UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTLINE

1. **Course**: CPSC 599.87: Visualization and Analytics
   **Lecture Sections**: L04, TR 9:30-10:45, TI Studio C, Wesley Willett, MS 680D, 220-2463, wesley.willett@ucalgary.ca
   **Office Hours**: R 15:00-17:00

   **Course Website**: D2L
   **Computer Science Department Office**, ICT 602, 220-6015, cpsc@cpsc.ucalgary.ca

2. **Prerequisites**: Consent of the Department
   (http://www.ucalgary.ca/pubs/calendar/current/computer-science.html#3620)

3. **Grading**: The University policy on grading and related matters is described in sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:
   - Weekly Analysis Assignments: 50%
   - Project 1: Data Collection and Cleaning: 15%
   - Project 2: Exploratory Analysis and Modelling: 15%
   - Project 3: Analysis Reporting and Visualization: 20%

   This course will not have a Registrar’s Scheduled Final Exam.

   **Special Regulations affecting the Final Grade**: None.

4. **Missed Components of Term Work**: The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar. Section 3.6. It is the student’s responsibility to familiarize themselves with these regulations. See also Section E.6 of the University calendar.

5. **Scheduled Out-of-Class Activities**: Regularly scheduled classes have precedence over any out-of-class time activity. If you have a clash with this out-of-class activity, please inform your instructor as soon as possible so that alternative assignments can be arranged.

6. **Course Materials**:
   - Data Science from Scratch, Joel Grus, O’Reilly Media 2015 (Recommended)
   - Data Points, Nathan Yau, Wiley 2013 (Recommended)
   - Visualization Design and Analysis, Tamara Munzner, CRC Press 2014 (Recommended)

   **Online Course Components**:
   Lecture slides will be posted online.

7. **Examination Policy**: None. Students should also read the Calendar, Section G, on examinations.

8. **Approved Mandatory and Optional Course Supplemental Fees**: None.

9. **Writing across the Curriculum Statement**: In this course, the quality of the student’s writing in the weighted components of the course will be a factor in the evaluation of these components. See also Section E.2 of the University Calendar.

10. **Human Studies Statement**: Students will be expected to participate as subjects or participants in projects. See also Section E.5 of the University Calendar.
11. OTHER IMPORTANT INFORMATION FOR STUDENTS:

a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offense that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K, Student Misconduct to inform yourself of definitions, processes and penalties.

b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points which can be found in each classroom and building.

c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at [http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf](http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf). Students needing an Accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Computer Science.

d) **Safewalk:** Campus Security will escort individuals day or night ([http://www.ucalgary.ca/security/safewalk/](http://www.ucalgary.ca/security/safewalk/)). Call 403-220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also [http://www.ucalgary.ca/secretariat/privacy](http://www.ucalgary.ca/secretariat/privacy)

f) **Student Union Information:** VP Academic (403) 220-3911 suvpaca@ucalgary.ca SU Faculty Rep (403) 220-3913 science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca, Student Ombuds Office: (403) 220-6420 ombuds@ucalgary.ca, [http://ucalgary.ca/provost/students/ombuds](http://ucalgary.ca/provost/students/ombuds)

g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend your cell phone should be turned off unless instructed otherwise. All communications with other individuals via laptop computers, cell phones or other devices connectable to the internet in not allowed during class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

h) **U.S.R.I.:** At the University of Calgary feedback provided by students through the Universal Student ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses ([www.ucalgary.ca/usri](http://www.ucalgary.ca/usri)). Your responses make a difference – please participate in USRI surveys.

Department Approval__________________________________________Date__________________________

Associate Dean’s Approval for out of regular class-time activity: _______________________________ Date:__________________________

Associate Dean’s Approval for Alternate final examination arrangements:__________________________ Date:__________________________

*A signed copy of this document is kept on file in the Computer Science main Office ICT 602*
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Tentative Topics Covered

The course will cover the full data analysis lifecycle from collection to reporting, focusing on the practical application of analysis techniques and tools to real-world data. Topics include:

- Data Collection.
- Data Cleaning and Integration.
- Statistical Analysis.
- Statistical Modelling, Classification, and Clustering.
- Exploratory Data Analysis.
- Presentation.
- Analysis of Geographic, Text, and Temporal Data
- Data and Ethics.

Learning Outcomes:

- **Data Collection.** Students should be able to identify and carry out a variety of data collection processes including surveys, using sensors, active and passive logging, and extracting data from existing databases and systems.
- **Data Cleaning and Integration.** Students should be able to identify common sources of error in real-world data (entry error, mis-calibration, spurious integrity, etc.) and their characteristics. Students should be able to take a dataset and apply de-duplication, outlier detection, type checking, and other data cleaning approaches.
- **Statistical Analysis.** Students should able to describe and conduct basic statistical analyses, including: dependence and independence, correlation/causation, conditional probability, confidence intervals, and common statistical distributions.
- **Statistical Modeling, Classification, and Clustering.** Students should be able to describe and apply basic linear and logistic regression, model-fitting, and clustering techniques.
- **Exploratory Data Analysis.** Students should be able to conduct exploratory data analysis on real, complex data sets using tools like Tableau and iPython Notebook/R Studio.
- **Presentation.** Students should be able to create visual presentations of their analytic results, including dashboards, graphical reports, presentations, and stories.
- **Data and Ethics.** Students should be aware of the ethical implications of data collection and analytics. Students should be able to identify problematic data collection and experimentation practices, anonymize datasets, and describe good data security practices.