

# Data Mining for Student Success and Perseverance

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# Chapter 1

## Preface

This report summarizes the work done by our team on using college registration records at three different anglophone CEGEPS in Montreal in order to find predictors of attrition.



## Chapter 2

# Introduction





## Chapter 3

# Literature

The most important relevant work for this project is (Jorgensen et al., 2009).



## Chapter 4

# Descriptive Statistics

Here in we will describe - the data set - the methods by which we label students at risk - the distributions of at-risk students by - demographic indicators - registration record indicators

### 4.1 Demographics across the colleges and major programs

### 4.2 Fraction of students who change colleges



## Chapter 5

# Methods Centered on Determining Predictive Factors

This chapter will be focused on methods which have a sound probabilistic framework, and allow for inference into the statistical importance of predictive factors.

- Logistic Regression
- Mixed Effects Models



## Chapter 6

# Methods centered on predicting at-risk students

This chapter will explore the use of machine learning algorithms whose primary focus is prediction. This comes at the expense of model interpretability, and this tradeoff will be discussed herein as well.

- Decision Trees and Random Forests
- Neural Networks

### 6.1 Example one

### 6.2 Example two





## Chapter 7

# Comparisons

This chapter will compare the effectiveness of the methods developed in the previous two chapters, and compare them to more basic approaches to identifying students at-risk.

For example, we know that some CEGEPs have implemented a policy whereby they identify students as being at risk based on their mid-term assessments: if the student receives a certain number of “at-risk” or “failing” results, they are automatically sent an email referring them to academic support services.

Based on this, we can ask the following research questions : - how effective is this approach at identifying students who drop-out? - how does this approach compare to our models from the previous chapters?

We begin with a basic logistic regression with demographic variables, and as well as the number of each type of results of mid-term assessment, for students in their last term at the college. With these predictors, we try to predict if students are about to graduate, or simply not register again.

	Estimate	Std. Error	z value	Pr(> z )
<b>num_pass</b>	0.5877	0.02321	25.32	1.747e-141
<b>num_at_risk</b>	1.455	0.03664	39.7	0
<b>num_failing</b>	2.193	0.04653	47.15	0
<b>num_courses</b>	-0.7442	0.02373	-31.36	6.315e-216
<b>SexeM</b>	0.2111	0.0386	5.469	4.537e-08
<b>birth_placeQuebec</b>	-0.5914	0.04815	-12.28	1.108e-34
<b>LangueMaternelleAU</b>	-0.193	0.05173	-3.731	0.0001907
<b>LangueMaternelleFR</b>	0.3504	0.04914	7.13	1.006e-12
<b>(Intercept)</b>	0.5654	0.0694	8.147	3.741e-16

(Dispersion parameter for binomial family taken to be 1 )

Null deviance:	24452 on 18370 degrees of freedom
Residual deviance:	17188 on 18362 degrees of freedom



