



Department of Statistics and Actuarial Science

# BACHELOR OF SCIENCE

Major in *Statistics*

Major in *Risk Management*

Major in *Decision Analytics*



<https://saasweb.hku.hk/>

A theme underlying all 3 majors is...

STATISTICS

*addresses an important human endeavour...*

a desire to make “sense” of *observations*



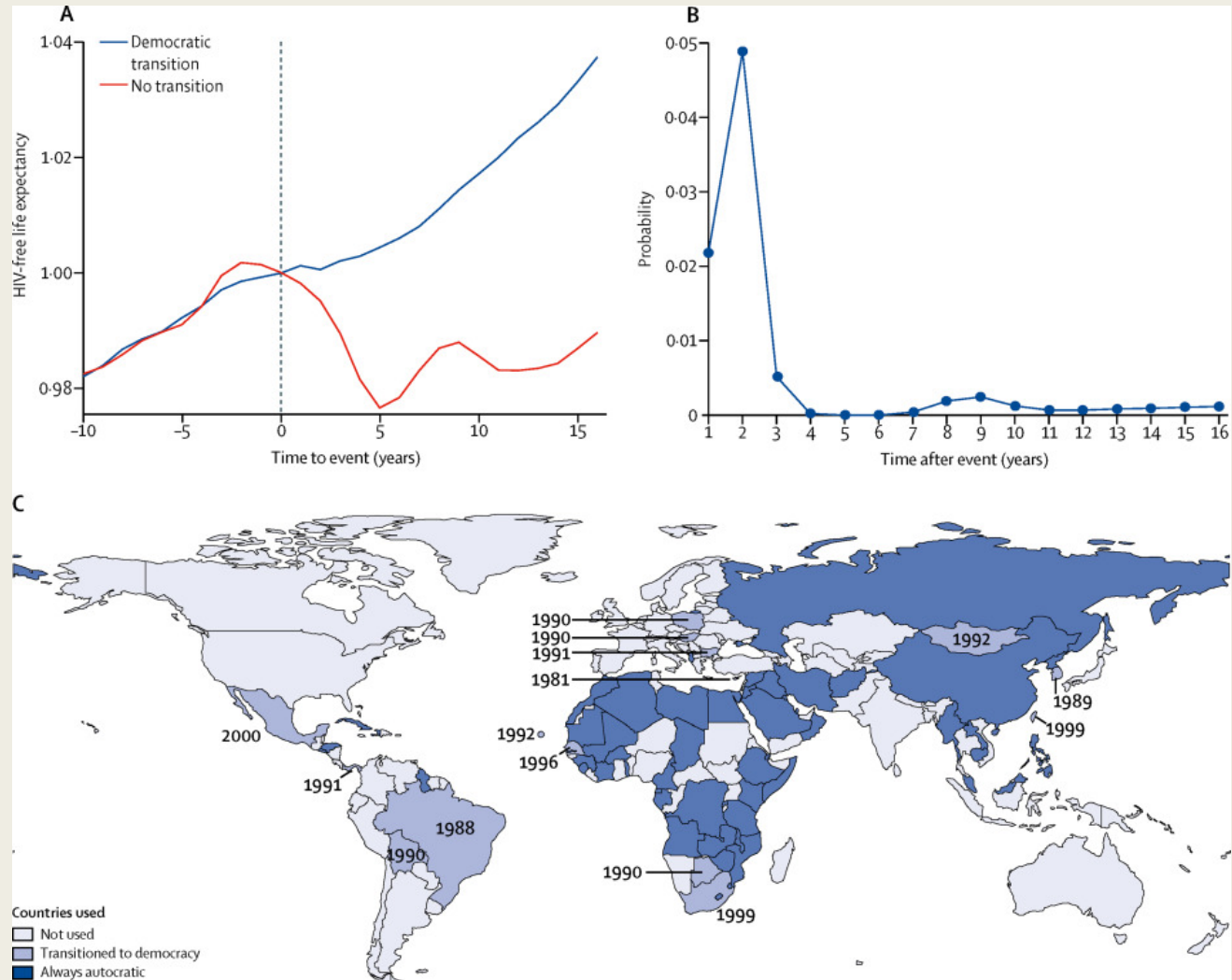
STATISTICAL  
REASONING



## EXAMPLES OF APPLICATIONS

# THE LANCET

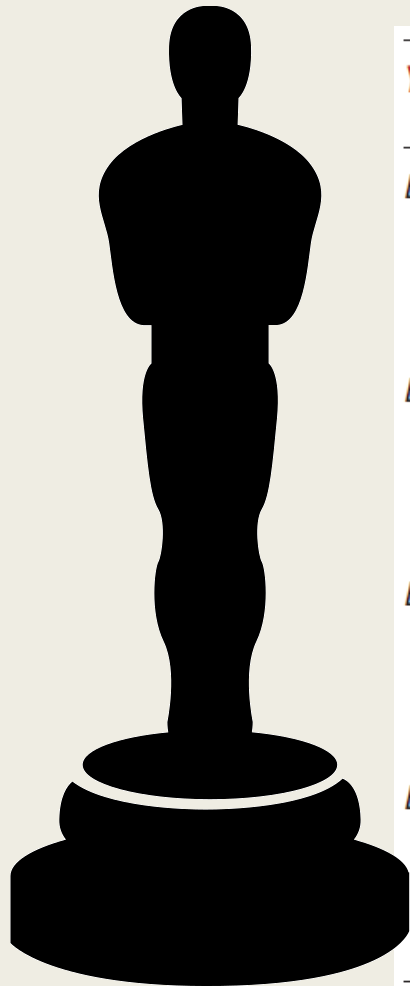
The relationships between democratic experience, adult health, and cause-specific mortality in 170 countries between 1980 and 2016: an observational analysis



