

# AUA CS108, Statistics, Fall 2020

## Lecture 01

Michael Poghosyan

26 Aug 2020

Welcome

# Welcome to the AUA Statistics Course

Welcome

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And Happy New Year Semester ! 😊

# Contents

- ▶ Syllabus highlights
- ▶ Intro to the Course
- ▶ Intro to the Descriptive Statistics

# Syllabus Highlights

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- ▶ Question: Do we need some supplementary R Labs?  
YESSS/No

## Syllabus Highlights, Cont'd

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$$Total = 0.25 \cdot (MT + Q) + 0.2 \cdot HW + 0.3 \cdot F$$

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- ▶ No late HWs (except some veeery special cases)

# Syllabus Highlights, Cont'd

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- ▶ Advice: Always ask your questions during lectures, ask your questions during OHs, solve HWs by yourself!

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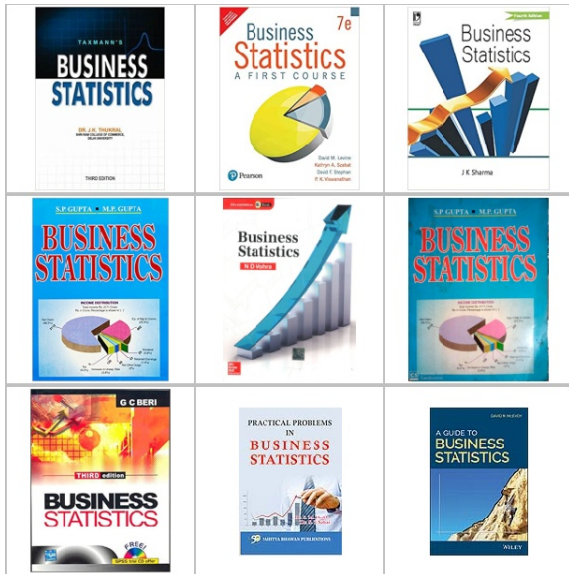
- ▶ No Grades Curving. ☹
- ▶ Advice: Always ask your questions during lectures, ask your questions during OHs, solve HWs by yourself!
- ▶ Advice: Run over the Probability Topics, especially, about RVs and Distributions

Questions?

# Where we use Statistics

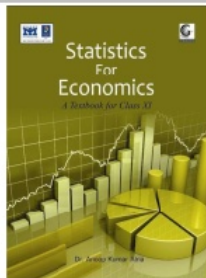
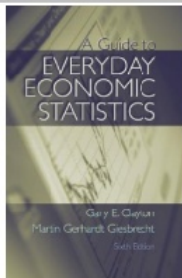
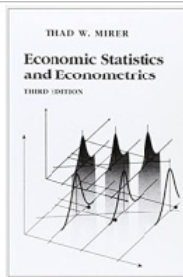
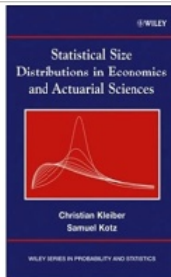
# Where we use Statistics

## Business



# Where we use Statistics

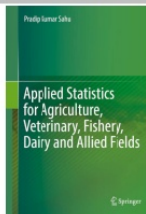
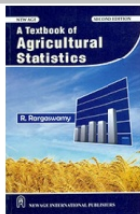
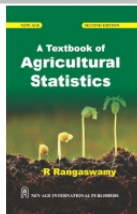
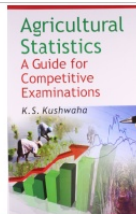
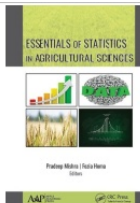
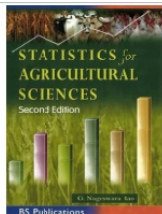
## Economics





# Where we use Statistics

## Agriculture



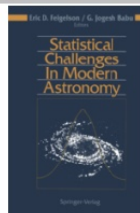
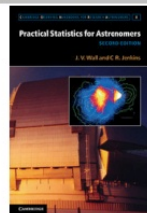
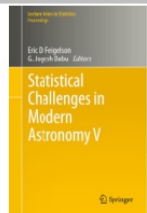
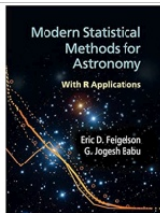
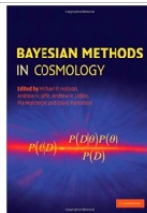
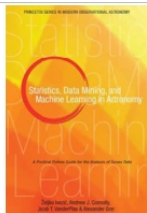
# Where we use Statistics

