OBA 455/555
Data-Driven Predictive Modeling (in R)

Background

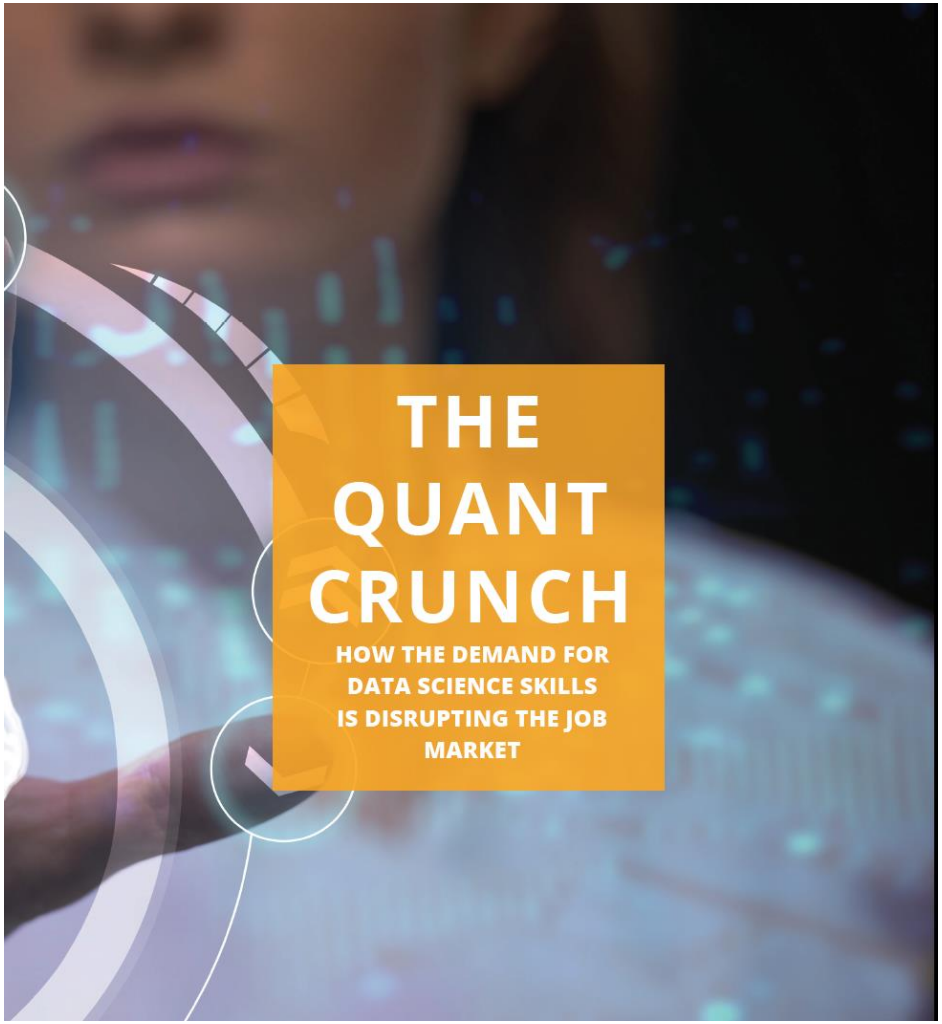
- **Pradeep Pendem**, Asst. Prof, OBA, LCB, UO, 2018 – current
- M.S. Ph.D. (OM), Kenan-Flagler, UNC-Chapel Hill, 2013-18
- M.S. Statistics, Indian Statistical Institute, India
- B.E. Electrical Engineering, AU, India
- Industry Experience
  - Operations Research Analyst, Fidelity Investments, five years
- Research Interests: Data-driven Operational Analytics in Service Systems
  - Retail, People Analytics, Urban Mobility
- Achievements
  - Goulet Outstanding Junior Faculty Research Award, 2021
  - Elwood S. Buffa Best Ph.D. dissertation award, 2019
  - Recipient of first Harvey M. Wagner Scholar award at UNC for exceptional research, 2017
- Teaching
  - OBA 335 Operations Management
  - Interests: Data-Driven Predictive Modeling, Operations Management

Your turn!

- Name
- Brief background
- Something special about yourself
  - Hobby
  - Adventure you had in the past, or anything you want to share with us
- Any experience (e.g., internship) with business/predictive modeling
- Expectations from this course

Why Data ?

