DIVISION OF STATISTICS, UC DAVIS

# Statistics 32: Basic Statistical Analysis Through Computers

(Spring 2000)

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| **Lecture Room & Time** | MWF 12:10–1:00pm at 126 Wellman |
| **Instructor** | Danh Nguyen |
| **Contact Information** | Office: Kerr Hall 270<br>Phone: 752–5854, e–mail: `nguyen@wald.ucdavis.edu` |
| **Course Website** | `http://anson.ucdavis.edu/~nguyen/` |
| **Instructor Office Hours** | MWF 10:00–10:50 am |
| **TAs Office Hours** | Scott Bartell (Kerr 362), OH: Tue 12:10–2:00 pm<br>e–mail: `sbartell@wald.ucdavis.edu`<br>Terran Brown (Kerr 493), OH: Thu 2:10–4:00 pm<br>e–mail: `tlbrown@wald.ucdavis.edu` |
| **Brief Course Description** | Descriptive statistics.<br>Regression and correlation analysis. Introduction to some basic probability concepts. Probability distributions: Binomial, Hypergeometric, Uniform, Normal, Exponential, Gamma, Weilbull, Beta, Student's t, Chi–square, and F–distributions. Basic inferential statistics: point and confidence interval estimation, and hypothesis testing. |
| **Prerequisites** | Some knowledge of basic calculus and programming.<br>See course catalog for details. |
| **Reference Text** | Hayter, Anthony, J., (1996). *Probablity and Statistics for Engineers and Scientists*, PWS Publishing Company, Boston. |
| **Grading Policy** | The final course grade is based on<br>1. a midterm (20%),<br>2. computing assignments (20%),<br>3. quizes (usually at the beginning of class) (10%), and<br>4. a final (50%).<br>Homework assignments will be extra credit (10%). |
| **Course Outline**: | This statistics course is organized into three parts:<br>1. **Descriptive Statistics**,<br>2. **Probability Distribution Theory** and<br>3. **Statistcal Inference**.<br>We will generally adhere to the following course outline, however, there may be some departure from the course outline. |

**PART I: DESCRIPTIVE STATISTICS**

**Week 0** *Fri 3/31*

Introduction I: An overview of statistics. Notations. Review of some basic integral and differential calculus.

**Week 1** *Mon 4/1–Fri 4/7*

Review continued. Variables, constant variables. Data.

Graphical summaries of data. Numerical summaries of data.

Distances. The "best" (closest) constant approximation (CCA) problem. The solution of the CCA problem via numerical search. The analytical solution to the CCA problem. Standard deviation as distance.

Other numerical summaries of data.

**Week 2** *Mon 4/10–Fri 4/14* and **Week 3** *Mon 4/17–Fri 4/21*

Simple linear combinations of variables. Simple linear regression: the "best" (closest) simple linear combination (CSLC) problem. The solution of the CSLC problem via numerical search. The analytical solution to the CSLCproblem.

The correlation coefficient. Scatter plots. Proportionate reduction in error (PRE).

Multiple linear combinations of variables. Simple linear regression: the "best" (closest) multiple linear combination (CMLC) problem. The solution of the CMLC problem via numerical search. The analytical solution to the CMLCproblem.

The (multiple) coefficient of determination as a proportionate reduction in error (PRE).

**PART II: PROBABILITY DISTRIBUTION THEORY**

**Week 4** *Mon 4/24–Fri 4/28*

Introduction II: The need for studying probability. Basic probability concepts: Sets. Intersection, union, complementation. Simple events. The sample space. Probability. Indepedent Events.

Law of total probability. Conditional probability. Bayes rule. Computing probabilities: counting techniques.

**Week 5** *Mon 5/1–Fri 5/5*

Introduction to probability distributions and random variables. Probability distributions as models. Expectations of random variables.

Discrete distributions: Binomial, Hypergeometric and discreted uniform family of distributions. "Heights" as probabilities.

**Midterm** *Friday 5/5*

**Week 6** *Mon 5/8–Fri 5/12*

Continuous distributions: Uniform (Rectangular), Triangular, Normal, Exponential, Gamma, Weilbull, Beta, Student's t, F–distribution, and Chi–square family of distributions. "Areas" as

probabilities.

Transformation of random variables. Linear combination of random variables. Random number generation. Simulating random variables.

**PART III: INFERENTIAL STATISTICS**
**Week 7** *Mon 5/15–Fri 5/19*
Introduction III: The "bridge" between probability and statistics. Sampling. Introduction to sampling distributions.

The Central Limit Theorem (CLT). Normal approximation of discrete probabilities.

Point estimation.

**Week 8** *Mon 5/22–Fri 5/26* and **Week 9** *Wed 5/31–Fri 6/2*
**Holiday** *Mon 5/29*
Confidence interval (CI) estimation. CI for the mean of a normal populaton, with variance know and unkown. CI for the variance.

Two independent normal populations. CI for variance. CI for difference of two means with variances known; with variance unknown but equal.

One Binomial population. Approximate CI for population proportion. Two independent binomial populations and CI for the difference of two population proportion. CI for the intercept and slope in SLR.

**Week 10** *Mon 6/5–Wed 6/7*
Introduction to test of hypotheses. Tests for population mean(s) and proportion(s). Test in SLR. Test for correlation.

**Final Exam** *Date, Time*

**Calendar for Spring 2000**

March

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April

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May

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June

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