M1S: PROBABILITY AND STATISTICS I

INTRODUCTION

This course is concerned with developing mathematical concepts and techniques for modelling and analyzing situations involving uncertainty.

No previous exposure to ideas of Probability or Statistics will be assumed.

The following topics indicate the range of applications of the material to be studied. Some of these will feature in the course as examples or exercises.

Authorship	Who wrote the works of 'Shakespeare'?
Brewing	Dispersion properties of yeast cells in fluid.
Business	Investment, option pricing, futures.
Card Games and Gambling	Bridge, poker, roulette, lottery.
Coincidences	Does extra-sensory perception (ESP) exist?
Ecology	How many fish in a lake? Birds on an island?.
Epidemics	Spread of infectious diseases in a community.
Espionage	Information transmission. Codes.
Finance	How do stock/currency exchanges vary with time ?
Genetics	Transmission of inherited characteristics, identification of genes responsible for disease.
Health	Efficient screening for diseases.
Health Policy	Assessing health costs.
History	Estimating numbers of deaths of genocide.
Law	Assessing evidence for or against guilt.
Market Research	Surveys of consumer buying behaviour.
Medical Diagnosis	Using symptoms to predict disease state.
Military	Assessing the accuracy of the enemy's aim.
Oil Industry	Prospecting, analyzing seismic surveys.
Pharmacology	Comparing effects of different drugs, determining dose regimens.
Politics	Opinion polls.
Population Growth	Locusts; Nuclear chain reactions; World population.
Quality control	Rates of defective items; Process design.
Queues	Hospitals, supermarkets, computer tasks.
Radioactive decay	Rate of emission of particles.
Reliability	Risks of failure of complex systems.
Social Science	Surveys of social conditions and attitudes, measuring association.
Sport	Tennis, baseball, football.
Telecommunications	Imaging, face recognition.

Assessment of uncertainty in such real-life problems is a complex issue which requires a rigorous mathematical treatment. This course will develop the probability framework in which questions of practical interest can be posed and resolved.

Recommended Reading: There are a large number of introductory texts on Probability and Statistics in the library. The material covered in each book tends to be similar.

Two books recommended for this course are:

A First Course in Probability, by S. Ross.

Introduction to probability and mathematical statistics, by L. J. Bain and M. Engelhardt.

Course WWW page:

http://www.ma.ic.ac.uk/~das01/M1S/

which will (hopefully) contain sketch lecture summaries, links to course handouts, and other links.

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