Growing Demand for Data Professionals



- 2015 → 2020, ~ 2,350,000 → 2,720,000 (**+15%**)
- Jobs requiring machine learning skills are paying an average of $114,000

Scarcity in Analytical Expertize

McKinsey&Company

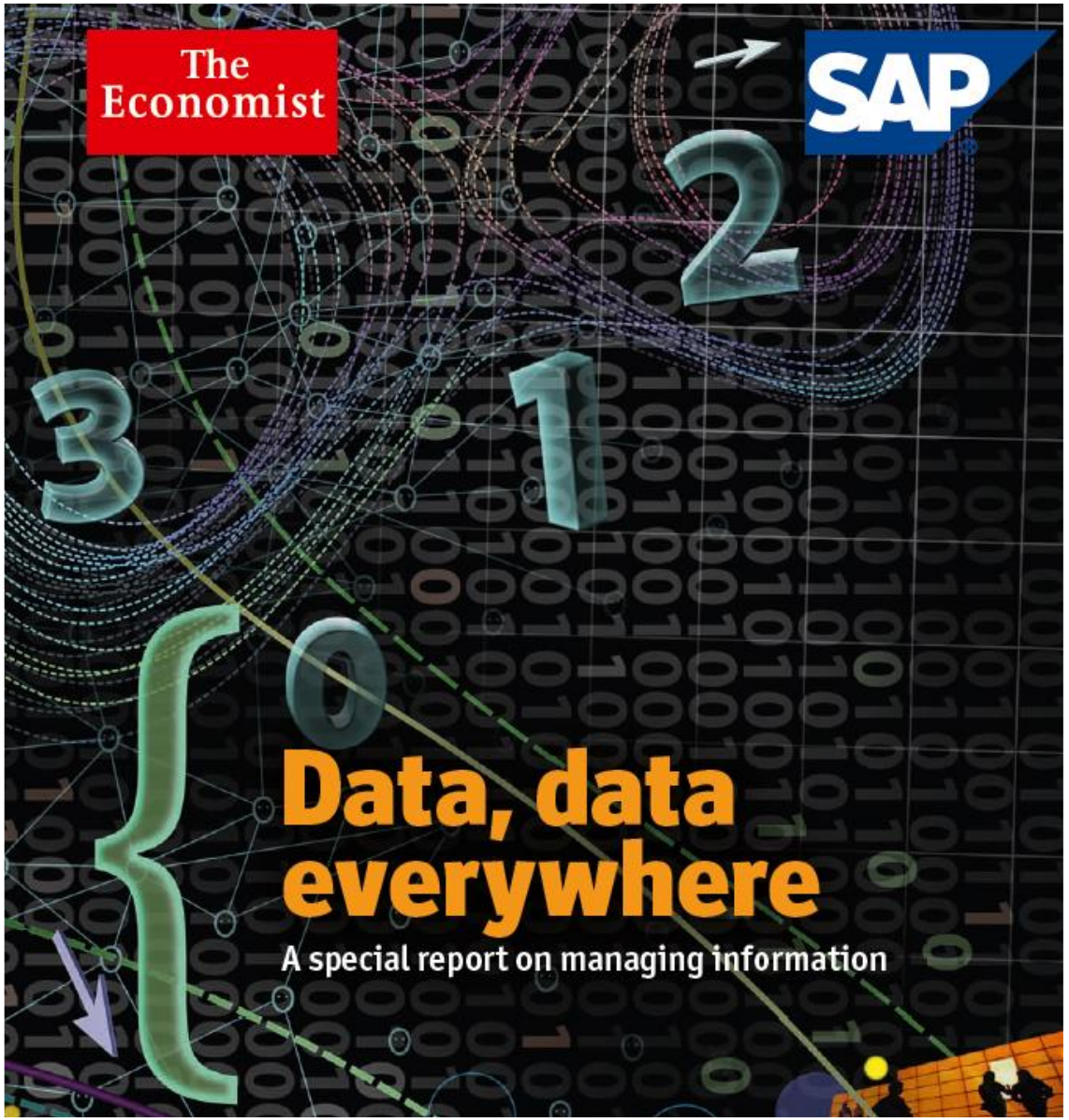
McKinsey Global Institute

May 2011

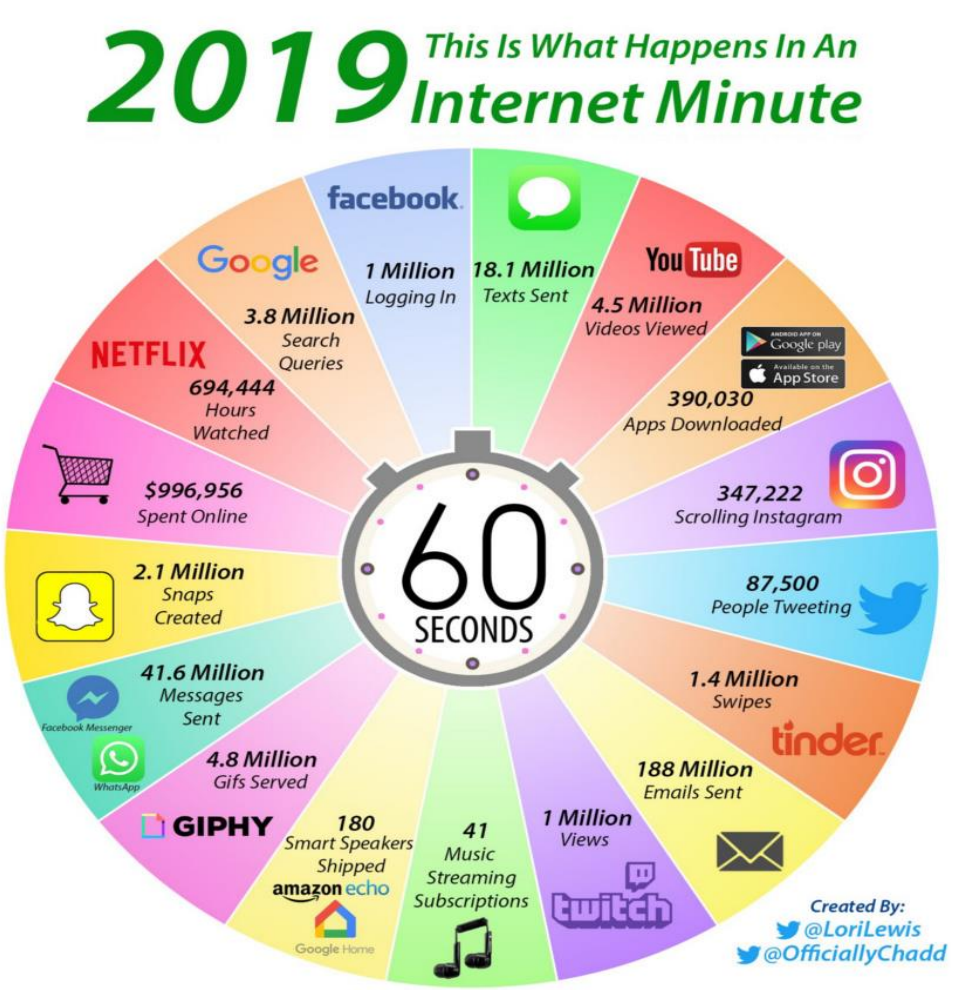
