



Modern Statistics

Lecture 1: Introduction

Xiangyu Chang(常象宇)

Email: xiangyuchang@xjtu.edu.cn

Center for Intelligent Decision-Making and Machine Learning

School of Management

Xi'an Jiaotong University

Introduction



Professor

Center for Intelligent Decision-Making
and Machine Learning

Department of Information Systems and
Intelligent Business

School of Management

Address

Room #435, Main Building of
Management School
Xi'an Jiaotong University ([XJTU](#))
China

Email

xiangyuchang AT xjtu DOT edu DOT cn

Employment Experience

- 2018.12-2019.12, Visiting Associate Professor
Department of Industrial & Systems Engineering, University of Washington, Seattle.
- 2016.01-2016.02, Research Associate
Department of Mathematics, the City University of Hong Kong
- 2015.04-2016.04, Visiting Assistant Professor
Department of Business Statistics and Econometrics, Guanghua School of Management, Peking University

Education

- 2013-2014, Ph.D., Applied Math, XJTU, China
- 2010-2012, Visiting Ph.D. Student, Statistics, UC Berkeley, U.S.
- 2009-2010, Ph.D. Candidate, Applied Math, XJTU, China
- 2008-2009, M.S., Applied Math, XJTU, China
- 2003-2007, B.S., Applied Math, XJTU, China

Research Interests

- Statistics & Machine Learning
- Business Data Science

Course

<http://xiangyuchang.github.io/>



SOM-XJTU

Modern Statistics

Spring 2026

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Modern Statistics / Spring 2026

Updates

- New Lecture is up: Lecture 1 Introduction [[slides](#)] [[notes](#)]
- New course in Spring 2026 is coming soon.

Course Description

This course is to present the basic concepts and theories in modern statistics for undergraduate students at School of Management, Xi'an Jiaotong University.

Location: Main Building B-303

Date: 3rd&4th class, Tuesdays and 3rd&4th class, Thursdays, 03/03 - 04/23, 2026.

<https://som-course.github.io/stats-spring-2026/>

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Instructors



Xiangyu
Chang



Yinghui
Huang

Teaching Assistants



Yunxuan
Jiang

Course Introduction

- 32hrs, 1-8 week
- To learn the basic concept and theory of modern statistics
- To learn LaTeX for the scientific writing (HW)
- To practice Python or R for handling simulation problems

Outline

Part I: Probability Theory

- Probability
- Distribution
- Random Vector
- CLT and LLN

Part II: Statistical Inference

- Parametric Inference
- Hypothesis Testing
- Linear Model
- Non-parametric Inference

