



University of Michigan

# BIOINFORMATICS

***NEW COURSE, WINTER 2008***

## **BIOINF 800.007 (MODULE B): Introduction to Statistics in Bioinformatics.**

***Feb 12 – March 11, four course weeks***

**Note: Students should register for this course by January 23, 2008, to avoid Rackham late fees!**

**Lectures:** Tuesdays 4:00-5:30

2062 Palmer Common

**Labs:** 2:00 – 4:00 PM, Mondays or Thursdays,

2036 Palmer Common

**Module B Director:** Kerby Shedden (STAT/BIOSTAT, [kshedden@umich.edu](mailto:kshedden@umich.edu))

**Course Director** (for Modules A-C): George Zhang (EEB, [jianzhi@umich.edu](mailto:jianzhi@umich.edu))

“1 credit. Basic statistics as used in bioinformatics, especially standard statistical tests of significance and when they apply. Applications to genetics, experimental and medical data, as well as exploration of multiple testing issues that arise in bioinformatics and other experimental settings.”

Cited from: [http://www.bioinformatics.med.umich.edu/bgp\\_courses/bioinf-800.007](http://www.bioinformatics.med.umich.edu/bgp_courses/bioinf-800.007)

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### **Lecture (B1) Probability distributions and their characteristics**

**Instructor: Dr. Laura Scott**

**Time:** Feb 12 (Tuesday), 4:00-5:30 PM

#### **Topics:**

Binomial, normal and Poisson distributions

Examples of traits/experimental quantities with Gaussian and Poisson distributions in biomedical research

What does it mean to sample from a population?

Estimating means and proportions and their variances

**Lab (B1) (Led by Dr. de Wet): Properties of commonly used probability distributions**

**Instructor: Dr. De Wet**

**Time:** 2:00-4:00 PM Feb 14 (Thursday) or Feb 18 (Monday)

**Lecture (B2) Testing for association with examples from genetic association studies and experimental data**

**Instructor: Dr. Laura Scott**

**Time:** Feb 19 (Tuesday), 4:00-5:30 PM

**Topics:**

- Treatment/control comparisons; t-tests
- Chi-square tests for 2x2 contingency tables
- Pearson's correlation coefficient
- Fold changes; Log odds ratio
- Differential expression
- Bootstrapping and permutation tests

**Lab (B2) (Led by Dr. de Wet): Association tests**

**Instructor: Dr. de Wet**

**Time:** 2:00-4:00 PM Feb 21 (Thursday) or Mar 3 (Monday)

**Lecture (B3) Power and methods for dealing with multiple testing with examples from microarray and genome-wide association data**

**Instructor: Dr. Kerby Shedden**

**Time:** March 4 (Tuesday), 4:00-5:30 PM

**Topics:**

- Multiple comparisons testing including Bonferroni correction and false discovery rate procedure
- Calculating power for different types of experiments
- Issues with testing many correlated variables

**Lab (B3) (Led by Dr. de Wet): Analysis of results from microarray and genome-wide association data: Calculation of power, Bonferroni p-value, false discovery rate**

**Instructor: Dr. De Wet**

**Time:** 2:00-4:00 PM March 6 (Thursday) or March 10 (Monday)

**Lecture (B4) Model Building: ANOVA and linear regression using biomedical data**

**Instructor: Dr. Kerby Shedden**

**Time:** March 11 (Tuesday), 4:00-5:30 PM

**Topics:**

- Design and analysis of factorial experiments
- Linear models for normalization and batch correction
- Predictive analysis of quantitative biomedical traits with linear models

**Lab (B4) (Led by Dr. de Wet): ANOVA and linear regression**

**Instructor: Dr. De Wet**

**Time: 2:00-4:00 PM March 13 (Thursday) or March 17 (Monday)**