## Chapter 8

# Continuing Education at Dawson

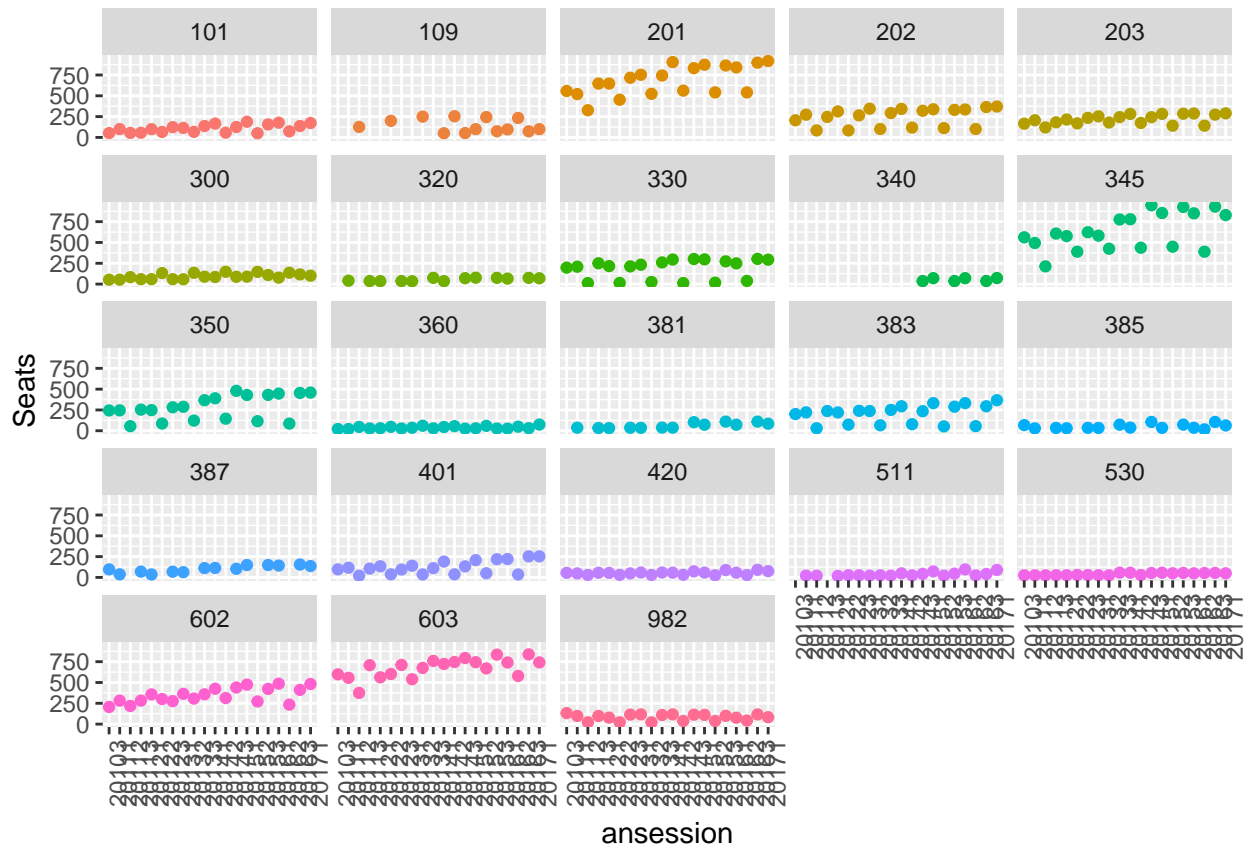
The department of Continuing at Education offers evening courses across many disciplines throughout the year. The purpose of this report is to give a broad overview of the demographics and sector-level metrics for students taking courses within Cont Ed.

### 8.1 Services

Herein, we look at the services offered by the Division of Continuing Education.

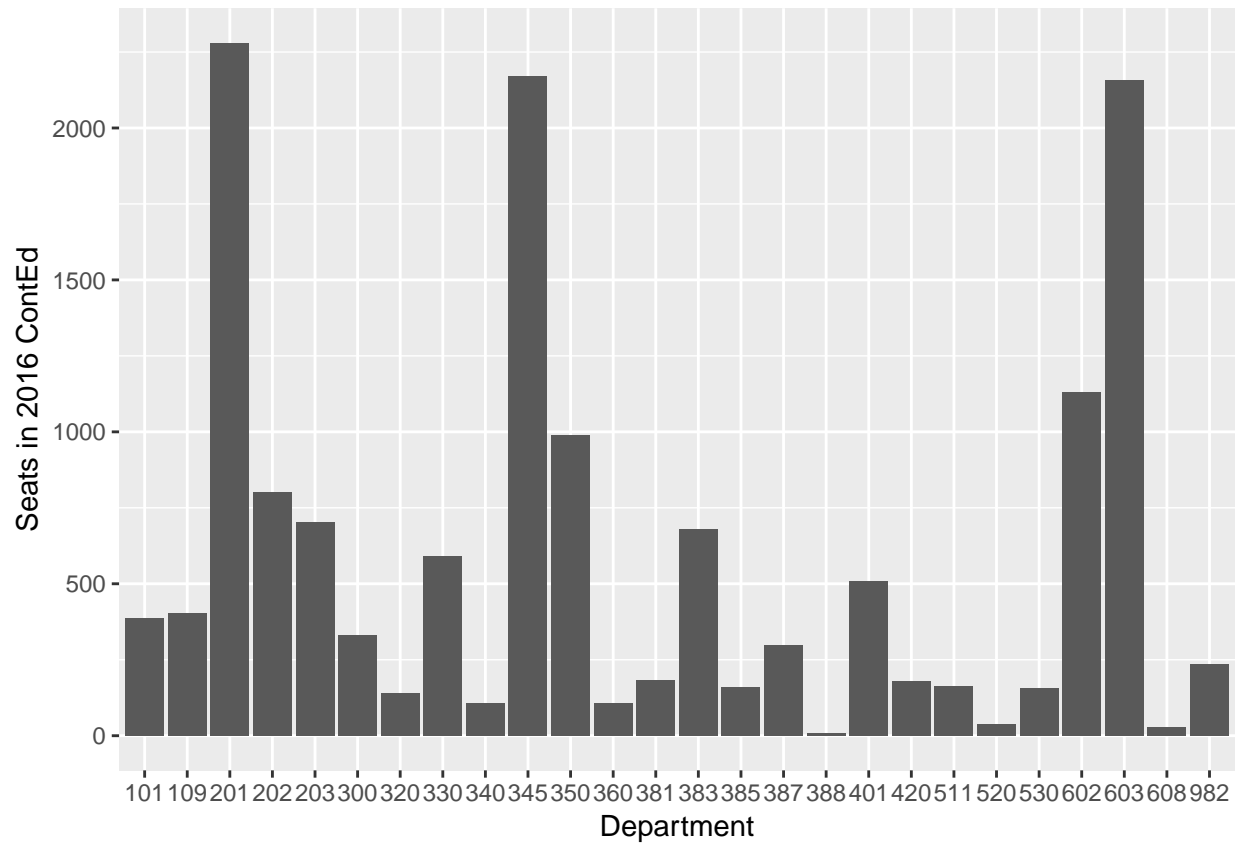
#### 8.1.1 Continuing Education's Growth over Time