Big data: The next frontier for innovation, competition, and productivity

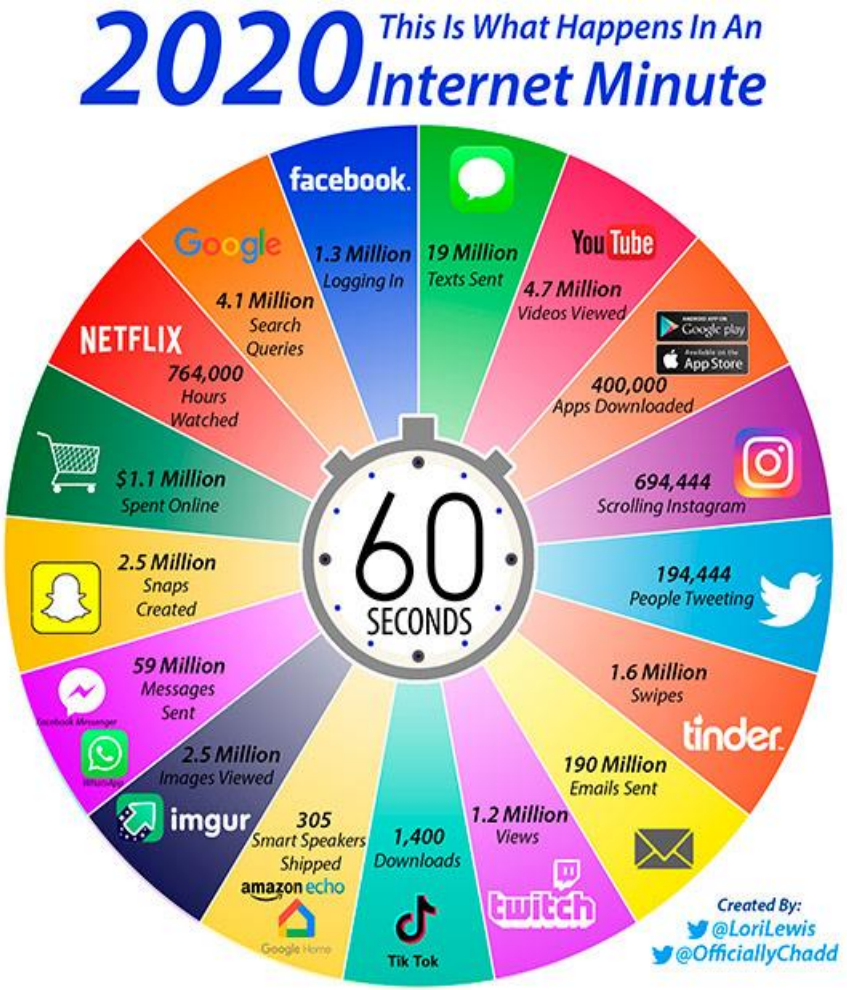
"The United States alone faces a shortage of **140,000** to **190,000** people with analytical expertise and **1.5 million** managers and analysts with the skills to understand and make decisions based on the analysis of big data."