## Finance



# Where we use Statistics

## Astronomy



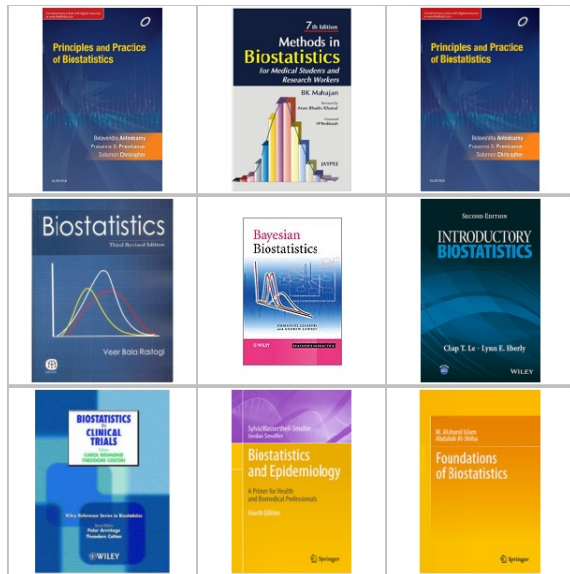
# Where we use Statistics

## Biology



# Where we use Statistics

## BioStatistics



# Where we use Statistics

## Psychology



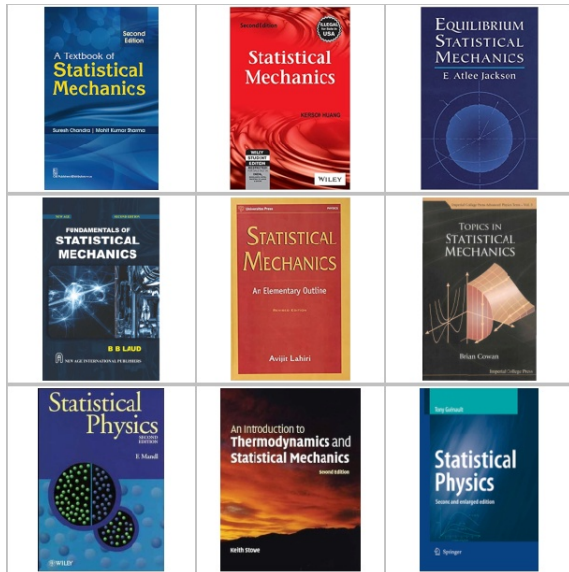
# Where we use Statistics

## Medicine

 <p>ALL YOU NEED TO UNDERSTAND AND APPLY TO MEDICAL STATISTICS</p> <p><b>OXFORD HANDBOOK OF MEDICAL STATISTICS</b></p> <p>Paul C. Hoare &amp; Philip J. Hepton</p> <p>Replete with worked examples, this book is essential reading for all medical students. It covers the major statistical methods used in medicine and gives clear examples of how to apply them.</p>	 <p><b>PRINCIPLES OF MEDICAL STATISTICS</b></p> <p>Alvan R. Feinstein, M.D.</p> <p>CHURCH &amp; HILL</p>	 <p>Michael J. Campbell David Machin Stephen J. Walters</p> <p><b>MEDICAL STATISTICS</b></p> <p>A TEXTBOOK FOR THE HEALTH SCIENCES</p> <p>FOURTH EDITION</p> <p>WILEY</p>
 <p><b>AN INTRODUCTION TO MEDICAL STATISTICS</b></p> <p>MARTIN BLAND</p>	 <p>FOURTH EDITION</p> <p><b>Medical Statistics from Scratch</b></p> <p>Principles and Practice for the Health Sciences</p> <p>David Machin</p> <p>WILEY-Blackwell</p>	 <p><b>MEDICAL STATISTICS</b></p> <p>A GUIDE TO PRINCIPLES, ANALYSIS AND CRITICAL APPRAISAL</p> <p>SECOND EDITION</p> <p>BELINDA BARTON JENNIFER PEAT</p> <p>WILEY-Blackwell</p> <p>BMJ Books</p>
 <p><b>MEDICAL STATISTICS MADE EASY</b></p> <p>M. Harris and G. Taylor</p>	 <p><b>Medical Statistics from A to Z</b></p> <p>A GUIDE FOR CLINICAL AND MEDICAL STUDENTS</p> <p>SECOND EDITION</p>	 <p>Series in Statistical Science</p> <p><b>Practical Statistics for Medical Research</b></p> <p>Second Edition</p> <p>Douglas G. Altman</p> <p>WILEY-Blackwell</p>