## Predicting Oscar winners

significance

december2007



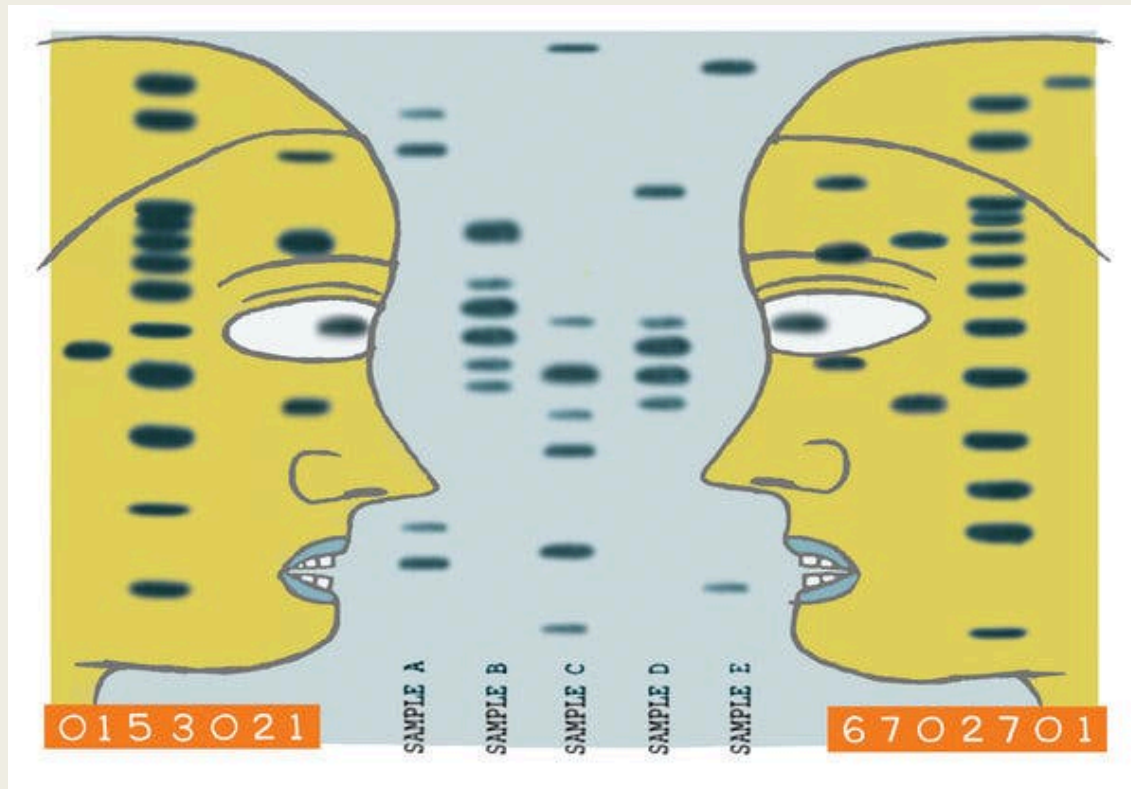
<i>Year</i>	<i>Winner</i>	<i>Probability</i>	<i>Predicted</i>	<i>Probability</i>
<i>Best Picture</i>				
1948	<i>Hamlet</i>	0.01	<i>Johnny Belinda</i>	0.97
2004	<i>Million Dollar Baby</i>	0.01	<i>The Aviator</i>	0.97
1981	<i>Chariots of Fire</i>	0.01	<i>Reds</i>	0.88
<i>Best Director</i>				
2000	Steven Soderbergh	0.01	Ang Lee	0.95
1968	Carol Reed	0.02	Anthony Harvey	0.97
1972	Bob Fosse	0.03	Francis Ford Coppola	0.96
<i>Best Actor</i>				
2001	Denzel Washington	0.00	Russell Crowe	0.99
1968	Cliff Robertson	0.00	Peter O'Toole	0.88
1974	Art Carney	0.02	Jack Nicholson	0.87
<i>Best Actress</i>				
2002	Nicole Kidman	0.07	Renée Zellweger	0.90
1985	Geraldine Page	0.07	Whoopi Goldberg	0.70
1950	Judy Holliday	0.09	Gloria Swanson	0.76