How have each of the departments increased their ContEd offerings over time?



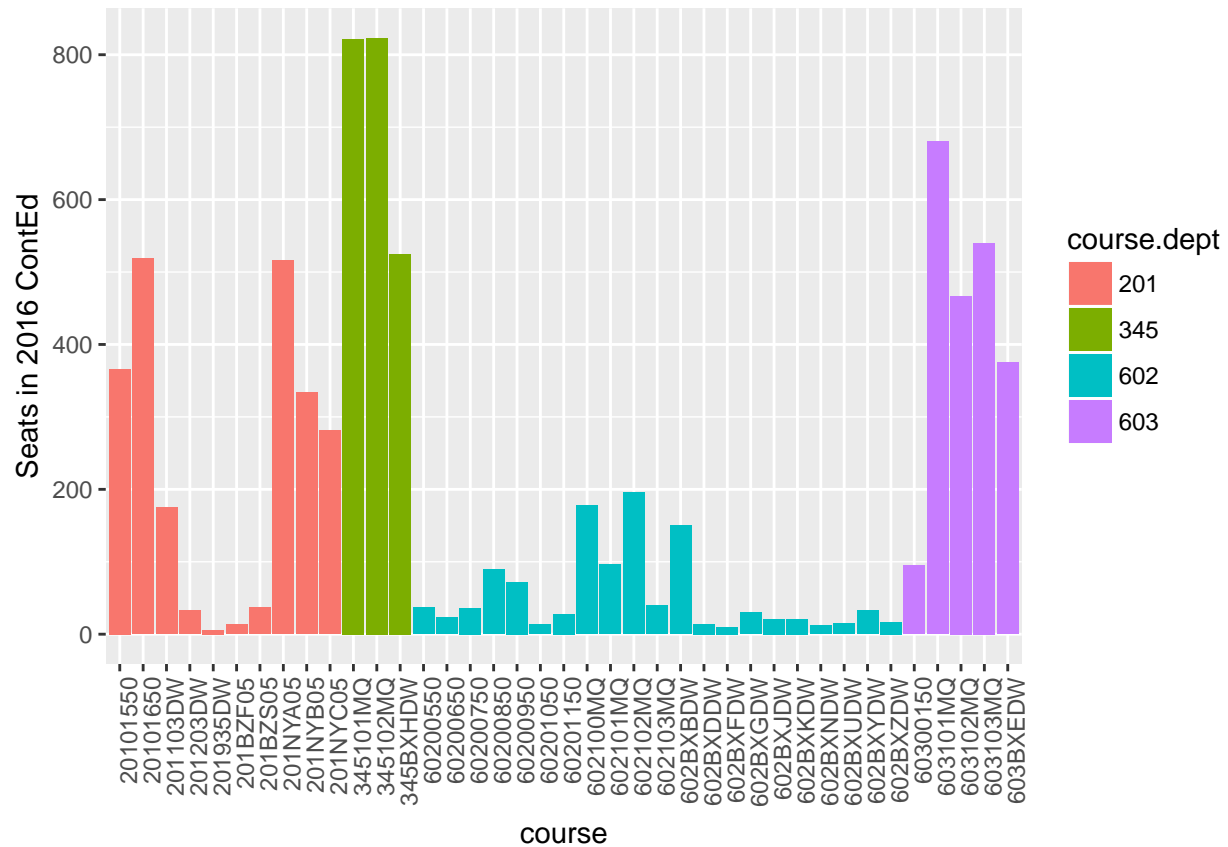
### 8.1.2 Department Level Seat Distributions

Which parts of Continuing Education are the most important in 2016?



