

Understanding Risk with Mathematics (MATS2950)

Introduction

Uncertainty and risk is everywhere. Every single day, you have to assess a multitude of possibilities and then make a judgement on the likelihood and cost of them happening. For example, you might be on your way to school but suddenly realize you have left your phone at home: at that point, you need to decide whether you should return home to retrieve your phone. What are the costs of returning to get your phone? For example, you might end up arriving late to school and get in trouble. What are the benefits? What are the likelihoods of each scenario happening?

Understanding risk is especially important in the finance sector – a wrong move might cost millions of dollars. Also, Insurance companies allow you to pass on your risk to them for a fee – but what fee is appropriate? How do you charge for something that may or may not happen?

In this course, we will study risk through the key tool of probability. On the way, we will see the importance of probability and also the dangers of misusing probability. Through this we will address the problem of how much an insurance company should charge for its services.

The instructor, Dr Jonathan Tsai, obtained his PhD in Mathematics from the University of Cambridge in 2008. Since then he has worked at all levels of mathematics including cutting-edge research and high school mathematics education.

Programme Type / Level

Across Domains and Interdisciplinary Course (Level 2) ([Token-required](#))

Instructor(s)

Dr Tsai Hin Tung Jonathan

Pre-requisites

Students are expected to have some exposure to probability. Knowledge in conditional probability, independence and Bayes theorem is helpful but not essential

Target Participants



- S1 – S3 HKAGE student members only in 2018-19 academic year
- Class size: 30

Medium of Instruction



English with English handouts

Certificate



E-Certificate will be awarded to participants who have:

- ❖ Attended **at least 3 sessions AND**
- ❖ Completed all assignments with **satisfactory performance** in the course tests

Intended Learning Outcomes



Upon completion of the programme, participants should be able to:

1. perform calculations in probability and conditional probability;
2. identify situations where conditional probability should be used;
3. apply Bayes' theorem to real-life situations;

4. calculate the correct premium that insurance companies should charge;
5. understand the limitations of using probability.

Application Procedure



This programme is Programmes with No Screening

There are no screening questions, written test or other screening methods for this type of programmes.

- Student members can select up to 5 programmes from a list of selection. Applicants have to state the priority when submitting the application. (1st priority, 2nd priority, 3rd priority, etc). 1 token is required for each programme (For programme list, please refer to the issue 15 of Gifted Gateway ([click here](#)));
 - Application can only be submitted once. Once it is submitted, the priority and the programme selection cannot be changed;
 - If a student member removes a programme from the application before the application deadline by withdrawal, the choice priority will remain unchanged. (For example: A student has selected three programmes and removed the programme with the 1st priority from the application. The choices of 2nd and 3rd priority will remain unchanged with no promotion in priority.);
 - We will select the students based on the student's choice of priorities and a randomly generated selection by the computer system. If there is time clash between the applied programme and other programmes with offer, HKAGE will consider if the application will be accepted;
 - Priority will be given to student members who have not completed the applied programmes;
 - Student members should avoid applying programmes with time clash;
- The decision of HKAGE on the result of selection should be final.

Application Deadline

25 Jul 2019 12:00 n.n.

Application Result
Release Date

2 Aug 2019

If student members withdraw from the programme after the Application Deadline, the token will be deducted.

Schedule



Session	Date	Time	Venue (HKAGE)
1	2 Nov	9:00 a.m. – 12:00 n.n.	Room 403
2	9 Nov		
CANCELLED	16 Nov		
CANCELLED	23 Nov		
Make-up	24 Dec		
Make-up	27 Dec		

Remarks: For any assessment to be held in the programme, no make-up will be arranged.

Sample Examples for the Programme

1) You play a game with a friend where a 6-sided dice is rolled. You get lucky and roll four consecutive sixes. Your friend says: "No one is that lucky! The next number that you roll must be less likely to be a six".

Is your friend right or wrong? Explain your reasoning.

2) A parent really wants his son to get into a top university. He wants his son to get into a top boarding school which has a 40% acceptance rate to Oxford or Cambridge. If he gets in, what of the following could be actual the chance he will get into Oxford or Cambridge?

(a) 100% (b) 70% (c) 40% (d) 20% (e) 0%. Choose all that apply.

3) A person is on trial for insurance fraud. His house was burgled 3 times in 9 months. It is alleged that he staged the burglary each time to claim money from the insurer. The probability of a house being burgled is calculated to be 0.01 and hence, for a house to be burgled 3 times, the probability is $0.01 \times 0.01 \times 0.01 = 0.000001$. Is this correct? Explain your reasoning.

4) How does an insurance company set the premium for a new customer who buys car insurance? How might the premium be adjusted after 3 years?

Enquiries



For enquiries, please contact us at 3940 0101 after language selection, press "1".