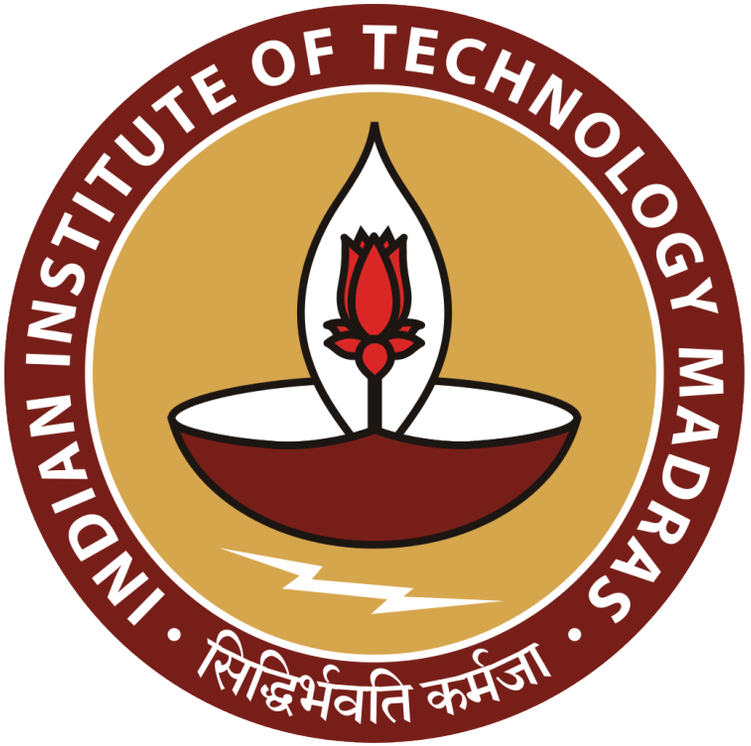

IIT Madras

ONLINE DEGREE

Statistics for Data Science -1

Course Overview

Usha Mohan

Indian Institute of Technology Madras

Introduction and course overview

Week wise schedule and learning objectives

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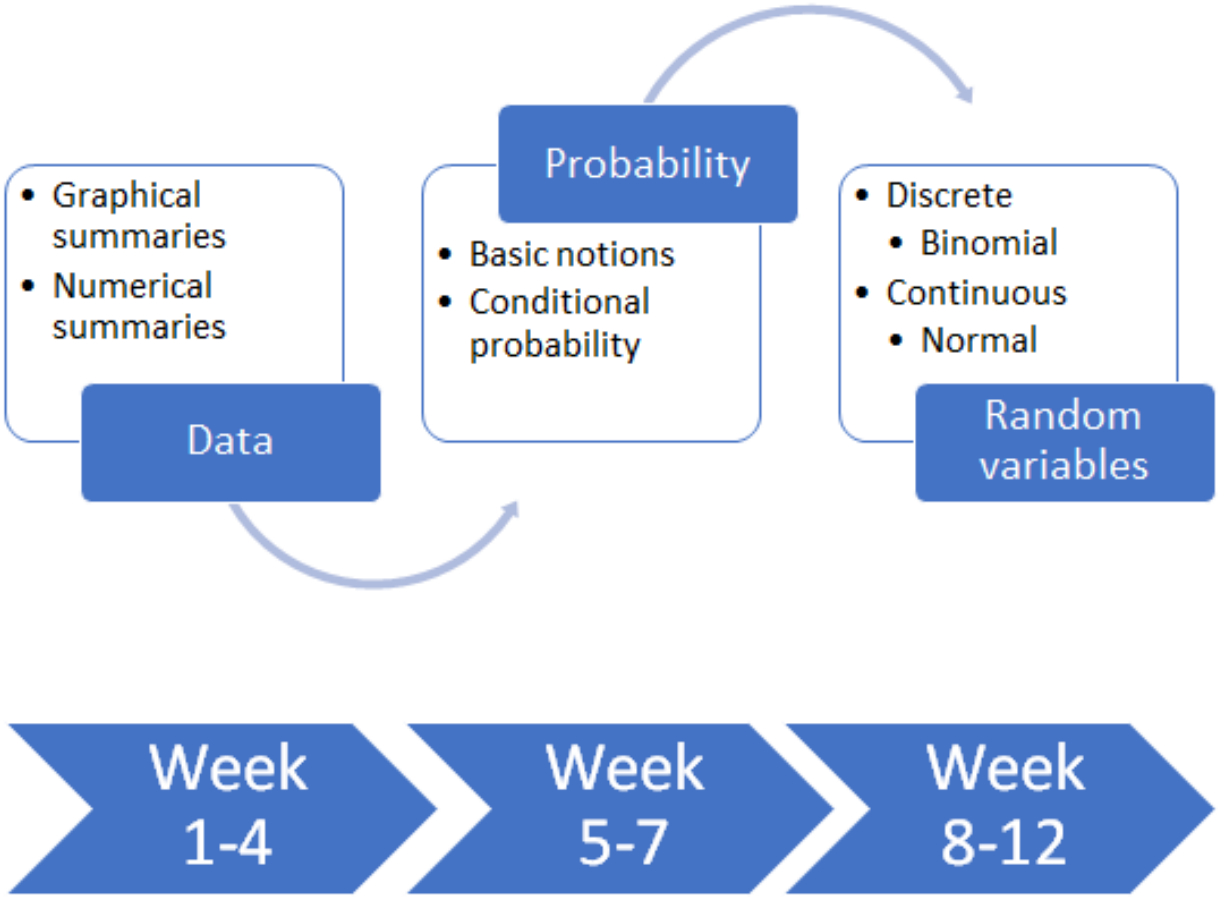
   - 4.1 Understand notions of random experiment, events, probability and conditional probability.
   - 4.2 Understand use of random variables, both discrete (in particular, Binomial) and continuous (in particular, Normal).