Data Everywhere

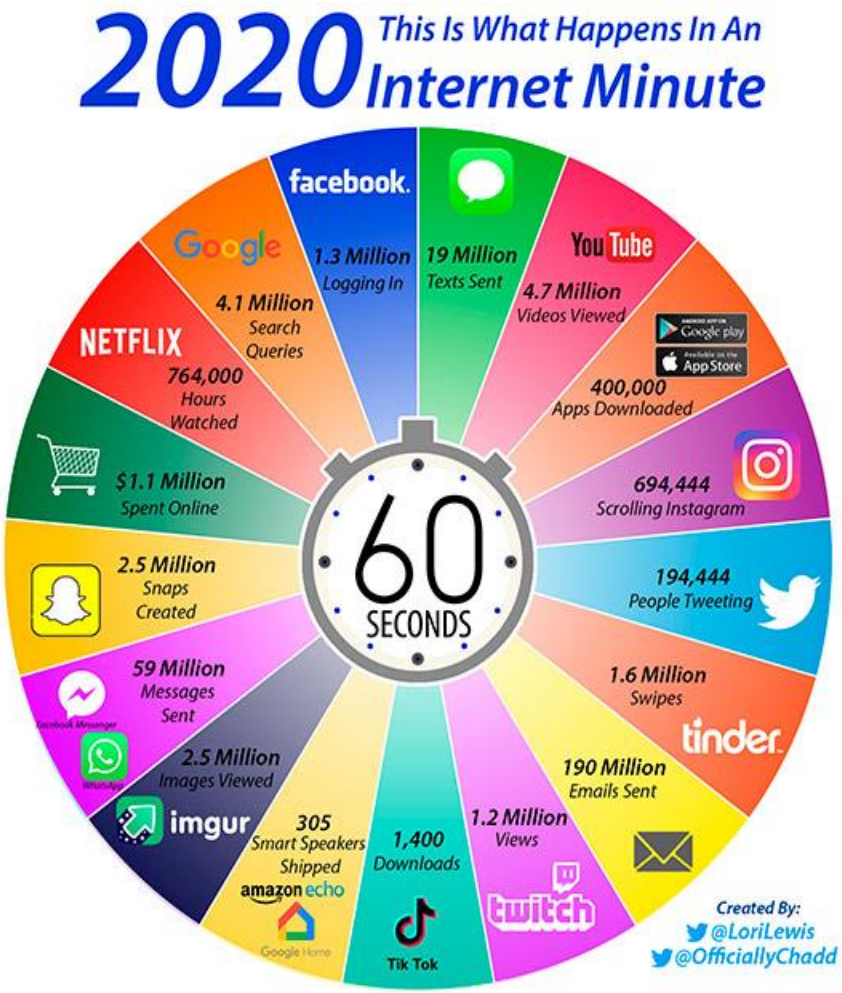


Data Velocity 2019 → 2020

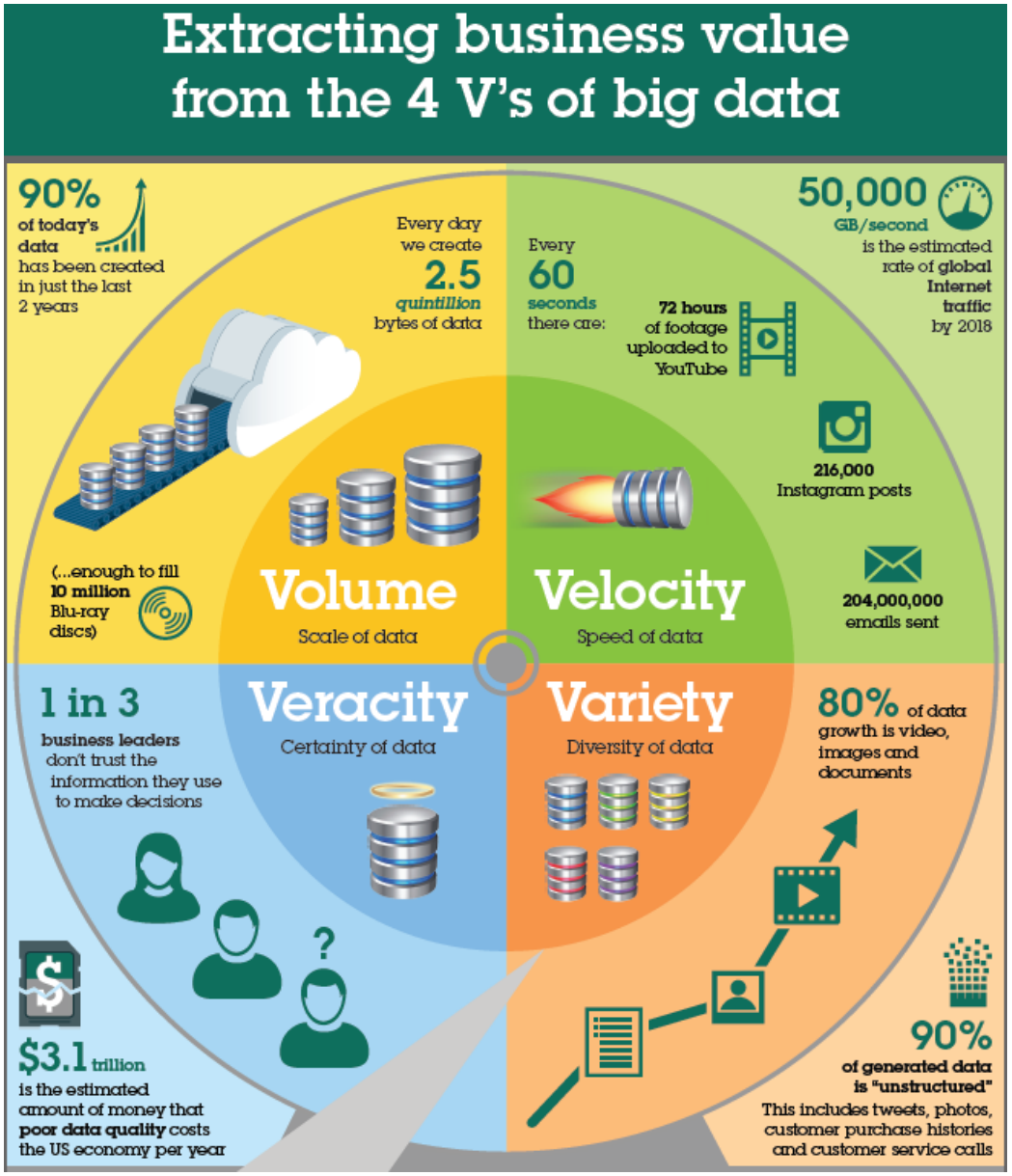




Data Velocity 2020 → 2021



4 V's of Big Data



Big Data is the new gold

Fifth V?

The ability to mine the new gold and achieve greater **VALUE** through insights from superior analytics

Where are things heading?