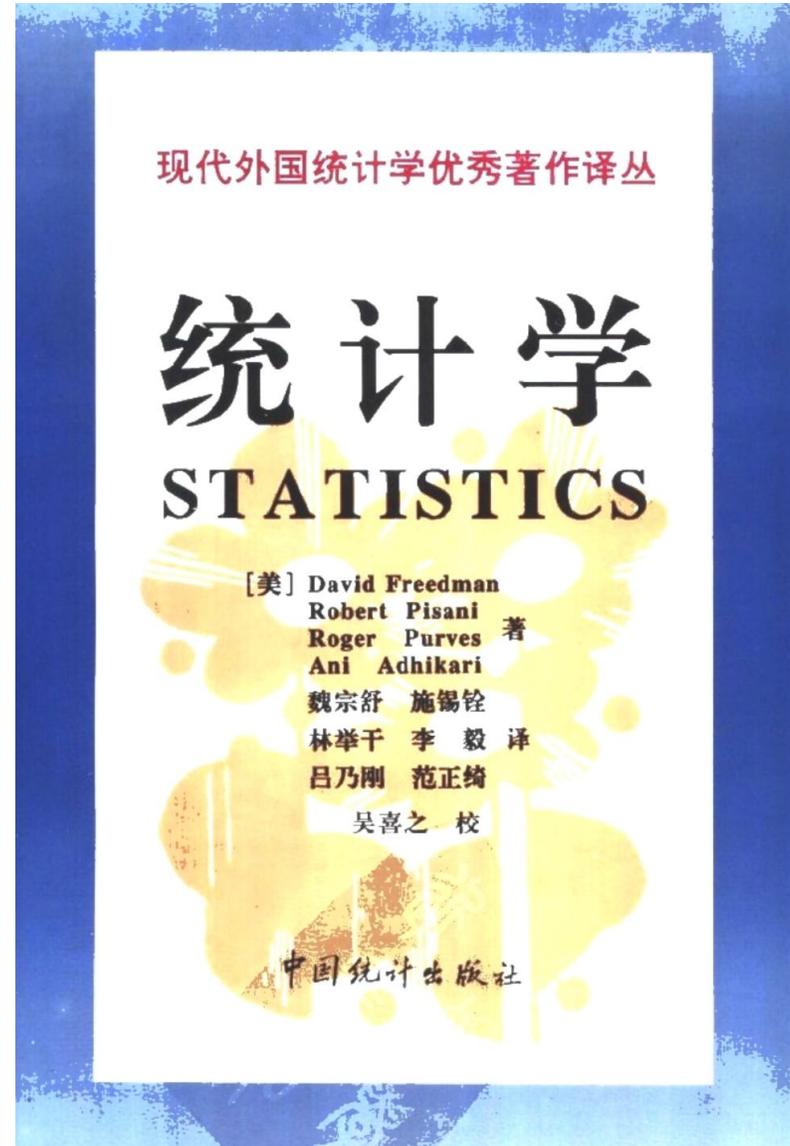
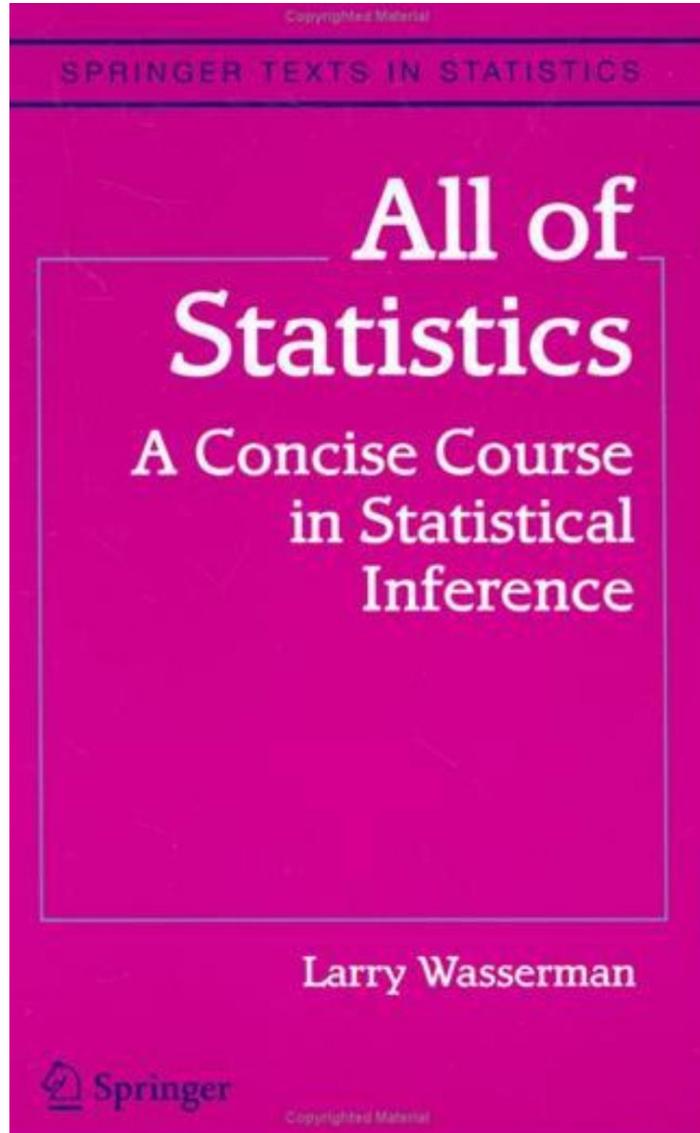
Part III: Advance Topics

- Bootstrap
- Stochastic Processing
- Cause Inference

Evaluation

- **50%HW + 50%Final= 100%**
- **Edit your Homeworks and Lectures by LaTeX!**

Text Books



Materials

Suggested Text Book

- [All of Statistics](#) by Larry Wasserman
- [Statistical Inference](#) by George Casella and Roger Berger
- [Statistics](#) by David Freedman, Robert Pisani, Roger Purves and Ani Adhikari. 译：魏宗舒，施锡铨，林举干，李毅，吕乃刚，范正绮。
- [Veridical Data Science](#) by Bin Yu and Rebecca L. Barter

R

- R
- [RStudio](#): Suggested IDE
- [R Cheatsheet](#)
- An introduction course of R by Xiangyu Chang: [Lecture 1](#), [Lecture 2](#), [Lecture 3](#), [Lecture 4](#), [Lecture 5](#), [Lecture 6](#)

Lectures

You can download the lectures here. We will try to upload lectures prior to their corresponding classes.



