Understanding and Communicating Multimodal Transportation Data

First Edition

Development, Deployment, and Assessment of a New Educational Paradigm for Transportation Professionals and University Students (A Collaboration of the Region X Transportation Consortium)

by Chris Monsere

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Table of Contents

List of Figures

Student Notes

Preface

This course will introduce students to appropriate research methods for using transportation data sets and communicating the results of their work to a broad audience. The course content includes:

(a) selections of the appropriate graphical method (making knowledge-based decisions on selections for best perceptions)

(b) managing, extracting, and filtering large-scale data

(c) understanding types and dimensions of data (time resolution, discrete, continuous, and aggregations)

(d) techniques for visualizing data and exploratory analysis

(e) basic statistical analysis applied to transportation problems (public transportation, traffic, safety, freight, bicycle performance) using open-source script-based statistical tools (R) and databases (PostgresSQL)

(f) selection of appropriate analysis technique

(g) presentation of material in a technical summary

This is a gateway course; the knowledge gained in this course will be applied throughout the remaining graduate curriculum.

Students taking this course will have had an introductory transportation course, an undergraduate course in statistics and probability, and an engineering problem solving course with an exposure to programming logic. Three audiences are envisioned for this course:

(a) Graduate-level civil engineering students with an emphasis in transportation, in their first quarter.

(b) Transportation professionals with a desire to expand their knowledge of data analysis

(c) Advanced senior undergraduate civil engineering students with necessary skills and permission of the instructor.

The course uses the open source language R. Use of the PostgreSQL database will require comfort with various computing platforms (Unix, Windows) including the installation of software, downloading and installing web-based technologies.

The long-term behaviors, roles, and way of being will be supported by this course:

(a) Problem solver

(b) Researcher

(c) Communicator

(d) Collaborator

(e) Open-source software

i. R

ii. PostgreSQL

Reference books (required)

i. Keen, Kevin. *Graphics for Statistics and Data Analysis with R*

ii. Dalgaard, Peter. *Introductory statistics with R*. 2nd ed.

iii. *Scientific Approaches to Transportation Research* Volumes 1 and 2, web book

In this activity textbook, each activity includes an overview, a description of the task, a description of the deliverable, and the assessment method. Activities are also shown as in class or out of class. The following structure will be used to assess activities:

1. **Participation Activities**
    a. These activities require quick assessment and feedback. You will receive credit for completing these activities.

2. **Annotated Code Activities**
    a. In these activities you be asked to only submit a script or code file that contains comments and demonstrates active exploration of the objectives within the activity.

3. **Peer Assessment Activities**
    a. Some activities will require you to assess the work of your fellow students. In these activities, your performance will be based on your work assessed by the instructor, your feedback to peers, and your peers' assessment of your work.

4. **Short Response Activities**
    a. Many activities are structured such that you respond to a set of questions. You will receive credit both for completing these activities and for the depth and detail of your responses. We will attempt electronic submittal and feedback for these activities.

5. **Discovery Activities**
    a. These activities require you to build on knowledge and skills introduced to you in previous activities. These activities will be open ended and you will receive credit for completing these activities and for the creativity of your exploration.

There will also be a final project which is an independent structured analysis which you will select from a set of open-ended questions devised by the instructor presented in Chapter 6. This project will serve as the final assessment that the student has made progress in developing knowledge and skills in this class. The project is due during the final exam period, where students will make a brief presentation on their results to the class. You are encouraged to make an early selection of the project topic to begin your work in advance.

A number of people have contributed to make this version of the course document. The early version of this course and activities were developed by the primary author, Chris Monsere. Contributions include those from Ashley Haire, Chengxin Dai, and Joel Barnett (who did a lot of work doing the final editing of the course design document. This workbook benefited from the collaboration and input of Michael Kyte and Steve Berylein, University of Idaho, Kelly Pitera, University of Washington, Shane Brown, Washington State University, and Ming Lee, University of Alaska. The work was funded by FHWA TDEDP program. All errors and omissions are the responsibility of the primary author. Robert Bertini initiated Portland State's collaboration on this project .