- Smarter physical ecosystems
- IOT (Internet of Things)
- Sensors to connect homes, automobiles, roads, garbage bins……
  - Smart refrigerator: "you are short on eggs!"
  - Populating your grocery store mobile app shopping list
  - Refrigerator negotiating a deal with Uber EATS driver to deliver a meal to you
  - Sensors in roads and vehicles to compute traffic congestion

Future will be fueled by Data Analytics

AN *MIT SMR* EXECUTIVE GUIDE

Seven Technologies Remaking the World

- Pervasive Computing: Embedded, Networked Digital Processors
- Wireless Mesh Networks: High-Bandwidth, Dynamic, Wireless, Smart Connectivity
- Biotechnology: Technologically Created and Enhanced Life-Forms and Systems
- 3D Printing: Digitally Designed, Chemically Manufactured Objects
- **Machine Learning: Augmented, Automated Data Analysis**
- Nanotechnology: Engineered Atoms, Super-Materials
- Robotics: Precise, Agile, Intelligent Mechanical Systems

Business Analytics

- Practice and art of bringing quantitative data to bear on decision making and creating value

Value

Business Fundamentals

Deployment

Right Questions

Good Analysis

Good Data

- Harness, Store, Process, Tools
- (Un)structured
- ……

- Descriptive Summary
- Visualization
- Methods
- ……

What will you learn in the course?

Value

Business Fundamentals

Deployment

Right Questions

- Final project

Good Analysis

- **Few** predictive methods
- **Little** theoretical basics
- Model building process in R
- Inference

Good Data

- **Basics** of R
- Data management

Why take this course?

- Learn basic coding in R/RStudio
- Learn basic techniques in Predictive Modeling/ Machine Learning and their application in R

Why not take this course?

- Do not like coding/Data analytics
- Well versed in R/RStudio & tools of Predictive Modeling

Course Logistics

Groups

- Students form groups of **three** on canvas
- Group name: Chain of each member's first letter of the first name
  - E.g., **C**asey, **D**avid, **P**eter; Group name is **CDP**
- Groups remain **same** for all homework's, final project & presentation
- **Due date & time** in the syllabus file
- Students **not** formed groups by due date & time will be randomly grouped
- Groups cannot be changed after the due date
- Please choose your group members carefully