## EXAMPLES OF APPLICATIONS

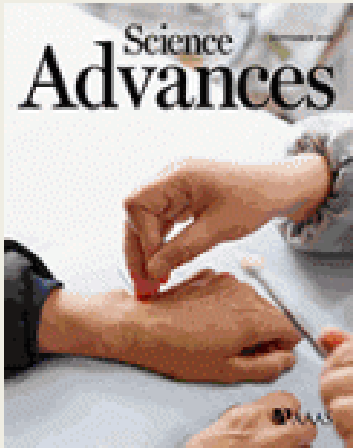
### The New York Times

**One Twin Committed the Crime — but Which One?  
A New DNA Test Can Finger the Culprit**

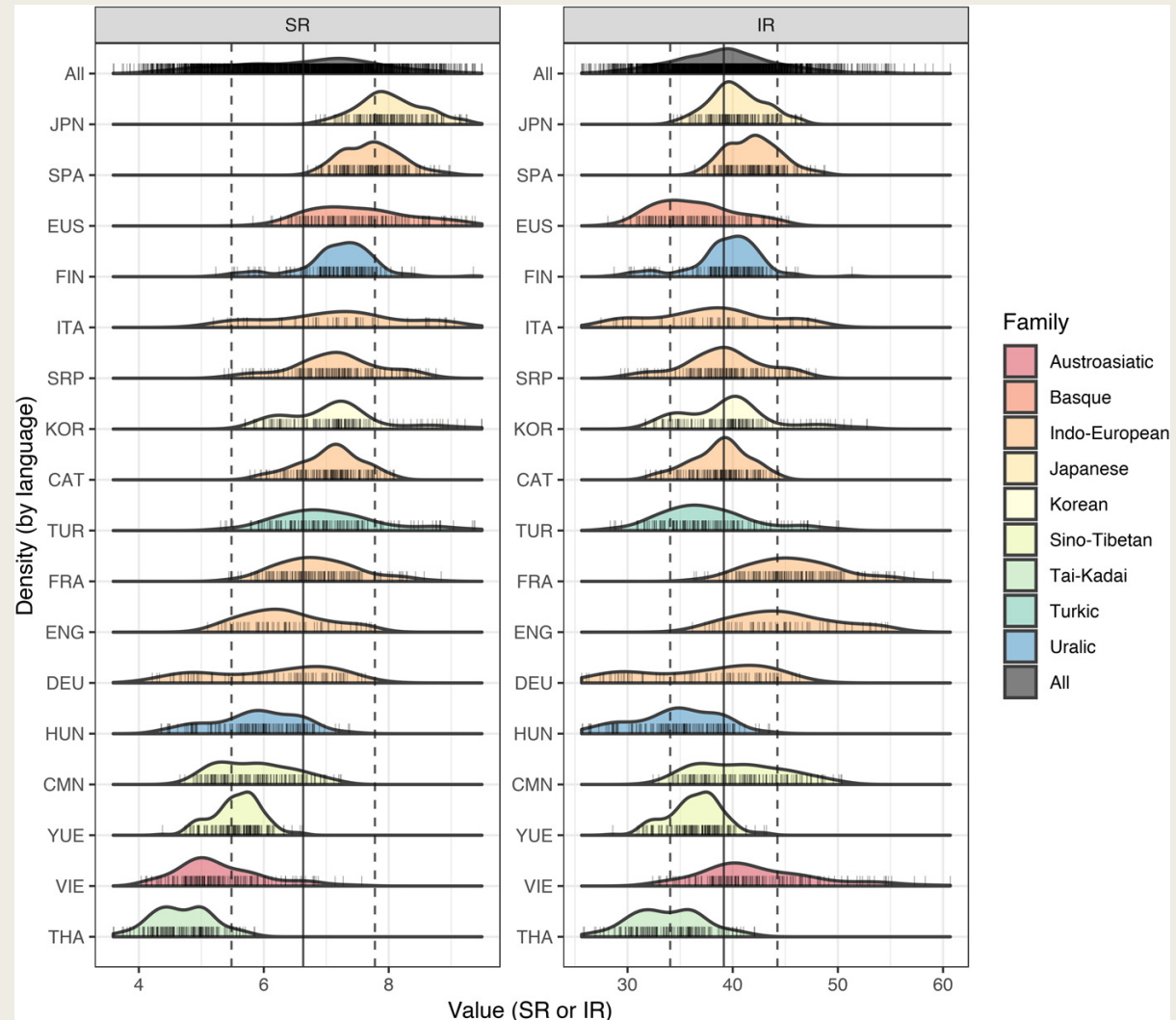
A handful of criminal prosecutions have stalled because DNA tests cannot distinguish between suspects who are twins. Then scientists decided to create one.



# EXAMPLES OF APPLICATIONS



Different languages, similar encoding efficiency:  
Comparable information rates across the human  
communicative niche





# EXAMPLES OF APPLICATIONS



Journal of Archaeological Science

Volume 49, September 2014, Pages 249-254



Focus article

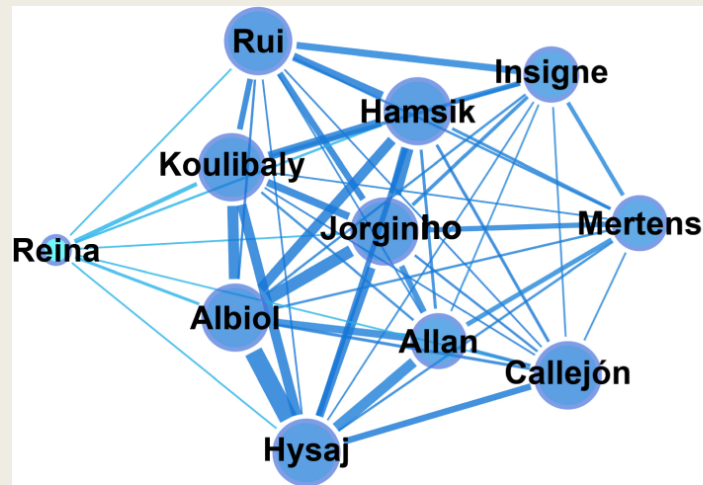
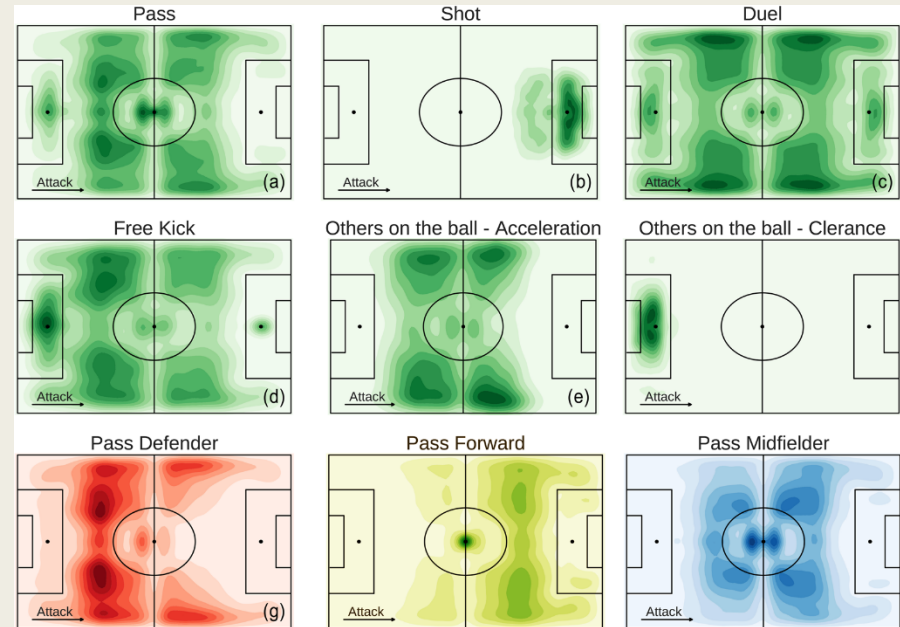
## Computer vision, archaeological classification and China's terracotta warriors



