

## **Experimental Data Analysis Using R Workshop**

**Hosted By:** Plant Science Graduate Students Association in Faculty of Agriculture

**Time:** 9:00 AM -12:00 PM, 13:00-16:00, Saturday, Feb 10, 2018

### ***Location:***

R is a free, open-source powerful language and software environment for statistical computing, data analysis and graphics. More and more students are now using R-based statistical packages to analyze the research data source. Understanding of R is extremely valuable for the student's professional development, data analysis skills, and potentially improves the outcomes of the master or PhD project.

This one-day workshop aims to provide participants some familiarity with R as an analysis tool for experimental data in plant science. In the morning sessions, basic R commands, R help pages, data manipulation, summarizing data, basic statistical analysis and basic plotting commands, as well as analysis of experimental data from one-factorial design using R will be covered. In the afternoon, you will learn how to analyse data from a variety of more complex experimental design. This includes multi-way factorial design, block design, fixed and random effects, nested designs, and split plot designs. The workshop will comprise a mixture of lectures on analyses on experimental data with hands-on exercises using R.

Requirements: Workshop participants should have working knowledge of experimental design and analysis of variance (ANOVA) modeling, including experience using SAS or other statistical software to apply these models. No experience in data analysis with R is required.

### ***Workshop Instructor:***

Dr. Depeng Jiang is an Associate Professor of Biostatistics in the Department of Community Health Sciences of University of Manitoba. Dr. Jiang also leads the Biostatistics Group in the Data Science Platform of George and Fay Yee Center of Healthcare Innovation (CHI). Dr. Jiang had many years of experience in providing statistical consulting to a broad range of clients and training students and researchers on the conduct of statistical analyses. Dr. Jiang's program of research focuses on person-oriented statistical methods. His main research interests include longitudinal analysis and multilevel models, person-oriented statistical approaches (latent class analysis and growth mixture models), structural equation models, clinical trial design and impact evaluation.

## Workshop Outlines (Tentatively)

### Session 0: Example: Experiments of the herbicide and surfactant interaction on canola yield

#### Session 1: Introduction to R

- Basics: Interacting with the R Interpreter
- Objectives and vectors
- User-defined functions
- Other structures and objectives
- Reading data in R
- Working with data in data frames

#### Session 2: Basics statistical graphics in R

- Univariate display
- Plotting bivariate relationship
- Plotting multivariate data
- Other popular graphics packages (lattice and ggplot2)

#### Session 3: One-way ANOVA in R

- Exploratory data analysis
- Fitting linear model and conduct ANOVA
- Multiple comparison procedure
- Graphing results
- Welch's ANOVA

#### Session 4: Multi-way ANOVA in R

- Exploratory data analysis for factorial design
- Fitting linear model and conduct multi-way ANOVA
- Multiple comparison procedure
- Graphing results
- Type I, II, and III sum of squares

#### Session 5: Nested design and random effect model in R

- Model I and II ANOVA
- Random effect and fixed effect
- The wrong analysis
- Linear model for nested data
- Appropriate error terms and nested analysis

## Session 6: Analysis of split-plot experiments in R

- Factorial (no split) and split-plot designs
- CRD and RCBD
- Linear model for the split-plot
- Appropriate error terms
- Analysis of a split-plot with main plots arranged as an RCBD
- Mean comparisons (if time permit)
- Split-split plot design (if time permit).