Lecture 1 Introduction

tl;dr: introduction lecture and probability

[\[slides\]](#) [\[notes\]](#)

Suggested Readings:

- [LaTeX Materials](#)
- Chapter 1 of AOS
- Chapter 13-15 of STATS



课后复习用, 每次课结束后公布



课前预习用, 每次课之前公布



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Assignments

You can download the assignments here. Also check out each assignment page for any additional info.

HW1: Master LaTeX Template





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HW1: Master LaTeX Template

Released on Tuesday 03/03/2026

Due Date: 2025-03-10 10:00

Download [[problems](#)] [[attachment](#)]

Late Policy

- Late homework will not be accepted.

This is a simple assignment.



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Schedule

EVENT	DATE	DESCRIPTION	COURSE MATERIAL
Lecture	03/03/2026 Tuesday	Lecture 1 Introduction [slides] [notes]	Suggested Readings: <ul style="list-style-type: none">◦ LaTeX Materials◦ Chapter 1 of AOS◦ Chapter 13-15 of STATS
Assignment	03/03/2026 Tuesday	HW1: Master LaTeX Template released!	[HW1: Master LaTeX Template]
Due	03/10/2026 10:00 Tuesday	Master LaTeX Template for Course Notes.	

LaTeX vs. Word

$$B_{t,\alpha} = \begin{cases} 1 - i\beta \operatorname{sgn}(t) \tan\left(\frac{\pi\alpha}{2}\right) & \text{if } \alpha \neq 1 \\ 1 + i\beta \operatorname{sgn}(t) \frac{2}{\pi} \log |t| & \text{if } \alpha = 1 \end{cases} \quad (2)$$

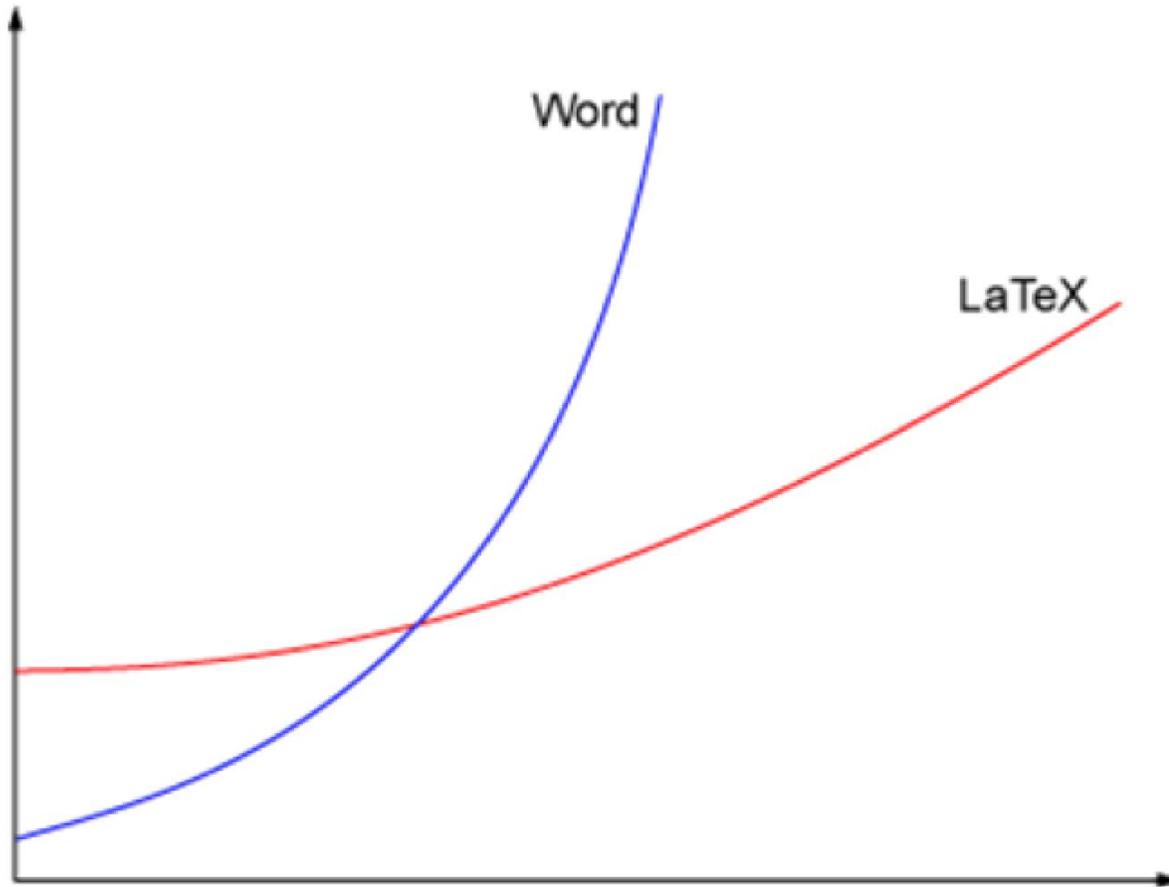
Where $-\infty < \delta < \boxed{-\infty, \gamma} > 0$, $0 < \alpha \leq 2$, $-1 \leq \beta \leq 1$. α ($0 < \alpha \leq 2$) is the characteristic exponent and sets the degree of impulsiveness of the distribution. The smaller the value of

