

Two hours

EXAM PAPER MUST NOT BE REMOVED FROM  
THE EXAM ROOM AND MUST BE RETURNED

**UNIVERSITY OF MANCHESTER  
SCHOOL OF COMPUTER SCIENCE**

Foundations of Machine Learning

Date: Monday 18th January 2016

Time: 14:00 - 16:00

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**Please answer ALL Questions provided**

**Section A should be answered in a separate answerbook.**

**Answer ALL Questions in Section B**

**Write your answers directly on the exam paper. Only answers written in the boxes on the exam paper will be marked.**

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This is a CLOSED book examination

The use of electronic calculators is permitted provided they are not programmable and do not store text

[PTO]

Section A

Answer *all* questions.

*All answers below can be stated briefly, and still gain full marks. Please try to state your answer briefly rather than writing down everything you know about the topic.*

1. Name two non-linear SVM kernels. For each, state an associated hyper-parameter, unique to that kernel, and what effect it has. (6 marks)
  
2. State one **disadvantage** for using **each** of the following models (3 marks)
  - Logistic regression*
  - K Nearest Neighbour rule*
  - Decision Tree using mutual information as splitting criterion*
  
3. State one example for each of the following: (3 marks)
  - wrapper method
  - filter method
  - embedded method
  
4. State 3 search strategies that are commonly used in feature selection. (3 marks)
  
5. I supply you with the following training data:

$x_1$	$x_2$	$x_3$	$y$
2	2	1	3
2	1	1	3
1	2	1	2
1	2	1	1
2	1	2	2
2	1	1	1

Given a test point  $\mathbf{x} = \{2, 2, 1\}$ , calculate the class probability distribution,  $p(y|\mathbf{x})$ , predicted by the Naive Bayes model. (6 marks)

Please state, in words AND mathematics, the assumption made by this model. (2 marks)

Draw the Bayesian network corresponding to this model. (2 marks)

# *Section B*

*This Section contains Multiple Choice Questions and is therefore restricted*