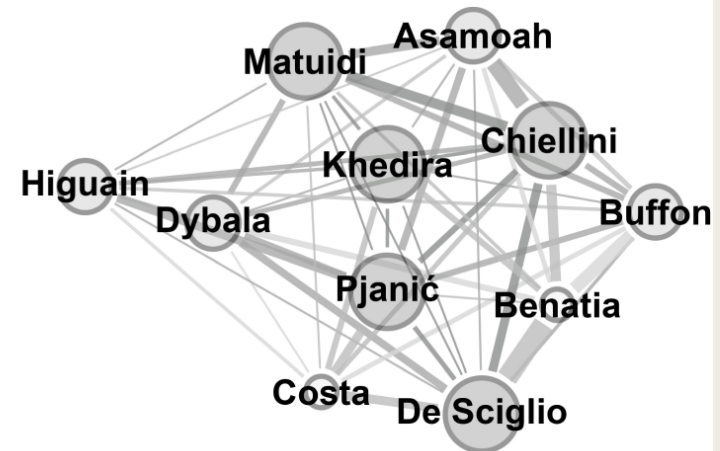
# EXAMPLES OF APPLICATIONS

## SCIENTIFIC DATA 110110 0111101 11011110 011101101

A public data set of spatio-temporal match events in soccer competitions



**Napoli (0)**  
connectivity = 14.74



**Juventus (1)**  
connectivity = 19.89



## EXAMPLES OF APPLICATIONS

### The Guardian

Aliens may not exist – but that's good news for our survival

A new study suggests that we could well be on our own in the universe. Yet loneliness might have its advantages



# EXAMPLES OF APPLICATIONS



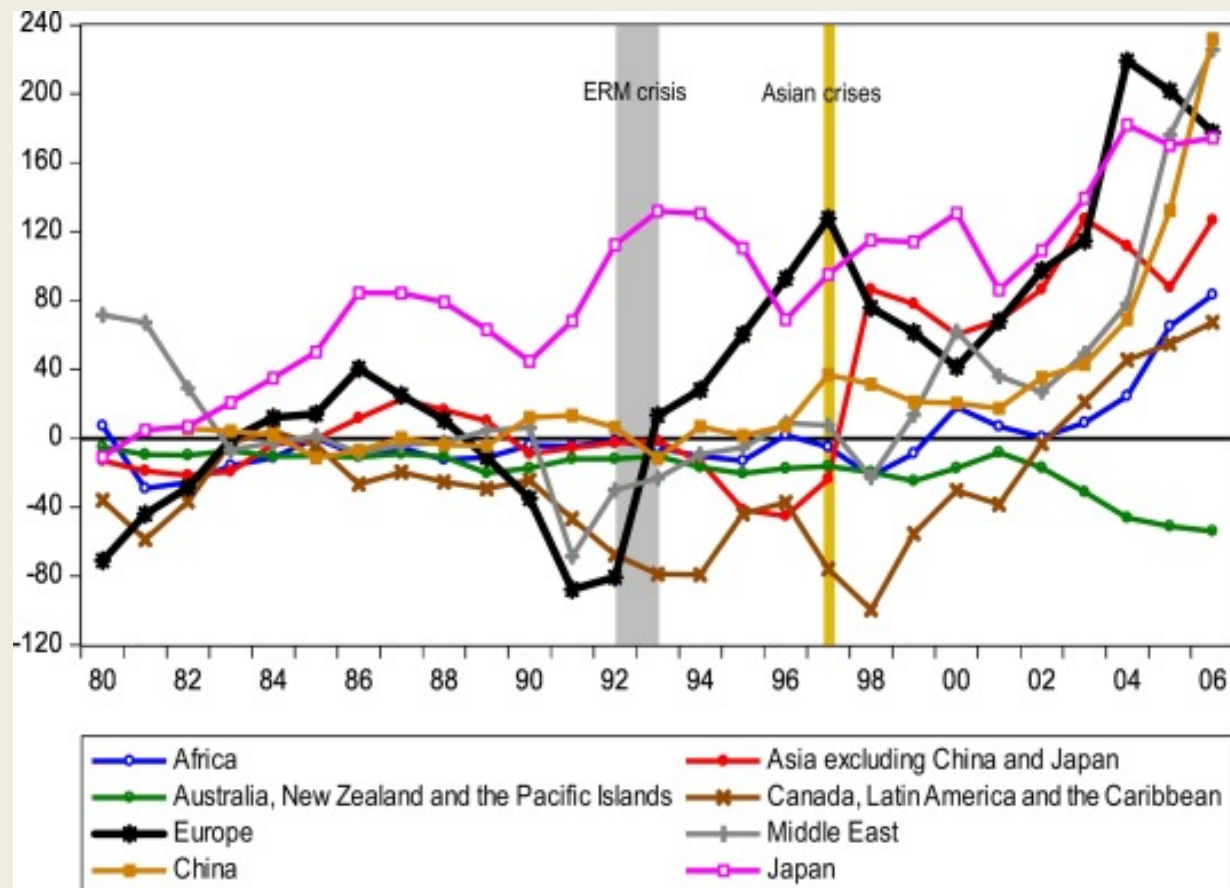
International Review of Financial Analysis

