STAT2003/STAT3102 ICA (4 March 2014)

Feedback

Much of this assessment was straightforward, although the final parts of both questions required some thought. Marks were lost due to a lack of understanding of basic ideas and from not thinking clearly (this is not a course where one can always successfully regurgitate course material or previous questions). Please see me if, having read this note and attended the ICA lecture, you have any questions about the material covered in the assessment or in the course in general. For each question the average % mark is given at the end.

Specific comments (in addition to the ICA lecture and numerical solutions).

1. (a) This should have been easy as the example was similar to those covered in lectures and examples: it was, in the main, well answered. Most common errors were not specifying whether transient states were closed, periodic or ergodic. 88%

   (b) i. Most people did this correctly, but quite a few answers tried to overcomplicate the issue by performing calculations, which were not necessary at all - the answer can just be read from P_S. 78%

   ii. This was poorly answered. Many answers were based around complex conditional probabilities and quite a few confused the vector $\boldsymbol{p}^{(n)}$ with the matrix $\boldsymbol{P}^{(n)}$. The simplest approach is to read routes from the state space diagram. 37%

   iii. A straightforward invariant distribution calculation, greatly simplified if one realises that the answer can only involve states 1, 2 and 4. A surprising number of answers ignored the fact that the sum of the resulting probabilities must be 1. 69%

   iv. A standard question involving the situations in which an equilibrium distribution might exist. Mostly well answered, although the fact that for an equilibrium distribution to exist a chain must end up in a closed ergodic class was often ignored. 71%

   v. This was not well answered. Many people ignored what the question asks for and started calculating the number of steps until a closed class is reached. To reach state 3, one must be in states 3, 5 or 6: this simplifies the calculations considerably. 43%

(c) This was a new type of question and, considering that, the answers were good. The main shortfall was not making the new chain irreducible. 44%

2. (a) Not well answered. Just repeating the definition of a Markov chain, in words or formulae, was not enough. The key thing to notice is that each element in the chain is independent of any other and the Markov property follows. 42%

   (b) Most answers took the independence into account and were correct. 68%

   (c) Time was clearly beginning to be an issue here. Many answers attempted to find a correct pair of conditional probabilities but struggled with the calculations, which, due to independence, were not complicated. 32%

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