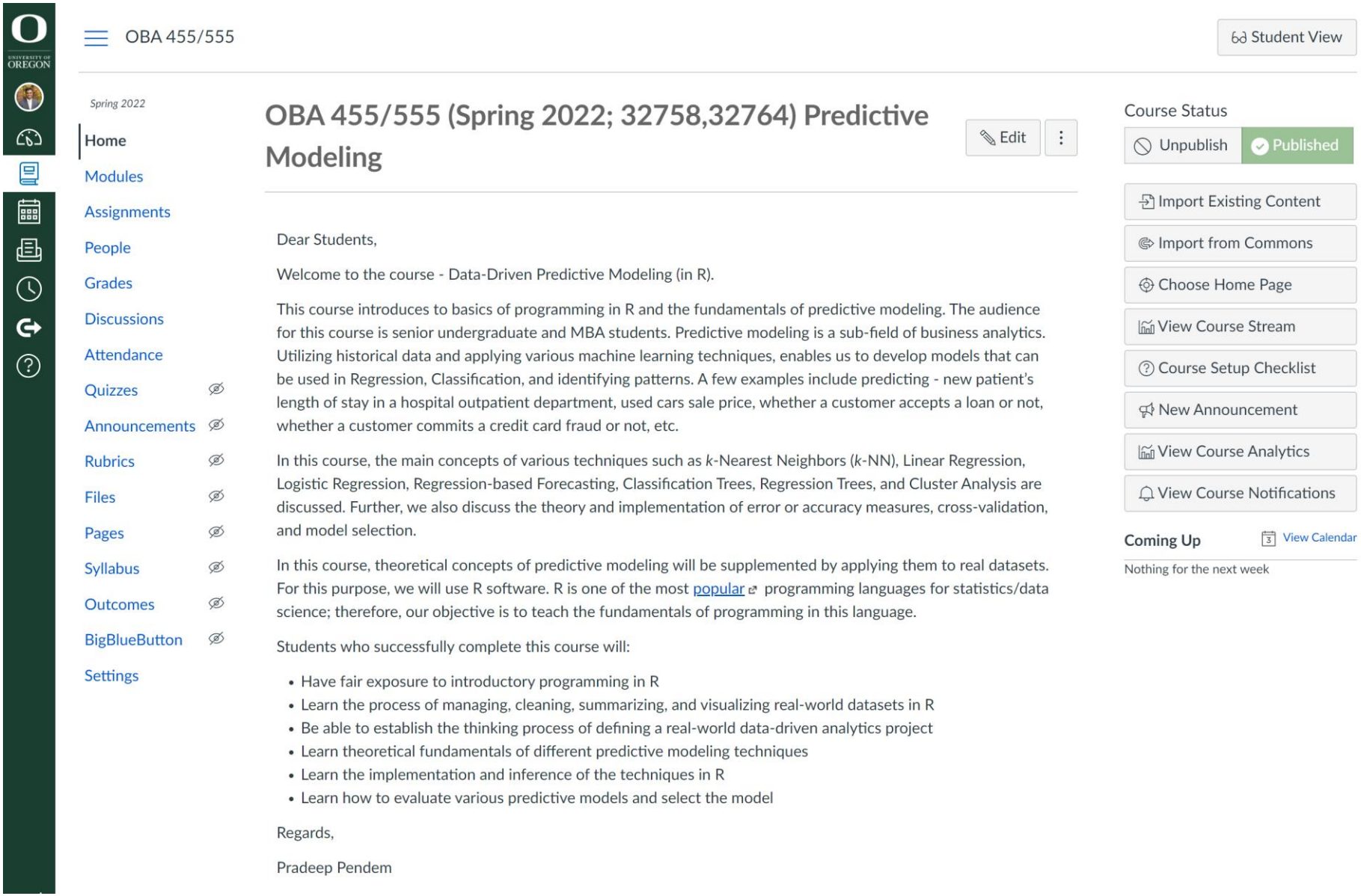
Materials

- Textbook
  - An Introduction to Statistical Learning with Applications in R

    by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
- Electronic version available for download at
  - https://statlearning.com/
- Textbook primarily for concepts beyond instructed in class

Canvas

- Website: https://canvas.uoregon.edu/courses/202280



Class Style

- Lectures
  - Theoretical introduction of a topic
  - Examples of real-world application contexts
- Software implementation
  - Implementation of model in R/RStudio
  - Inference of results
- Break
  - 5 - 10 minutes
- Homework problem set at the start/mid of the topic
  - Reinforcing of topics
  - Evaluating learning on your own

Class Access

- Scheduled In-person
  - No Zoom live streams and recordings will be available
- Attendance
  - Tracked in every class on canvas
  - No weight towards the grade

Class content & materials

- Materials available before the class start
  - Datasets
  - Incomplete code file(s)
- Materials available after the class
  - Class slides
  - Completed code file(s)
- All files to be accessed from the "**Modules**" section on canvas

Assessment

Type	Weight
Homework's (four)	20%
Midterm Quiz 1	20%
Midterm Quiz 2	20%
Project (Report + Presentation)	30 + 10%
	100%

- Grade assignment is based on **relative** performance
- Top x% will get A, the second top y % will get A- and so on ……
- The grading process is equivalent to **curving**

Homework (20%)

- **Four** homework's
- Not to seek help from individuals **outside** your group
- Homework's to be submitted in Canvas by their due date (and time)
- **Due date(s) & time** in the syllabus file
- Only **one** member of the group to submit on canvas
- List the group name on the top right of the submitted file
- Late/No submission results in a zero score for the group

Midterm (20% + 20%)

- Two midterms
- Multiple choice quiz on canvas
- **Quiz date(s)** in the syllabus file
- Open book
- Content
  - Conceptual knowledge
  - Identifying appropriateness of different techniques for different business problems/scenarios
  - Identifying strengths and shortcomings of the techniques
  - Interpret results of analyses
  - Code errors, output

Final Project (40%)

- Specify a business problem
- Identify a relevant dataset
- Business context could be in any area or function
- Assessment
  - Report (30%) + Presentation (10%)
- Presentation
  - 10–15-minute presentation on one of the classes in last week
  - **Presentation date(s) i**n the syllabus file

Final Report (30%)

- Formal report
  - Introduction, Problem description, Approach
  - Data Analysis, Results, Inference
  - Conclusions, recommendations
- 8-10 pages including any tables and graphs (excluding code)
- Submit the code with comments at end of the report
- **Due date & time** in the syllabus file
- Late submissions results in a zero score for the group

Public datasets for final project

kaggle

- https://www.kaggle.com/
- Online community of data scientists and machine learners
- Owned by Google Inc.
- Register yourself, and you can download datasets for free
- As of June 2017, Kaggle passed over 1,000,000 registered users
- Variety of datasets
- Your imagination only limits possibilities