Volume 69, May 2020, 101377



**The run-up to the global financial crisis:**

**A longer historical view of financial liberalization, capital inflows, and asset bubbles**



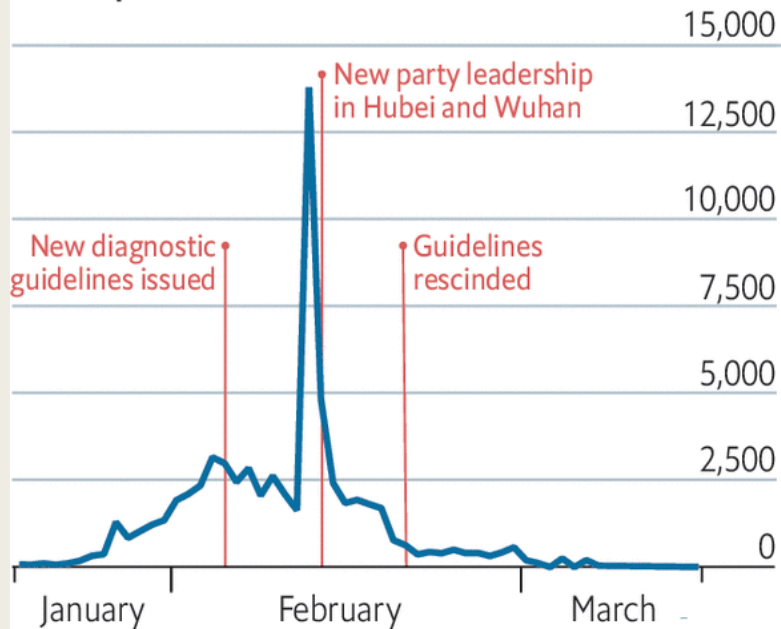
# EXAMPLES OF APPLICATIONS

## The Economist

### Some days are more equal than others?

China, covid-19, 2020, new confirmed cases, by day

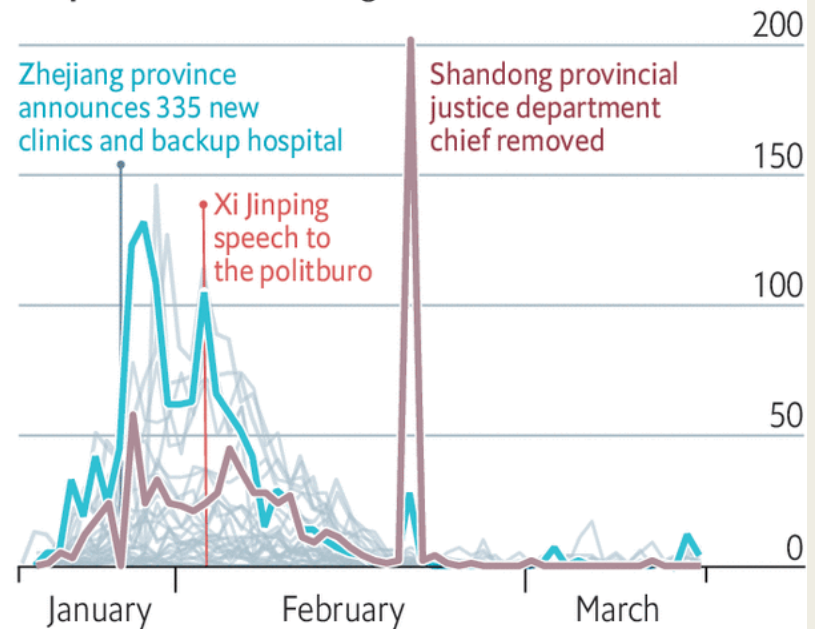
#### Hubei province



Source: China's National Health Commission

The Economist

#### All provinces, excluding Hubei



## Major in **DECISION ANALYTICS**

### DECISION ANALYTICS

*addresses decisions for modern human ...*

a desire to make sense of “big data”

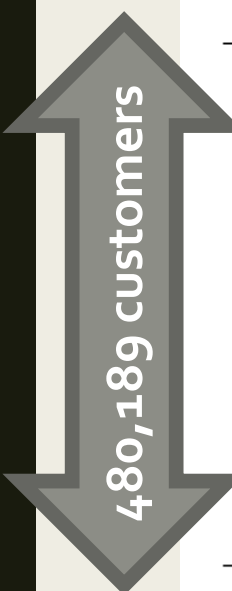


## EXAMPLES OF APPLICATIONS

# Netflix movie-rating challenge

17,770 movies

Dirty Dancing  
Meet the Parents  
Top Gun  
The Sixth Sense  
Catch Me If You Can  
The Royal Tenenbaums  
Con Air  
Big Fish  
The Matrix  
A Few Good Men



Customer 1	•	•	•	•	4	•	•	•	•	•
Customer 2	•	•	3	•	•	•	3	•	•	3
Customer 3	•	2	•	4	•	•	•	•	2	•
Customer 4	3	•	•	•	•	•	•	•	•	•
Customer 5	5	5	•	•	4	•	•	•	•	•
Customer 6	•	•	•	•	•	2	4	•	•	•
Customer 7	•	•	5	•	•	•	•	3	•	•
Customer 8	•	•	•	•	•	2	•	•	•	3

How to predict missing ratings of customers?

## EXAMPLES OF APPLICATIONS

... involved many statistical techniques, of which most important is SVD (Singular Value Decomposition)

# Netflix Prize

[Home](#)
[Rules](#)
[Leaderboard](#)
[Update](#)

## Leaderboard

Showing Test Score. [Click here to show quiz score](#)

Rank	Team Name	Best Test Score	% Improvement	Best Submit Time
Grand Prize - RMSE = 0.8567 - Winning Team: BellKor's Pragmatic Chaos				
1	<a href="#">BellKor's Pragmatic Chaos</a>	0.8567	10.06	2009-07-26 18:18:28
2	<a href="#">The Ensemble</a>	0.8567	<a href="#">10.06</a>	<a href="#">2009-07-26</a> 18:38:22
3	<a href="#">Grand Prize Team</a>	0.8582	9.90	2009-07-10 21:24:40
4	<a href="#">Opera Solutions and Vandelay United</a>	0.8588	9.84	2009-07-10 01:12:31
5	<a href="#">Vandelay Industries !</a>	0.8591	9.81	2009-07-10 00:32:20
6	<a href="#">PragmaticTheory</a>	0.8594	9.77	2009-06-24 12:06:56
7	<a href="#">BellKor in BigChaos</a>	0.8601	9.70	2009-05-13 08:14:09
8	<a href="#">Dace</a>	0.8612	9.59	2009-07-24 17:18:43
9	<a href="#">Feeds2</a>	0.8622	9.48	2009-07-12 13:11:51
10	<a href="#">BigChaos</a>	0.8623	9.47	2009-04-07 12:33:59
11	<a href="#">Opera Solutions</a>	0.8623	9.47	2009-07-24 00:34:07
12	<a href="#">BellKor</a>	0.8624	9.46	2009-07-26 17:19:11



# *the* Oxford Scientist

ChatGPT: A milestone in natural language processing

[The Oxford Scientist](#) [January 9, 2023](#)



*ChatGPT is a language model that can be accessed by anyone online. We asked it to tell us about itself and why it's so significant in the field of AI.*

# EXAMPLES OF APPLICATIONS

## Step 1

**Collect demonstration data, and train a supervised policy.**

A prompt is sampled from our prompt dataset.