# Where we use Statistics

## Physics and Mechanics





# Where we use Statistics

## Marketing



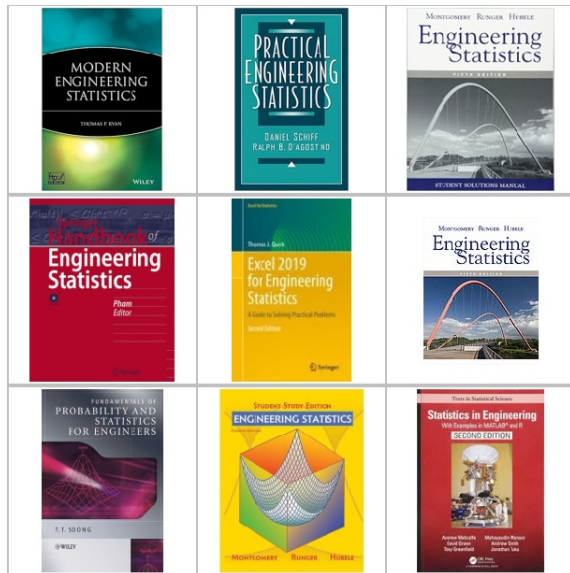
# Where we use Statistics

## Language Study

 <p>R. H. Baayen <b>Analyzing Linguistic Data</b> A Practical Introduction to Statistics using R</p>	 <p>DE GRUYTER TEXTBOOK Stefan Th. Gries <b>STATISTICS FOR LINGUISTICS WITH R</b> A PRACTICAL INTRODUCTION</p>	 <p>second edition <b>Essential Statistics for Applied Linguistics</b> Using R or JASP Hornsby Windsor Begg Loebe Selzer</p>
 <p><b>STATISTICS IN CORPUS LINGUISTICS</b> A Practical Guide VACLAV BREZINA</p>	 <p><b>Statistics in language studies</b> ANTHONY WOODS PAUL FLETCHER ARTHUR HUGHES Cambridge Textbooks in Linguistics</p>	 <p><b>Statistics for Linguists</b> A step-by-step guide for learners</p>
 <p>Guillaume Desagulier <b>Corpus Linguistics and Statistics with R</b> Introduction to Quantitative Methods in Linguistics Springer</p>	 <p><b>Statistics for Linguists</b> Crystal David Crystal and John Leech</p>	 <p><b>STATISTICS FOR LINGUISTS</b> AN INTRODUCTION USING R ROD WINTER R</p>

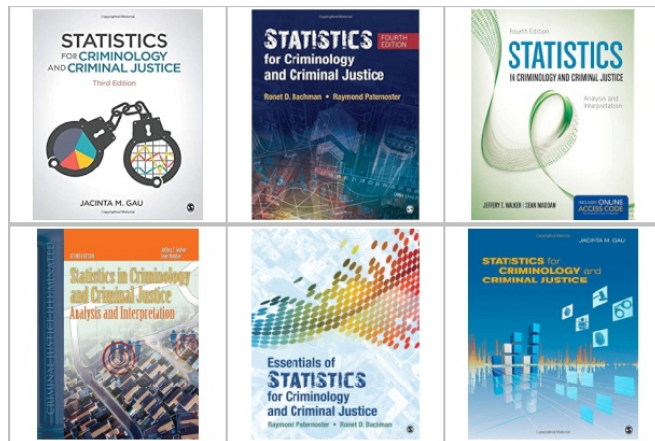
# Where we use Statistics

## Engineering



# Where we use Statistics

## Criminology



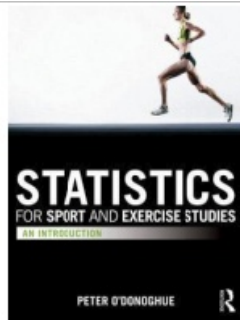
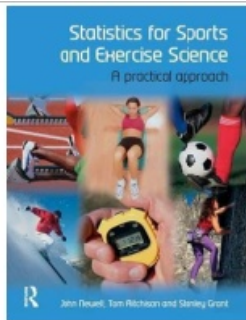
# Where we use Statistics

## Quality Control



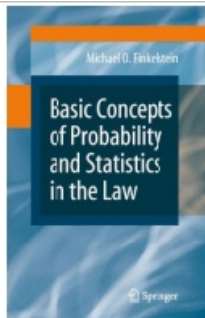
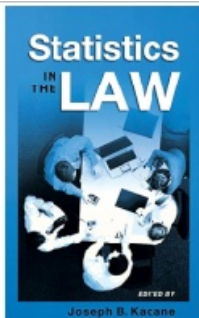
# Where we use Statistics

