CS F407 Artificial Intelligence: Assignment

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Abstract

There is one assignment with a credit of 20 marks. Two alternatives are offered to choose one from. The purpose is three-fold

1. Making you work for an elective course to ritually maintain the decorum and "standards".
2. Making evaluation and grading not tougher than your reciprocal effort.
3. Teaching some hands-on AI those students who are willing to learn.

The "expected outcome" is a significant addition to your understanding of *Rational AI*, and bringing into your consciousness the fact that applications of computers henceforth will be more than just coding.

1 Option 1: Average Branching Factor of 8-Puzzle

You need to run a Monte-Carlo Simulation on any (or all, or some) of the 8-puzzle solvers implemented by anyone (including my programs that I have uploaded) in any programming language. This means generating (solvable, plausible) instances of 8-puzzle initial states, running the solver(s), collecting information about the height and/or size of the tree/graph searched, the number of nodes, maybe all pathlengths or some averages or min-max-mean-median-mode statistics, whatever abcxyz, and then arrive at the estimation of an average branching factor b such that, given n as the number of nodes generated and m the maximum depth reached, then

$$n \approx kb^{d+1}$$

with the constant k satisfying

$$0 \leq \epsilon \leq 1 \leq 1 + \epsilon < 2$$

If you are confident of your estimation being sharp, just send me that. Else send a full justification with the experimental setup described precisely, so that I should not have doubts about the result being mechanically biased by naive or uncontrolled simulation parameters. I will run a simulation myself to see the correlations.

2 Option 2: The Sharp Peak in WalkSAT Run-Time

See [Russell and Norvig, 2010, Figure 7.19]. I want you to obtain a sharper figure than this for 3SAT. Run a simulation on a wide range of n (number of variables) and for each n the m (the number of clauses) should be in the range $[3n, 3n+1, ..., 5n]$. Use the DIMACS format for the instances (this is said for *your* convenience) that you generate. Again, if you are confident of your estimations and the figure being sharp, just send me that. Else send a full justification with the experimental setup described precisely, so that I should not have doubts about the result being mechanically biased by naive or uncontrolled simulation parameters. I will run a simulation myself to see the correlations.

3 The Submission Procedure

Whatever you think is appropriate to send as proof of your work and performance, send it to rsj@goa.bits-pilani.ac.in by Saturday 27 April 2019 Morning 0900 hrs (9 am) with the subject line either `ASGN-PZL` or `ASGN-3SAT` depending on your choice of the two options above, **from your BITS mail id**. On Monday morning, I will tell you on bits mail and on the lms your marks. If you need to defend something (that means your submission fetched low marks) in order to get some more marks from me, swarm my chamber after that. The fights must end by 1700 hrs (5 pm) Monday 29 April 2019.

References

[Russell and Norvig, 2010] Russell, S. and Norvig, P. (2010). *Artificial Intelligence: A Modern Approach*. Prentice Hall Series in Artificial Intelligence. Prentice Hall, 3 edition.