A labeler demonstrates the desired output behavior.

This data is used to fine-tune GPT-3 with supervised learning.

## Step 2

**Collect comparison data, and train a reward model.**

A prompt and several model outputs are sampled.

A labeler ranks the outputs from best to worst.

This data is used to train our reward model.



## Step 3

**Optimize a policy against the reward model using reinforcement learning.**

A new prompt is sampled from the dataset.

The policy generates an output.

The reward model calculates a reward for the output.

The reward is used to update the policy using PPO.



Leverages Proximal Policy Optimization (PPO)

A policy is, a strategy that an agent uses in pursuit of goals

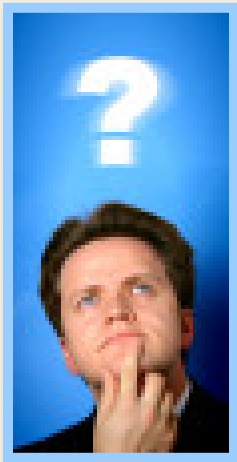
Kullback-Leibler penalty for SFT model to avoid overfitting

Major in **RISK MANAGEMENT**

RISK MANAGEMENT

a desire to make sense of, & manage, “risk”

- **Risk Management** is a logical and systematic methodology of studying the risks involved in any activity or process.



Identifying risk

Analyzing risk

Treating risk

Monitoring risk

- **Major Objectives of Risk Management:**

- To *avoid* or *minimize* potential losses
- To *help managers* make best use of their available resources

# Professional Qualification

## ■ Financial Risk Manager (FRM) Certificate Exam

- awarded by Global Association of Risk Professionals (GARP) <http://www.garp.com> (founded in 1996)

## ■ Professional Risk Managers (PRM) Exam

- awarded by Professional Risk Managers' International Association (PRMIA) <http://www.prmia.org>

## ■ Chartered Enterprise Risk Actuary (CERA)

- awarded by CERA Global Association <https://ceraglobal.org>



# U.S. News Best Jobs Rankings 2022

<https://money.usnews.com/careers/best-jobs/rankings>

## Statistician

- #3 in Best Business Jobs
- #7 in Best STEM Jobs
- #8 in 100 Best Jobs

## Data Scientist

- #3 in Best Technology Jobs
- #6 in 100 Best Jobs
- #6 in Best STEM Jobs

## Actuary

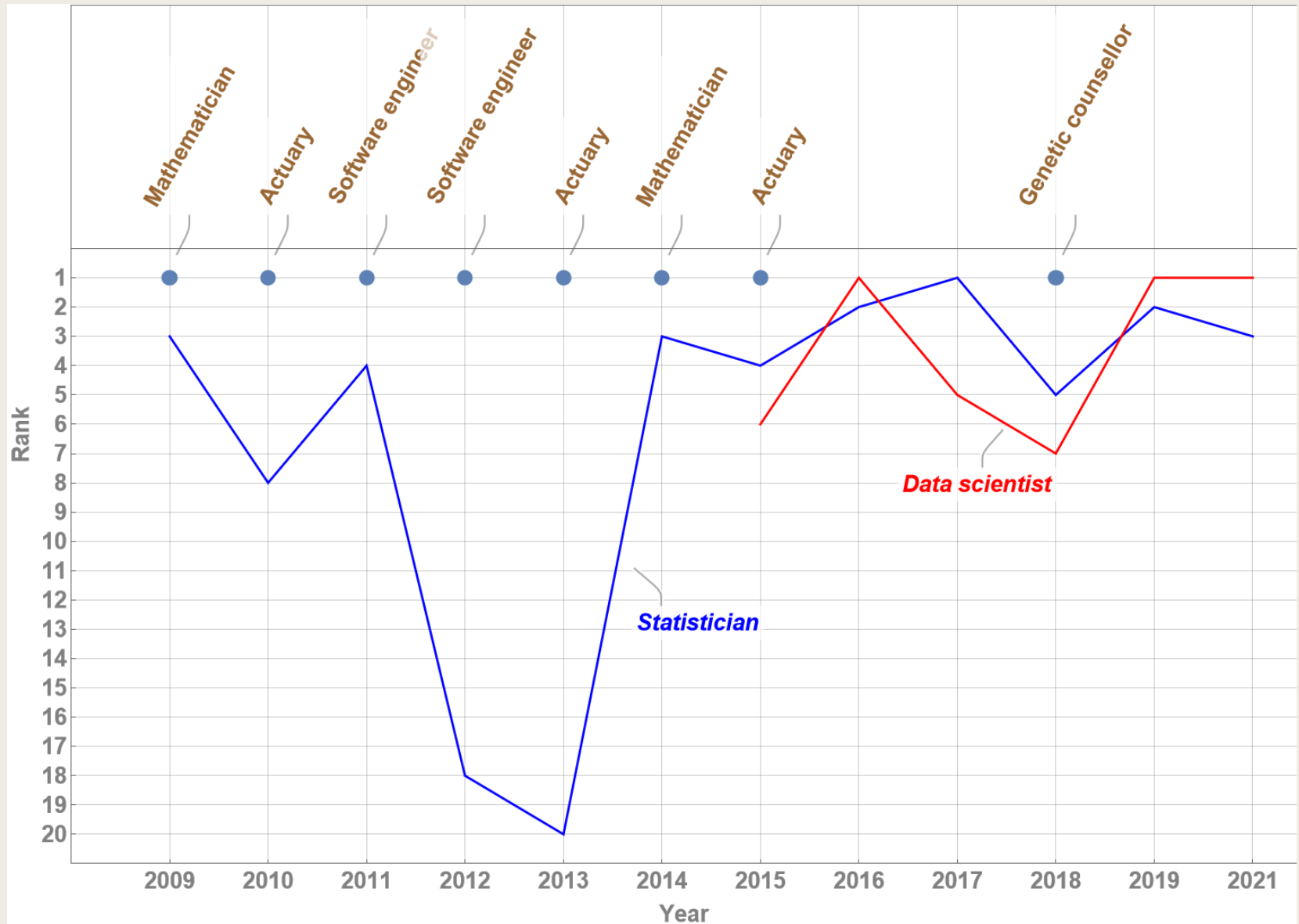
- #7 in Best Business Jobs
- #11 in Best STEM Jobs
- #20 in 100 Best Jobs
- #24 in Best Paying Jobs

