increase the mental composition of the team.
7. The team having the right combinations (team strength), with confident players, has a higher chance of winning.
8.Given the ground in Chinnaswamy so the probability of CSK playing on their home ground is 0 and the probability of RCB playing on their homeground is 1.

## QUERY :-

**Form** - P(X | p(X), p(p(X)) )
where p(X) refers to the parent of X.

**Query -** P( CSK = win | MC = Good, CF = Good )

P( CSK = win | MC = Good, CF = Good ) = P( CSK = win | MC = Good, TS = High) *
P(TS = High | CF = Good) +
P( CSK = win | MC = Good, TS = Avg) *
P(TS = Avg | CF = Good) +
P( CSK = win | MC = Good, TS = Low) *
P(TS = Low | CF = Good) .

P(P = Batting | W = Sunny) = P(P = Batting | W = Sunny, Tm = Day)*P(Tm = Day)
+
P(P = Batting | W = Sunny, Tm = Night)*P(Tm =
Night)
= 0.8*0.2 + 0.85*0.8
= **0.84**
P(P = Batting | W = Rainy) = P(P = Batting | W = Rainy, Tm = Day)*P(Tm = Day)
+
P(P = Batting | W = Rainy, Tm = Night)*P(Tm =
Night)
= 0.6*0.2 + 0.65*0.8
= **0.64**
P(P = Batting | W = Other) = P(P = Batting | W = Other, Tm = Day)*P(Tm = Day) +
P(P = Batting | W = Other, Tm = Night)*P(Tm =
Night)
= 0.7*0.2 + 0.75*0.8
= **0.74**
P(P =Bowling | W = Sunny) = P(P =Bowling | W = Sunny, Tm = Day)*P(Tm = Day)
+
P(P=Bowling | W = Sunny, Tm = Night)*P(Tm =
Night)
= 0.2 * 0.2 + 0.15*0.8
= **0.16**
P(P =Bowling | W = Rainy) = P(P =Bowling | W = Rainy, Tm = Day)*P(Tm = Day)
+
P(P =Bowling | W = Rainy, Tm = Night)*P(Tm =
Night)
= 0.4*0.2 + 0.35*0.8
= **0.36**
P(P =Bowling | W = Other) = P(P =Bowling | W = Other, Tm = Day)*P(Tm = Day)
+
P(P =Bowling | W = Other, Tm = Night)*P(Tm =
Night)

= 0.3*0.2 + 0.25*0.8
= **0.26**

P(P = Batting) = P(P = Batting | W = Sunny)*P(W = Sunny) + P(P = Batting | W = Rainy)*P(W = Rainy) + P(P = Batting | W = Other)*P(W = Other)
= 0.84*0.7 + 0.64*0.1 + 0.74*0.2
= **0.8**

P(P = Bowling) = P(P = Bowling | W = Sunny)*P(W = Sunny) + P(P = Bowling | W = Rainy)*P(W = Rainy) + P(P = Bowling | W = Other)*P(W = Other)
= 0.16*0.7 + 0.36*0.1 + 0.26*0.2
= **0.2**

P(TS = High | CF = Good) = P(TS = High | CF = Good, P = Batting)* P(P = Batting) + P(TS = High | CF = Good, P = Bowling)* P(P = Bowling)
= 0.7 * 0.8 + 0.8*0.2
= **0.72**

P(TS = Avg | CF = Good) = P(TS = Avg | CF = Good, P = Batting)* P(P = Batting) + P(TS = Avg | CF = Good, P = Bowling)* P(P = Bowling)
= 0.2*0.8 + 0.1*0.2
= **0.18**

P(TS = Low | CF = Good) = P(TS = Low | CF = Good, P = Batting)* P(P = Batting) + P(TS = Low | CF = Good, P = Bowling)* P(P = Bowling)
= 0.1*0.8 + 0.1+0.2
= **0.1**

P( CSK = win | MC = Good, CF = Good ) = P( CSK = win | MC = Good, TS = High) * P(TS = High | CF = Good) +

P( CSK = win | MC = Good, TS = Avg) *
P(TS = Avg | CF = Good) +
P( CSK = win | MC = Good, TS = Low) *
P(TS = Low | CF = Good) .
= 0.9*0.72 + 0.75*0.18 + 0.55*0.1
= **0.838**