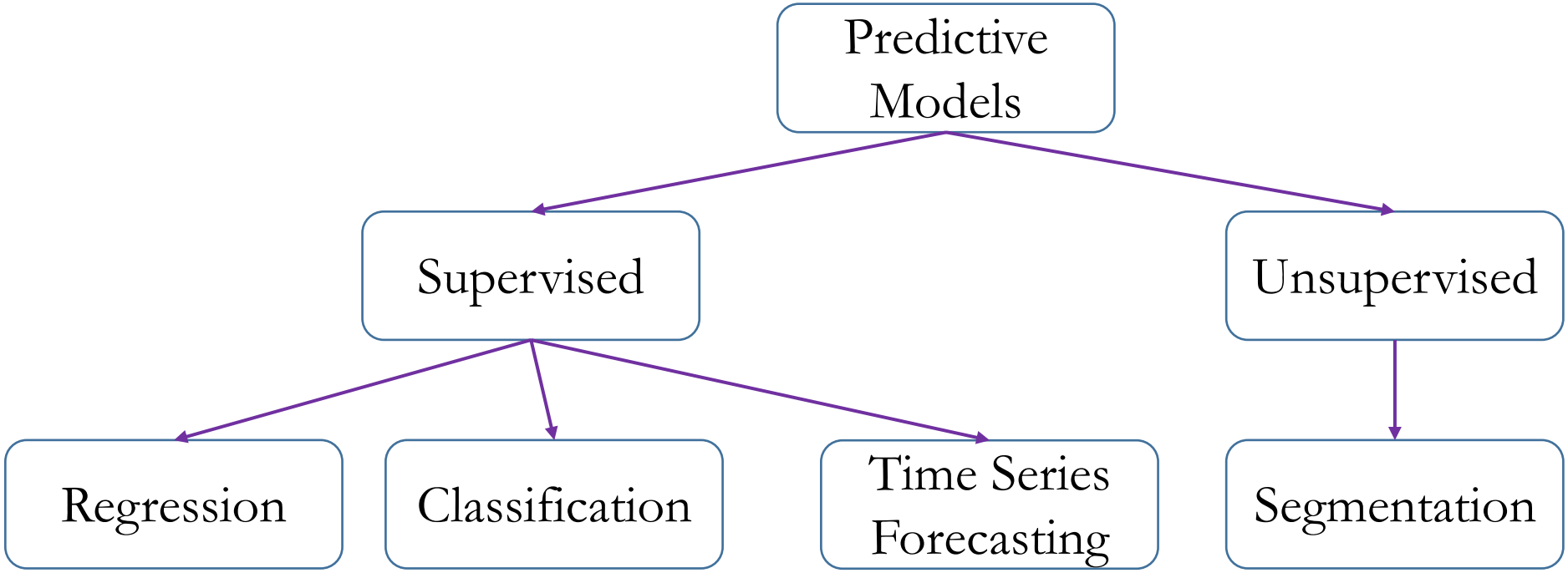
Office Hours

- Office Hours
  - Tuesday & Thursday 1 PM – 2 PM, Lillis 432
  - Schedule a Zoom meeting for an alternate time if you prefer remote support
  - Zoom link path: Canvas →Modules → General → Zoom Link
- Instructor
  - pradeepp@uoregon.edu
  - 541-346-3348

Communication Rules

- Use canvas or your **uoregon.edu** email for communication
- Unlikely to receive a response to emails sent from personal email IDs
- Lecture accent
  - English is neither my mother tongue nor I was born/grew in an English-speaking country
  - Stop and ask questions if you don't understand what I convey

Predictive Models



Famous examples/Real cases

- Pregnant prediction based on her prior purchases
  - Market to be mothers with coupons on baby related products
  - News about a surprised customer
- Moneyball : Predict players likely to contribute to winning team
  - Oakland Athletics assembled a competitive team with less-than stellar budget
- Obama For America (OFA)
  - Predict who is likely to vote to Obama
  - Personalized campaigning to voters
- OKCupid/Tinder
  - Predict what forms of message content are most likely to produce a response
  - Suggest a prospect with content on introduction
  - Suggest matches based on your historical left/rights swipes
- Netflix recommender system
  - Customer demographics, watching hours, videos

Today's tasks

- Get familiarity with course page in canvas
  - Layout
  - Syllabus, Content, and resources
- Mark all crucial dates (& times) in your calendar
  - Group formation on canvas
  - Midterms
  - Homework's
  - Presentation
  - Project Report
- Register on https://www.kaggle.com/
  - Glance at datasets

Next Class

- Process to set up R & RStudio Software
- Software interface and demonstration
- Brief introduction to programming
- Sources of software online help and documentation

Thank You