## Management Analyst

- #6 in Best Business Jobs
- #17 in 100 Best Jobs

## Market Research Analyst

- #4 in Best Business Jobs
- #14 in 100 Best Jobs





# Top Low Stress Jobs That Pay Well in 2021 (*GoBankingRates*)

<https://www.gobankingrates.com/money/jobs/high-paying-careers-wont-kill/#6>

## 1. University Professor

**Median Salary:** \$80,790

Post-secondary teachers tend to enjoy flexible schedules. While some teach classes at night or on weekends, these professionals generally find their jobs rewarding and appreciate the opportunity to share their expertise with students, according to the BLS. CareerCast ranked university professor as one of the careers with the lowest stress level in 2019, the most recent year the job website compiled its list.

In addition to teaching, university professors advise students and conduct research in their fields. While most positions require you to hold a Ph.D., a [graduate degree](#) might be sufficient for community colleges, according to the BLS.

## 5. Statistician

**Median Salary:** \$92,270

If you're good with numbers, you might want to consider a career as a statistician. These individuals collect data to help solve problems in a variety of industries and generally work full time. They could need to work overtime to meet a deadline or fill a last-minute request for information.

Job growth for this profession is currently high, as an increasing number of businesses are using statistical analysis to make decisions, according to the BLS. Most opportunities require candidates to hold master's degrees in statistics, mathematics or similar fields.

## 9. Mathematician

**Median Salary:** \$110,860

Mathematicians utilize techniques to solve problems in business, engineering and other fields. U.S. News ranked mathematician as the sixth-best job in business in 2021 and noted that mathematicians enjoy a variety of professional opportunities.

To qualify for a mathematics position, you'll need at least a bachelor's degree in math. Some positions require further education.

## 10. Actuary

**Median Salary:** \$111,030

An actuary analyzes the financial costs of risks taken by businesses and clients. However, pursuing a career as an actuary involves little risk and plenty of rewards. South Dakota State University touts the profession for its "high pay, low stress, good job security" and contribution in solving important problems.

Actuaries commonly hold bachelor's degrees in math or related analytical fields. Additional certification is needed to achieve full professional status.

# Top 10 Well Paid Jobs With Low Stress

Posted by [Glassdoor Team](#) *Career Advice Experts* Last Updated 20 August 2021

<https://www.glassdoor.co.uk/blog/well-paid-jobs-low-stress/>

## 10 well paid jobs that are relatively low stress:

1. Statistician
2. Dental Hygienist
3. Librarian

### 1. Statistician

**Glassdoor Average Salary:** £39,473

Statisticians use mathematical techniques to interpret data to draw parallels or to come to conclusions. Statisticians can work across various sectors, including public, private and academic. Freelance statisticians - those who are self-employed and work on a project basis, are in high demand.

Using logical thinking, combined with mathematical techniques to draw facts from raw data, statisticians can work solo or in a collaborative team. Having this option means, being a statistician is a relatively low-stress job.

An interest in mathematics and the ability to understand complex mathematical functions is important. When hiring, employers look for candidates who have a degree in maths or a related subject.

# Difference in focus between the 3 majors

- **Decision Analytics** –

*heavy emphasis on both **STATISTICS** and **COMPUTER SCIENCE***

- **Risk Management** –

*courses focus primarily on business-related topics: e.g.*

*investment, insurance, finance, banking, etc.*

- **Statistics** –

*courses cover wide range of topics with emphasis on*

*“METHODS”, their applications, and underlying theory.*

A few practical reasons for majoring in

## *Statistics / Risk Management / Decision Analytics*

- Flexibility of the programme enables you to tailor-make your course of study.
- Develop your interest at your own pace.
- Pre-mature commitment not required.

# Mathematical background adequate?

Students must have level 2 or above in

- HKDSE Extended Module 1 or 2 of Mathematics or equivalent

Otherwise, strongly advised to take

MATH1011 University Mathematics I

in Semester 1.

# What do we need from your Mathematics?

- Set notation and theory
- Functions (*incl.* limits, continuity)
- Sequences, series
- Basic calculus (*incl.* partial differentiation, double integration)
- Vectors, matrices (basic operations)



# New changes to curricula

## Major in *Statistics*

At least 36 credits from Lists A and B, among which at least **18** ~~42~~ credits from List A:

### List A

STAT3602	Statistical inference (6)	
STAT3603	Stochastic processes (6)	[previous title: Probability modelling (6)]
STAT3620	Modern nonparametric statistics (6)	
STAT3621	Statistical data analysis (6)	
STAT3655	Survival analysis (6)	
STAT4601	Time-series analysis (6)	

### List B

STAT3604	Design and analysis of experiments (6)	
<b>STAT3605</b>	<b>Quality control and management (6)</b>	<b>To remove from 2022-23 and thereafter</b>
STAT3606	Business logistics (6)	
STAT3607	Statistics in clinical medicine and bio-medical research (6)	
STAT3608	Statistical genetics (6)	
STAT3612	Statistical machine learning (6)	
STAT3613	Marketing analytics (6)	
STAT3617	Sample survey methods (6)	
STAT4610	Bayesian learning (6)	

