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WHAT STARTS HERE CHANGES THE WORLD

CHE379/CHE384T

From Data to Decisions:
Measurement, Uncertainty, Analysis, and Modeling

Introduction

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Course Website

- <http://www.lithoguru.com/scientist/statistics>
- What you'll find there:
 - Links to video lectures
 - Links to reading materials
 - Homework problems
 - Data sets and example spreadsheets

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Course Objective

Standard introductory treatments of data analysis and modeling include important basic ideas of regression and goodness of fit. However, several significant real-world issues are rarely addressed adequately in these introductory courses.

This course will discuss many of the problems scientists and engineers routinely encounter when dealing with data and will provide rigorous methods for handling them: measurement uncertainty analysis, data outlier/flyer removal, impact of sampling on model quality, dealing with correlated inputs, and residual analysis.

In the end, students should have the tools necessary to answer one of the foundational problems in science: given two competing scientific models (theories), does the data contain sufficient information to choose one over the other?

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Topics Covered

- Prework: Review of Statistics, Regression, Goodness of Fit
- Introduction and Motivation, Regression Review
- Testing for Normality, Outliers, Leverage and Influence, and Heteroscedasticity
- Weighted Linear Regression, Total Regression, Model Error
- Multiple Regression
- Independence of Residuals, Autocorrelation in Time Series
- Multicollinearity
- Building Models
- Robust Regression, Bayesian Regression
- Design of Experiments, Response Surface Modeling
- Measurement and Propagation Uncertainty

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Prerequisites

- Differential and integral calculus
- Introductory probability and statistics
 - For an on-line review of introductory statistics, see <http://www.lithoguru.com/scientist/statistics/review.html>
- Working knowledge of Excel

This class is suitable for junior and senior science and engineering majors, as well as graduate students who are beginning to work with real data.

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Thank You, and good luck!

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