



## Artificial and Computational Intelligence

### Assignment 2 - Spinning the Bayes Net

- Date of Posting: **10/01/2021**
- Deadline: **23/01/2021**
- Weightage: 12%

Ravichandran Ashwin is one of the most successful test bowlers from India claiming more than 350 international wickets. He has been spearheading the spin attack for the Indian test team since his debut in November 2011 and is expected to make a dash to 400 wickets in the upcoming test series with New Zealand. However, some exciting new spinning prospects have also staked their claim for the test team.

As a selector you are aware about non subcontinent pitches being non-spin friendly which reduces the number of slots for spinners in the team. Being an ex-player, you also know how important toss is in test matches since it dictates whether a team will bat first or not. The decision to bat or bowl first can have significant import on the final outcome of a match.

You have decided to construct a Bayesian Network to help you with your conundrum and help you with your decision on Ashwin's selection for the upcoming tour.

Attached excel contains information on all test matches played by India since Ashwin's debut in 2011. Use given variables (in image) as nodes for your Bayesian Network (Please note that below image provides no information on conditionality between variables).



### **Questions:**

- 1) Create a function to calculate prior probability of any given variable. The function should read in an array and output a dictionary of prior probability of each possible outcome.

ex 2 :

```
{'won': 0.5529411764705883,  
'lost': 0.25882352941176473,  
'draw': 0.18823529411764706}
```

*[3M Weightage]*



- 2) Create a function to calculate conditional probability. The function should read in multiple arrays and calculate the posterior probability of the last array wrt to previous arrays. For example, if you pass arrays “Location” and “Ashwin Playing” the output should be

```
[[ 'home', 'Y', 0.xx ],  
 [ 'home', 'N', 0.xx ],  
 [ 'away', 'Y', 0.xx ],  
 [ 'away', 'N', 0.xx ]]
```

```
Ex : [['N', 'lost', 0.46666666666666667],  
      ['N', 'won', 0.3333333333333333],  
      ['N', 'draw', 0.2],  
      ['Y', 'won', 0.6],  
      ['Y', 'lost', 0.21428571428571427],  
      ['Y', 'draw', 0.18571428571428572]]
```

*[3M Weightage]*

- 3) Use the functions created above and python’s pomegranate library to define conditionality between variables to create Bayesian Network. Refer this excellent tutorial on how to use pomegranate to create Bayesian Networks.  
[https://github.com/jmschrei/pomegranate/blob/master/tutorials/B\\_Model\\_Tutorial\\_4\\_Bayesian\\_Networks.ipynb](https://github.com/jmschrei/pomegranate/blob/master/tutorials/B_Model_Tutorial_4_Bayesian_Networks.ipynb)

*[4M Weightage]*

- 4) Use the Bayesian Network model created in (3) to calculate the probability of:
- India winning, batting 2<sup>nd</sup>, Ashwin playing
  - India winning, batting 2<sup>nd</sup>, Ashwin not playing
  - India losing, batting 2<sup>nd</sup>, Ashwin playing
  - India losing, batting 2<sup>nd</sup>, Ashwin not playing

*[2M Weightage – 0.5\*4]*

**NOTE:**

- You are provided with a python notebook template which stipulates the structure of code. You are free to add as many as code cells as needed. Use well intended python code!
- Please keep your work (code, documentation) confidential. If your code is found to be plagiarized, you will be penalized severely. Parties involved in the copy will be considered equal partners and will be penalized.
- All probability values need to be calculated using the data provided. Any other assumption need to be clearly mentioned with explanation.

**\*\*\* ALL THE BEST \*\*\***