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Latex文档格式均匀，黑白和行距均匀，数学格式排版美观

LaTeX vs. Word



Slides from Prof. Yao Wang

LaTeX vs. Word

- 如果只是排版一些简单的公文, word就够用了
- 如果需要排版高质量的包含大量数学公式的科技文档, 那就需要用LaTeX
- 用LaTeX时间越长, 就越会发现word的不足, 从而更爱LaTeX
- LaTeX开源, 可免费获得(这一条理由就足够)

LaTeX: Install

CTEX : HomePage

Homepage Download Search: Your hostname is 124.237.212.213

科技排版系统

CTEX项目

- CTEX开发小组+
- 套装: 更新记录 / 下载中心
 - v2.9.2.164
- 模版: 国科大学学位论文模版+

快速链接

- TeX@smth+ / TUG+ / CTAN+ / TUNA+

TeX发行版

- TeXLive (Unix/Linux/Windows)+
- MacTeX (Mac OSX)+
- MiKTeX (Windows)+

帮助文档

- 基本知识
- 在线文档
- CTeX FAQ (常见问题集)

新闻公告

- 2018.11.21
 - CTEX论坛因故自即日起无限期关闭。
- 2018.04.01
 - 新版国科大学学位论文模版ucasthesis正式发布, 欢迎使用:
<https://github.com/mohuangrui/ucasthesis>
- 2016.06.15
 - CTeX 套装主要下载新增中国科技大学开源镜像。感谢中国科大开源镜像提供帮助。
- 2016.06.13
 - CTeX 套装主要下载迁移至清华大学TUNA开源镜像, 新版CTeX套装也将通过TUNA开源镜像服务器发布。感谢TUNA提供帮助。
- ...更多新闻公告



[MacTeX](#) | [Donate](#) | [FAQ](#) | [Help](#) | [TUG](#)

The MacTeX-2021 Distribution

The current distribution is MacTeX-2021

This distribution requires Mac OS 10.14, Mojave, or higher and runs natively on Intel and Arm processors.

To download, click [MacTeX Download](#).

You can also install TeX Live 2021 using the TeX Live Unix Install Script.

This method supports MacOS 10.6, Snow Leopard, and higher and runs on Intel and Arm processors.

To download, click [Unix Download](#).

To Obtain Older Versions of MacTeX If You Are Running Mac OS 10.3 through 10.13, [click here](#)

To download the smaller BasicTeX, click [Smaller Download](#).

For suggestions on keeping TeX up to date, go to [Update Schedule](#).

