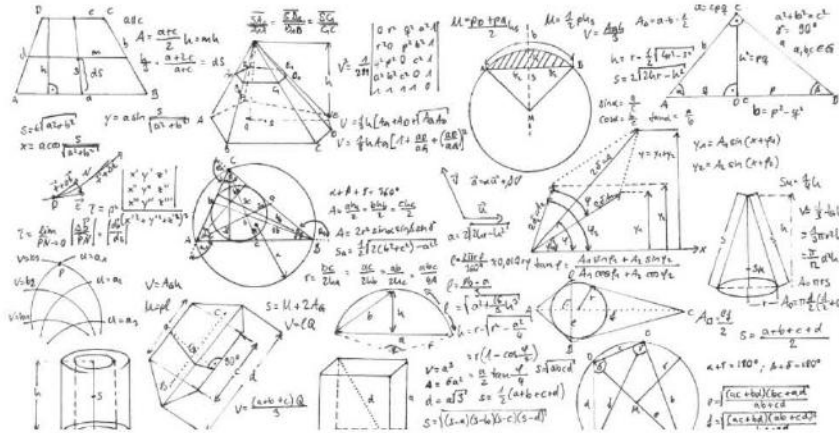# MAJOR IN PROBABILITY AND STATISTICS

DEPARTMENT OF MATHEMATICS
UNIVERSITY OF CALIFORNIA SAN DIEGO

2017-04-17 (REVISED 2017-04-18)

PRESENTATION OBJECTIVES

1) Purpose of Major in Probability and Statistics (B.S.; MA35)

2) Summary of major's curriculum

3) Possible graduate school and career path options

*Do not expect this (nor any) one presentation to cover
every possible thing there is to know about a topic*
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BASIC QUESTIONS TO ASK WHEN CONTEMPLATING THIS MAJOR

- **Do I enjoy upper division mathematics and particularly probability and statistics?**
- **Do I feel excited to study mathematics every day?**
  - Bad to choose major whose subject you are not passionate about
  - Interest in calculus is insufficient indicator of how much you will like upper division mathematics
  - Upper division real analysis, probability, and statistics are far more abstract than lower division mathematics; you may or may not enjoy them

- **Do I have an excellent aptitude for upper division mathematics?**

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MAJOR IN PROBABILITY AND STATISTICS (B.S.; MA35)

- Objective of major: Prepare for graduate study or employment in probability/statistics, data science, actuarial mathematics (assuming MATH 193A-B also taken).
- For graduate study in probability and statistics, we suggest...
  - Taking MATH 140A-B-C and, if able to do well in them, relevant graduate level courses
  - Completing Department of Mathematics Honors Program (if you qualify)
  - Doing a reading with a faculty member
- For career preparation in probability/statistics, we recommend...
  - A meaningful internship
- *R Project* is a software environment for statistical computing. Recommendation: Learn *R* on your own! We do not formally teach R in any course. Fairly easy to learn. You will be exposed to R in various courses, but not per se taught it.
- *Python* also good to know

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CAREER POSSIBILITIES

- Bachelor of Science in Probability and Statistics is good start for basic understanding
- At least master's in statistics is good preparation for more employment options
- Sample industries needing statisticians:
  - Financial companies
  - Actuarial work
  - Data analysis (high demand for this as companies are always collecting more data and seeking to make predictions about consumer behavior)
- Laboratories in psychology, sociology, political science need statisticians
- Ph.D. needed for independent research or high level data analysis (pharmaceutical work, for example)

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CURRICULUM (1/2)

- **Official source for all Department of Mathematics curricula is UC San Diego General Catalog:** http://www.ucsd.edu/catalog/curric/MATH-ug.html
- When requesting to graduate, department advisor will review your completed coursework to see whether requirements of major (per General Catalog when you started at UC San Diego or any Catalog published since then) have been met

- **Lower Division Coursework**
  - Linear algebra (MATH 18 or MATH 20F)
  - Calculus (MATH 20A-B-C-D-E)
  - Programming (CSE 8A-B or CSE 11 or ECE 15)
- **Upper Division Coursework**
  - Mathematical Reasoning (MATH 109)

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CURRICULUM (2/2)

- **Upper Division Coursework continued**
  - Linear Algebra (MATH 102 or 170A)
  - Analysis (MATH 140A-B or 142A-B)
  - Numerical Methods (MATH 174 or MATH 170A-B)
  - Probability (MATH 180A-B-C)
  - Statistics (MATH 181A-B)
  - Additional (one of MATH 181C, 181E, 193A, 193B, 194)
  - Computational Statistics (MATH 185)
  - Electives (from long list in curriculum in General Catalog)
  - Can take 8 units, upper division courses from outside department in applied mathematics if approved by faculty advisor via Undergraduate Student Petition
  - Need TOTAL 15 four-unit, upper division courses

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CHANGES TO CURRICULUM EFFECTIVE 2017 FALL QUARTER

- You can follow these rules (or those in effect when you started at UC San Diego):
  - Take MATH 185 or MATH 189 to meet Requirement 9 in curriculum
  - Take either MATH 185 or MATH 189 to meet Requirement 10 in curriculum
  - "Numerical Methods" (MATH 174 or MATH 170A-B) curriculum requirement is removed
  - Upper division electives will include these:
    - MATH 111A-B
    - MATH 130A-B
    - MATH 154
    - MATH 174
    - MATH 185
    - MATH 187 (the new MATH 187A-B will count)
    - MATH 189

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DEPARTMENT OF MATHEMATICS HONORS PROGRAM

- Open to high-achieving mathematics students; great preparation for graduate school

- Honors calculus sequence (MATH 31AH-BH-CH) is good, but *not* required for program

- Qualifications for honors program include:

  1. Junior or senior standing; and

  2. Completing mathematical reasoning (MATH 109) and at least one course in abstract algebra (MATH 100A or 103A) or real analysis (MATH 140A or 142A); and

  3. Overall GPA 3.0+ and major GPA 3.5+.

- Attend colloquium; complete honors thesis (over 2 quarters under faculty supervision) to be presented at student conference or on other suitable occasion

- Joint Mathematics/Economics majors must also take economics honors course

- See Department of Mathematics undergraduate website for full details and PDF's of past theses: http://www.math.ucsd.edu/programs/undergraduate/

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INTERNSHIPS

- When hiring for a career position, company representatives want to know…
  - That a candidate is capable of practical work, not just academic study
  - That a candidate enjoys the practical side of an area of study
  - That a candidate is easy to work with
- A meaningful internship…
  - Allows employer to try you out without making long-term commitment
  - Is chance for you to show character, skills, aptitude, whether you like practical applications
  - Should result in at least one excellent letter of recommendation
  - Might lead to career employment through same employer
- You can look for internships on your own (by going to careers/jobs links of companies at their web sites), via Port Triton, or UC San Diego Academic Internship Program (AIP) database. AIP are noted on student's transcript.
- Some company representatives have come to campus career fairs or directly to department for presentations on internships

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FINAL ADVICE

- Choose a major not based only on what sounds interesting, or on what you enjoyed in high school, but on what you can excel at in upper division coursework and will help you reach career goals

- Look for job advertisements at companies in your field of interest. What are major/degree qualifications?

- Consult reputable sources for information rather than guessing. Example: Data science might be popular, but do you really understand what it is? What qualifications necessary to become data scientist? What types of problems do data scientists solve?

- If planning on graduate school, you may be more attractive applicant if involved in research as undergraduate student

- Make the most of time at uc San Diego.

    - Get to know professors, advisors, teaching assistants

    - Establish great reputations and professional relationships with above people and others long before requesting letters of recommendation

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