Course Logistics

Susan Storm: So what **are** these fundamental principles, if they are not atoms?

Reed Richards: Stories, which give me hope. We are a boatful of monsters and miracles, hoping that, somehow, we can survive a world in which all hands are against us. […] Yet I posit we are in a universe which favours stories. A universe in which no story can ever truly end; in which there can be only continuances.

(N. Gaiman, *Marvel 1602*)

"The early stages of education *have* to include a lot of lies-to-children, because early explanations have to be simple. However, we live in a complex world, and lies-to-children must **eventually be replaced** by more complex stories if they are not to become delayed-action genuine lies."

(T. Pratchett, I. Stewart, J. Cohen, *The Science of Discworld*)

lies-to-children: "as much as they can understand"
lies-to-bosses: "as much as they need to know"
lies-to-patients: "as much as is required to keep them from worrying"
lies-to-ourselves: …

Mr. Gustave: I'm not angry with Serge. You can't blame someone for their basic lack of moral fiber. He's a frightened little yellow-bellied coward. It's not his fault, is it?

Mustapha Zero: I don't know. It depends.

Mr. Gustave: Well, you can say that about most anything. "It depends." Of course, it depends.

Mustapha Zero: Of course it depends. Of course it depends.

Mr. Gustave: Yes, I suppose you're right. Of course it depends. However, that doesn't mean I won't throttle the little swamp rat.

(*The Grand Budapest Hotel*, 2014)

Course Description

With solid **analytical** and **abstraction** skills, graduates with a background in mathematics and statistics are in high demand. The gap between theory (or textbook applications) and real-world uses can prove **surprisingly difficult** to navigate, however.

In this **project-based course**, you will

- study a number of quantitative consulting projects and techniques;
- learn about various non-technical aspects of consulting;
- explore the different roles that quantitative consultants play;
- develop the ability to interpret results for, and communicate findings to, clients, and
- apply the course teachings to concrete group consulting projects.

Course Outline

Non-Technical Aspects of Quantitative Consulting (video lectures)

Case Studies (slide decks)

BASA Project Work and Team Meetings (during regular class sessions)

Course Evaluation

Class Project (20%): we will be working in the same problem space and with the same data on various aspects of a problem

- system and data understanding, data processing and cleaning, data visualization
- you will be assigned specific tasks; class report (on Overleaf, due on Sep-30)

Team Projects (45%): I will guide you through the consulting process on 2 small-team projects (1 section each in the final report)

- team meetings and minutes (ongoing); weekly documentation of tasks and time worked (ongoing); progress reports (once a week); ongoing communication – 15%
- proposal and workplan – 5% (due on Oct-10)
- final report – 15% (on overleaf, due on Dec-21)
- final presentation – 5% (date TBD)
- commented code – 5% (due on Dec-21)

Course Evaluation

Class Participation (15%)

- attendance, punctuality, staying awake, not on the phone or surfing the web
- insightful interventions, honest questions, earnest answers
- social media exercise

Weekly Quizzes (10%)

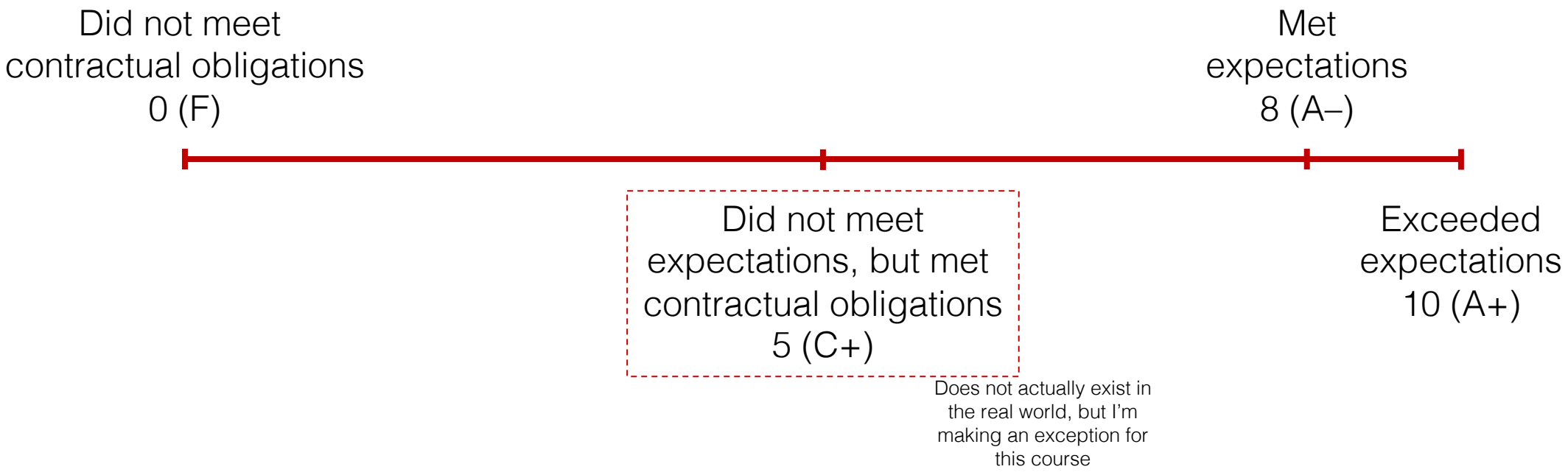
- about non-technical video lectures and case studies (ongoing)

CV and Bios (10%)

- due on Sep-25

Grading Scale

Every course evaluation item is graded on the **consulting scale:**



I will make my expectations clear for each item.

Assumptions and Expectations

Pre-requisites:

- multi-variable calculus, lin. alg., probability, statistics, regression analysis, machine learning
- more importantly, the ability to learn new technical topics rapidly, with little guidance
- programming proficiency (R / SAS / Matlab / Python / etc.)

You will be treated as junior consultant trainees in a consulting shop. We will set-up Slack channels for internal communication (preferred option). Emails can be sent to pboily@uottawa.ca if needed.

We meet over Skype/Zoom twice a week during regularly scheduled time. You are expected to be present online for these meetings.

Assumptions and Expectations

Time commitment: Consulting is not a spectator sport – I expect that you will spend on average 8 hours each week on this course (in the classroom, reading the course documents, and working on the various projects).

IMPORTANT: I will not be teaching specific quantitative methods. The focus is on project management and pipelines.

COVID-19 pandemic note: obviously, there is a lot of uncertainty and stress associated with the current crisis. I urge you to take any and all reasonable precautions to maximize your health, physical and mental.

Case Studies

Flight Route Predictive Analytics Model

Demographic Clustering of Canadian Health Regions

Effects of a Probiotic Agent on IBS

Predicting CIS Status

Fluidity Indicators and Seasonality Adjustment

Failure Analysis Simulation Model for Nuclear Waste Repository

Visualization of the Canadian Consular Network Data

Imputation of Blood Alcohol Content in Fatal Collisions

Canadian Vehicle Use Study

Optional Reading

Introduction to Quantitative Consulting

2. Data Preparation
3. Data Visualisation and Representation
4. Statistical Analysis
6. Data Science and Machine Learning
7. Simulations
8. Optimisation
9. Trend Extraction and Forecasting

(IQC documents still at a DRAFT stage)

Data Science Report Series

- Anomaly Detection and Outlier Analysis
- Essentials of Queueing Systems Methods
- A Soft Introduction to Bayesian Data Analysis
- Principles of Data Collection
- A ggplot2 Primer
- Dashboards and Data Visualization, with Examples
- Data Analysis Case Studies
- Feature Selection and Data Reduction