The link below leads to other optional download packages:

[MacTeXtras: optional pieces](#)

LaTeX: Suggested IDE



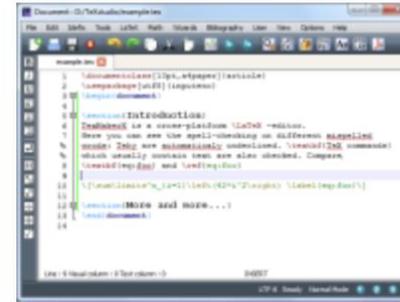
TeXstudio
LaTeX made comfortable

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Welcome to TeXstudio

TeXstudio is an integrated writing environment for creating LaTeX documents. Our goal is to make writing LaTeX as easy and comfortable as possible. Therefore TeXstudio has numerous features like syntax-highlighting, integrated viewer, reference checking, and various assistants. For more details see the [features](#).

TeXstudio is open-source and is available for all major operating systems.



Download now

TeXstudio 3.1.1 (OSX dmg)
for macOS 10.14 or higher

News

- 2021-02-22 A new bugfix release **TeXstudio 3.1.1** is available. Mainly it fixes crashes loading included files. see [changelog](#)
- 2021-02-17 A new bugfix release **TeXstudio 3.1.0** is available. Mainly changing the GUI language has been fixed. Furthermore a global TOC is available besides the structure view. It is work in progress and not (yet) automatically updated. Please give feedback. see [changelog](#)

LaTeX: How to Learn

Learn LaTeX in 30 minutes

In this guide, we hope to give you your first introduction to $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$. The guide does not require you to have any prior knowledge of $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$, but by the time you are finished, you will have written your first LaTeX document, and hopefully will have a good knowledge of some of the basic functions provided by $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$.

Contents

1. What is LaTeX?
2. Why learn LaTeX?
3. Writing your first piece of LaTeX
4. The preamble of a document
5. Adding a title, author and date
6. Adding comments
7. Bold, italics and underlining
8. Adding images
 - 8.1. Captions, labels and references
9. Creating lists in LaTeX
 - 9.1. Unordered lists
 - 9.2. Ordered lists

Use Overleaf!!!



Features & Benefits ▾

Templates

Plans & Pricing

Help ▾

Register

LaTeX, Evolved

The easy to use, online, collaborative LaTeX editor

The screenshot displays the Overleaf LaTeX editor interface. On the left, a file explorer shows a project named 'The Universe' with files 'main.tex', 'references.bib', 'figures', and 'sections'. The 'main.tex' file is selected, showing the following LaTeX source code:

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3
4 \title{The Universe}
5 \author{}
6 \date{May 2019}
7
8 \usepackage{natbib}
9 \usepackage{graphicx}
10
11 \begin{document}
12
13 \maketitle
14
15 \section{Introduction}
16 There is a theory which states that if ever anyone discovers exactly
17 what the Universe is for and why it is here, it will instantly
18 disappear and be replaced by something even more bizarre and
19 inexplicable.
20 There is another theory which states that this has already happened.
21
22 \begin{figure}[h!]
23 \centering
24 \includegraphics[scale=1.7]{figures/universe.jpg}
25 \caption{The Universe}
26 \label{fig:universe}
27 \end{figure}
28 \end{document}
```

On the right, the rendered PDF document is shown. It features a title page with 'The Universe' and 'May 2019'. The main content includes an 'Introduction' section with a paragraph of text and a figure of a galaxy. The figure is captioned 'Figure 1: The Universe'. The document concludes with a 'Conclusion' section.

AI is coming!!!

OpenAI 



Prism

Introducing a free, LaTeX-native workspace that integrates GPT-5.2 directly into scientific writing and collaboration.

[Explore Prism ↗](#)

<https://openai.com/prism/>

R

- R
- RStudio: Suggested IDE
- R Cheatsheet
- An introduction course of R by Xiangyu Chang: [Lecture 1](#), [Lecture 2](#), [Lecture 3](#), [Lecture 4](#), [Lecture 5](#), [Lecture 6](#)

Python

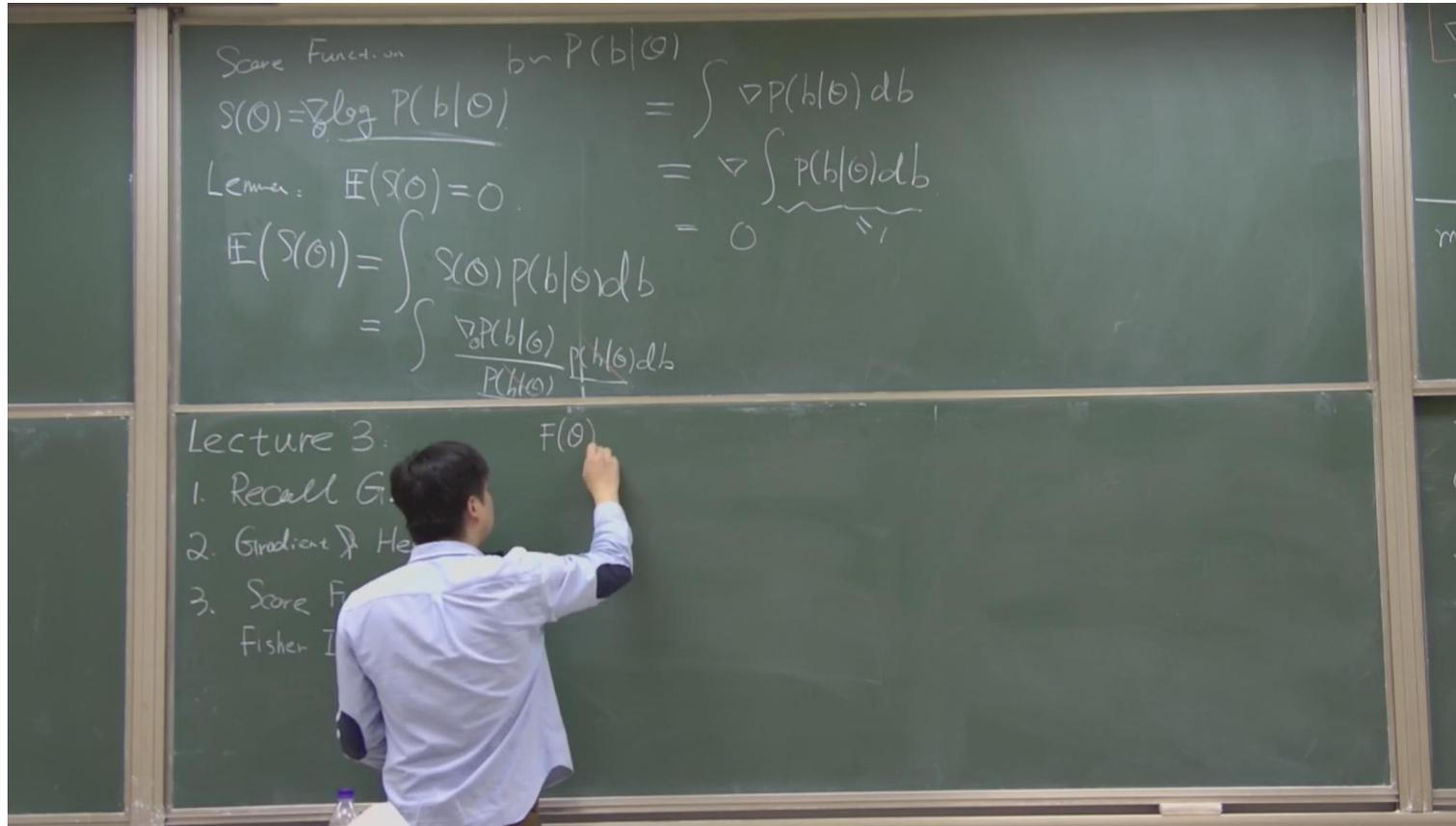
- Python for Beginners
- Python Cheatsheet
- Python 数据科学实践 by 常象宇, 曾智亿, 李春艳, 程茜著
- SciPy Tutorial
- NumPy Quickstart Tutorial

LaTeX

- MacTeX
- CTeX
- Learn LaTeX in 30 minutes
- Use Overleaf
- Prism by OpenAI
- TeXStudio: Suggested IDE



Teaching Style



- **Writing on the blackboard in English for main lectures, Speaking in Chinese**
- **Demostraing codes or visual examples by sildes**

Why?



观点 > 人民网评

人民网评：一流大学建设要坚持社会主义办学方向

2021-04-22 08:07 人民网-观点频道 作者：岚山



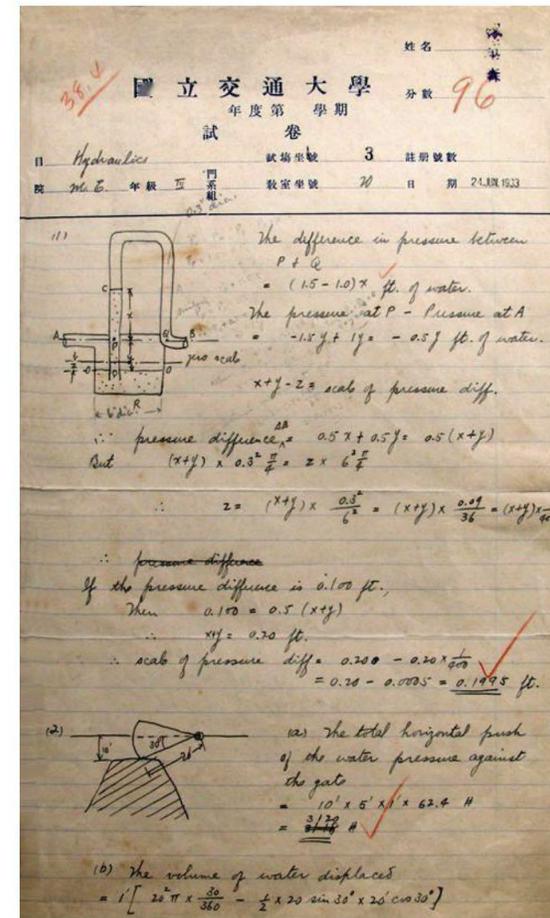
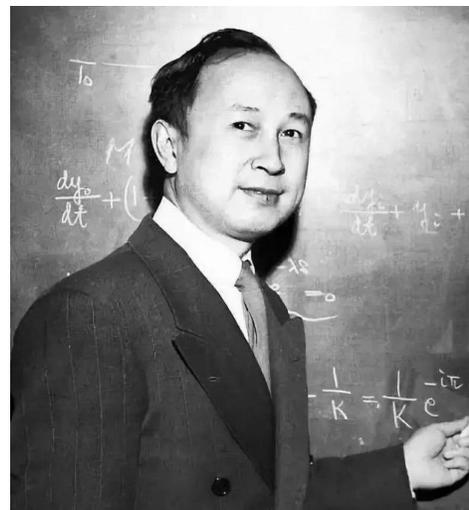
文章指出，教育兴则国家兴，教育强则国家强。在国家发展进程中办好高等教育，办出世界一流大学，首先要在体现中国特色上下功夫。



交通大学上海徐家汇校区老校门（1920年代）