## Sport



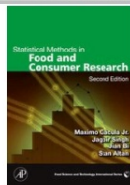
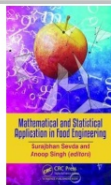
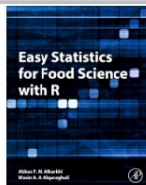
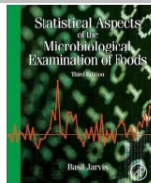
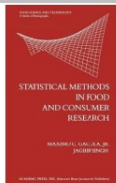
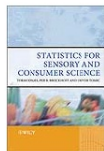
# Where we use Statistics

## Law



# Where we use Statistics

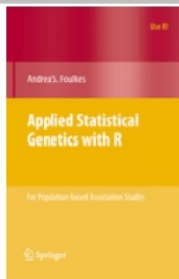
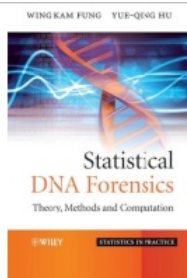
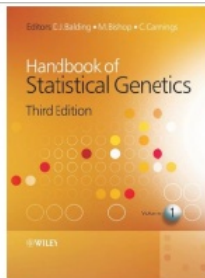
## Food





# Where we use Statistics

## Genetics



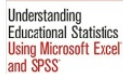
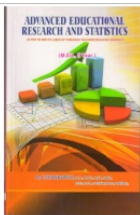
# Where we use Statistics

## Chemistry



## Where we use Statistics

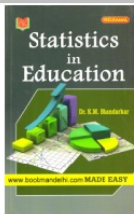
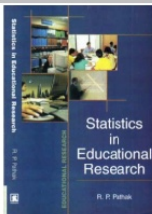
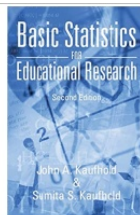
## Education



Marianne Lee Albarr



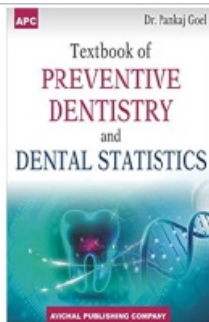
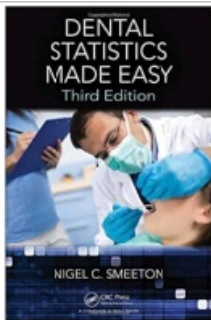
WILEY



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# Where we use Statistics

## Dentistry



# Where we use Statistics

Other...



# Where we use Statistics

## ML, Statistical Learning



# Where we use Statistics

**... and so on ...**

# About Statistics

- ▶ What is Statistics?



# About Statistics

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Statistics is an Art and Science of Learning from Data.

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## ► What is Statistics?

Statistics is an Art and Science of Learning from Data. In a little bit detailed form,

*Statistics is the Art and Science of **Collecting, Describing and Analyzing Data**, getting insight from Data.*

# About Statistics

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- ▶ in Probability Theory, we assume the Reality, the Truth, the Generating Process is given, and we get information about possible outcomes, possible observations.

# About Statistics

- ▶ What is the difference between Statistics and Probability?

In some sense, Statistics and Probability are inverse to each other:

- ▶ in Probability Theory, we assume the Reality, the Truth, the Generating Process is given, and we get information about possible outcomes, possible observations. Say,

We assume that the daily number of customers who are ordering Pepperoni Pizza at a particular pizzeria is following the  $Pois(15.2)$  Distribution (*the Reality, the Generating Process*), and we are interested in the Probability that the daily number will exceed 17 (*Probability of a possible outcome*)

# About Statistics

- ▶ in Statistics, we have Observations, we have Data, Outcomes, we want to learn about the Reality, about the Truth, about the Generating Process (from which that Data is obtained).

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We have Data about daily number of customers ordering Pepperoni Pizza at that pizzeria for some days:

10, 15, 14, 20, 7, 12, 10,

and we want to find out the Distribution of the r.v.

$X$  = the daily number of customers ordering PP at that pizzeria.



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And finally, to understand the everyday usage of Statistical language, graphs and estimates, say, about polls and salaries 😊

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- ▶ Estimate the number/proportion of defective production in a manufacturing plant;
- ▶ Show that there is a strong correlation between education and income;
- ▶ Determine whether it is true that, in average, women earn less than men;

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- ▶ Check if the drug is effective against Corona