# New changes to curricula

## Major in *Decision Analytics*

Disciplinary Electives (12 credits)		
<i>At least 12 credits selected from the following courses:</i>		
COMP3250	Design and analysis of algorithms (6)	
COMP3270	Artificial intelligence (6)	
COMP3323	Advanced database systems (6)	
COMP3407	Scientific computing (6)	
MATH3408	Computational methods and differential equations with applications (6)	To remove from 2022-23 and thereafter
MATH3600	Discrete mathematics (6)	To remove from 2022-23 and thereafter
MATH3604	Numerical analysis (6)	To remove from 2022-23 and thereafter
MATH3904	Operations research I (6)	To remove from 2022-23 and thereafter
STAT3620	Modern nonparametric statistics (6)	
STAT3621	Statistical data analysis (6)	
STAT3622	Data visualization (6)	
STAT3655	Survival analysis (6)	
STAT4011	Natural language processing	To add from 2017-18 to 2022-23 and thereafter
STAT4023	Medical image analysis	To add from 2017-18 to 2022-23 and thereafter
STAT4601	Time-series analysis (6)	
STAT4602	Multivariate data analysis (6)	
STAT4610	Bayesian learning (6)	

# A useful introductory-level course

## ■ STAT2604

### *Introduction to R programming and elementary data analysis*

- *introduction to statistical programming language R*
- *basic programming skills in R with examples and applications in elementary statistical analysis*
- *management of different data types: input/output, manipulation, transformation*
- *random sampling, descriptive data analysis*
- *production of professional summary reports with high-quality graphs*

# Reminder

- plan ahead
  - major/minor, overseas exchange, internship, research project
  - career vs further study
- watch out for pre-requisites of individual courses
- courses **CANNOT** be double-counted to fulfill different majors/minors
  - (exception for double major in Science: SCNC1111 & SCNC1112 & up to 12 credits of compulsory courses REQUIRED by both Science majors can be double-counted)
- consult course selection advisors if necessary

# Support from University and Department

- **HKU : Centre of Development and Resources for Students**
  - *NETmatch, NETjobs, JIIS (Joint Institutions Job Info. System)*
- **Department : Internship / Job Online Application System**

The screenshot shows a web browser window with the URL <https://apps.saas.hku.hk/internship/index.php>. The page header features the Department of Statistics & Actuarial Science logo and a group photo of students. The main content area displays user information and application status.

**Department of Statistics & Actuarial Science**  
**Internship / Job Online-application System**

**User Information:**

- UID: 2008000001
- Name: Ugrad Test\_Student1
- Last Status: Available working period: From: 2019-04-10 To: 2019-11-30
- Major: Statistics
- E-mail: @hku.hk
- Contact Phone: +852 12345678

**Application Status:**

- CAP Profile: (Cover letter & CV) [Upload Profile]
- PPP Score: Letter & CV Submitted: 0.0, Case Analysis & Presentation: 0.0, Mock Interview: 0.0

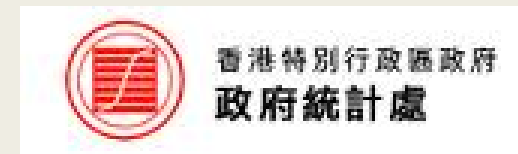
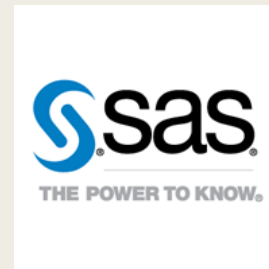
**Current Job List** • Application History • Past Internship Jobs •

Records shown 1 - 16 of 16

Jobtype	Company Name	Job Title / Job Description / Form	Closing date	Action
Full-time_ST&AS	EFA	Portfolio Investment Analyst(ASAP) (GRAD/Internship) IR 1452	2019-08-11	Submit completed application via email at <a href="mailto:careers@efadrin.com">careers@efadrin.com</a>
Internship_AS&ST	AIA Group	Actuarial Internship Programme (Jan-Jun 2020) AW 1526	2019-08-31	Submit completed application via email at <a href="mailto:Rachel-yh.chan@aia.com">Rachel-yh.chan@aia.com</a>
Internship_AS&ST	Blue, trade name of Aviva Life Insurance Co Ltd	Actuarial Intern (Jan-Jun 2020) MY 1529	2019-08-31	Submit completed application via email at <a href="mailto:careers@blue.com.hk">careers@blue.com.hk</a>
Full-time_AS&ST	CIGNA	Contract Associate - Valuation (IFRS) (ASAP) JC 1629	2019-08-25	Submit completed application via email at <a href="mailto:sandy.lau@cigna.com">sandy.lau@cigna.com</a>
Full-time_AS&ST	YF Life Insurance International Ltd	Actuarial Analyst (GRAD/ASAP) VL 1643	2019-08-18	Submit completed application via email at <a href="mailto:recruit@yflife.com">recruit@yflife.com</a>

# Career Development Training

- Summer IT course:
  - *Essential IT skills (certificate course)*
- Career Advising Programme (CAP) to prepare students for:
  - *internships and job opportunities*
  - *advancing resume and interview skills*





# Besides career...

- Opportunity for further studies
  - Recently our graduates had pursued Masters and PhD studies in universities including Harvard, UC Berkeley, Yale, Stanford, Cambridge
- Scholarships/Awards
- Other learning opportunities

*(e.g. overseas exchange, mentorship, internship, research projects)*

# Contact Persons

- Co-ordinators & Course Selection Advisors
  - *Ke Zhu (Statistics)*
  - *Yuan Cao (Decision Analytics)*
  - *K P Wat (Risk Management)*
- Credit transfer
  - *Chen Wang*
- Internship
  - *Eric Li*
- Tel: 3917 2466
- Email: [ug\\_enquiry@saas.hku.hk](mailto:ug_enquiry@saas.hku.hk)



# QUESTION AND ANSWER

Our Homepage: [www.hku.hk/statistics](http://www.hku.hk/statistics)