Road map


• Graphical summaries
• Numerical summaries
Data
Probability
• Basic notions
• Conditional probability
• Discrete
• Binomial
• Continuous
• Normal
Random variables
Week 1-4
Week 5-7
Week 8-12

Example

XYZ university has just completed admissions to their undergraduate program. Every admitted student fills up a form and the information is tabulated.

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A portion of the data obtained by the admissions office is given below:

S.No	Name	Gender	Date of Birth	Marks in Class 10	Board (Board)	Marks in Class 12	Board (Class 12)	Mobile Number
1	Anjali	F	17-Feb-03	484	State Board	394	CBSE	xxx7252826
2	Pradeep	M	03-Jun-02	514	ICSE	437	ICSE	xxx5243748
3	Varsha	F	02-Mar-01	527	CBSE	442	CBSE	xxx5242824
4	Divya	F	22-Mar-03	397	State Board	401	State Board	xxx6546889
5	Thomas	M	19-Dec-02	562	CBSE	451	CBSE	xxx4242736
6	Sarita	F	19-May-02	533	ICSE	462	ICSE	xxx5242577
7	Prashant	M	30-Oct-01	496	CBSE	413	CBSE	xxx3352630
8	Harsha	M	11-Feb-01	436	CBSE	375	CBSE	xxx1702736
9	Rafiq	M	31-Jul-02	501	ICSE	423	CBSE	xxx0026248

Questions

1. Identify variables, observations

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5. Framing questions that can be answered from data.
6. Distinguish between a sample and a population.

Questions

1. What is the gender diversity, in other words, what is the proportion of women students and proportion of male students?
2. How many students come from each board?

Week 2: Describing categorical data- one variable

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4. Discuss about misleading graphs.

Questions

1. What are the average marks obtained by students in Class 10/Class 12?
2. Is there a lot of variability in the marks obtained?
3. What is the least mark obtained? Highest marks obtained?
4. What is the average age of students admitted?

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3. Compute and interpret five-number summary
4. Use histogram and box-plot to identify outliers in a dataset.

Questions

1. Are there more women from state board when compared to men from state board?
2. Do students who have scored high marks in Class 10 score high marks in class 12 also?
3. Do students from State board score higher marks than those from other boards?

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3. Understand relationship between a categorical and numerical variable.

Questions

After joining a college, the students want to form committees.

1. How many ways can a committee of 3 be formed from 10 people?
2. How many ways can a committee of 3 (President, Vice-president, and secretary) be formed from 10 people?
3. Basic principle of counting.

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3. Understand differences between counting with order (permutation) and counting without regard to order (combination).
4. Use permutations and combinations to answer real life applications.

Questions

1. What are the chances of a student getting a top grade?
2. What are the chances of a student getting a top grade given the student is from a particular board?
3. Key word is "chance"

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7. Distinguish between independent and dependent events.
8. Solve applications of probability.

Questions

Suppose one of the questions asked in the questionnaire asked students to report the number of siblings(sisters and brothers) they have.

1. What is the chance that a randomly selected student has 2 siblings?

Week 8-9: Discrete random variables

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5. Expectation and variance of a random variable.

Questions

A multiple-choice examination has 4 possible answers for each of 25 questions.:

1. What is the chance of getting exactly 5 questions correct just by guessing?
2. What is the chance of getting more than 5 questions correct just by guessing?

Week 10: Binomial distribution

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1. Understand the binomial distribution.

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2. Applications of binomial distribution.

Questions

The time taken to write a test is recorded for each student. What is the chance that

1. the student requires more than 45 minutes to complete the test?
2. The student requires between 30 to 45 minutes to complete the test?

Week 11-12: Continuous distributions and Normal Distribution

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1. Concept of probabaility density function

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