1956年交通大学主体西迁西安庆典





Questions

What is Statistics?

Statistics is the science concerned with developing and studying methods for collecting, analyzing, interpreting and presenting empirical data. Statistics is a highly interdisciplinary field; research in statistics finds applicability in virtually all scientific fields and research questions in the various scientific fields motivate the development of new statistical methods and theory. In developing methods and studying the theory that underlies the methods statisticians draw on a variety of mathematical and computational tools.

Two fundamental ideas in the field of statistics are uncertainty and variation. There are many situations that we encounter in science (or more generally in life) in which the outcome is uncertain. In some cases the uncertainty is because the outcome in question is not determined yet (e.g., we may not know whether it will rain tomorrow) while in other cases the uncertainty is because although the outcome has been determined already we are not aware of it (e.g., we may not know whether we passed a particular exam).

Probability is a mathematical language used to discuss uncertain events and probability plays a key role in statistics. Any measurement or data collection effort is subject to a number of sources of variation. By this we mean that if the same measurement were repeated, then the answer would likely change. Statisticians attempt to understand and control (where possible) the sources of variation in any situation.

We encourage you to continue exploring our website to learn more about statistics, our academic programs, our students and faculty, as well as the cutting-edge research we are doing in the field.

统计是研究数据的收集，整理，分析和解释的科学。

统计是研究不确定性的科学手段。

数理统计是描述统计学的严谨的科学语言——例如利用概率论等语言严格描述。

数据科学——现代应用统计，用于解决实际应用问题的统计思想。

任正非：人工智能的本质是统计。





Спасибо

RUSSIAN



Gracias

SPANISH



Merci

FRENCH



CẢM ƠN

VIETNAMESE



谢谢

CHINESE



Thank
You!

ENGLISH



Ευχαριστώ

GREEK



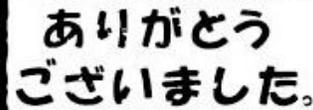
شكراً

ARABIC



고맙습니다

KOREAN



ありがとうございます
ございました。

JAPANESE