### 8.1.3 Course Level distributions

If we look at the three most important departments (Math, Humanities and English) in 2016, how are the seats distributed across courses?



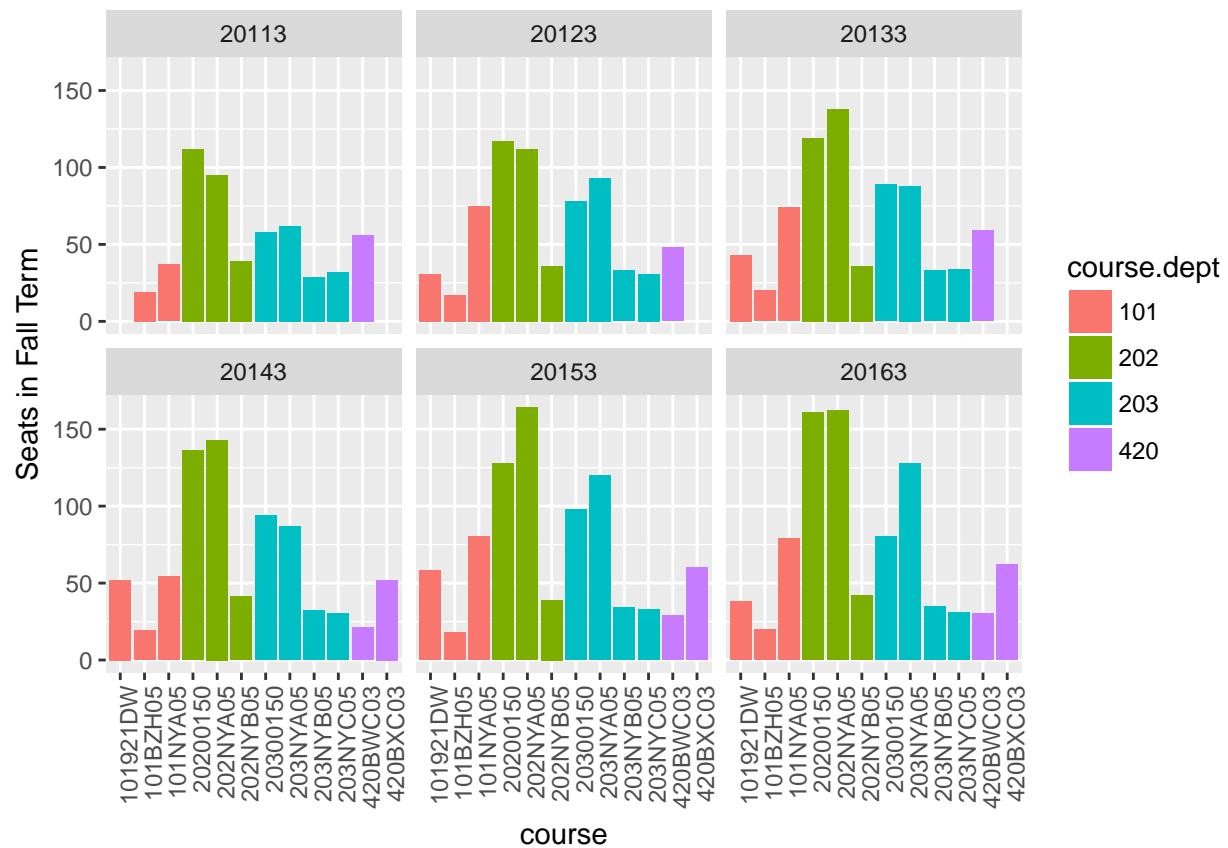
### 8.1.4 Specialized spaces

If we look at the departments that require specialized spaces (i.e. labs), in 2016, how are the seats distributed by course? - Has this evolved over time? - What are the seasonal variations?

## 8.1.4.1 Winter

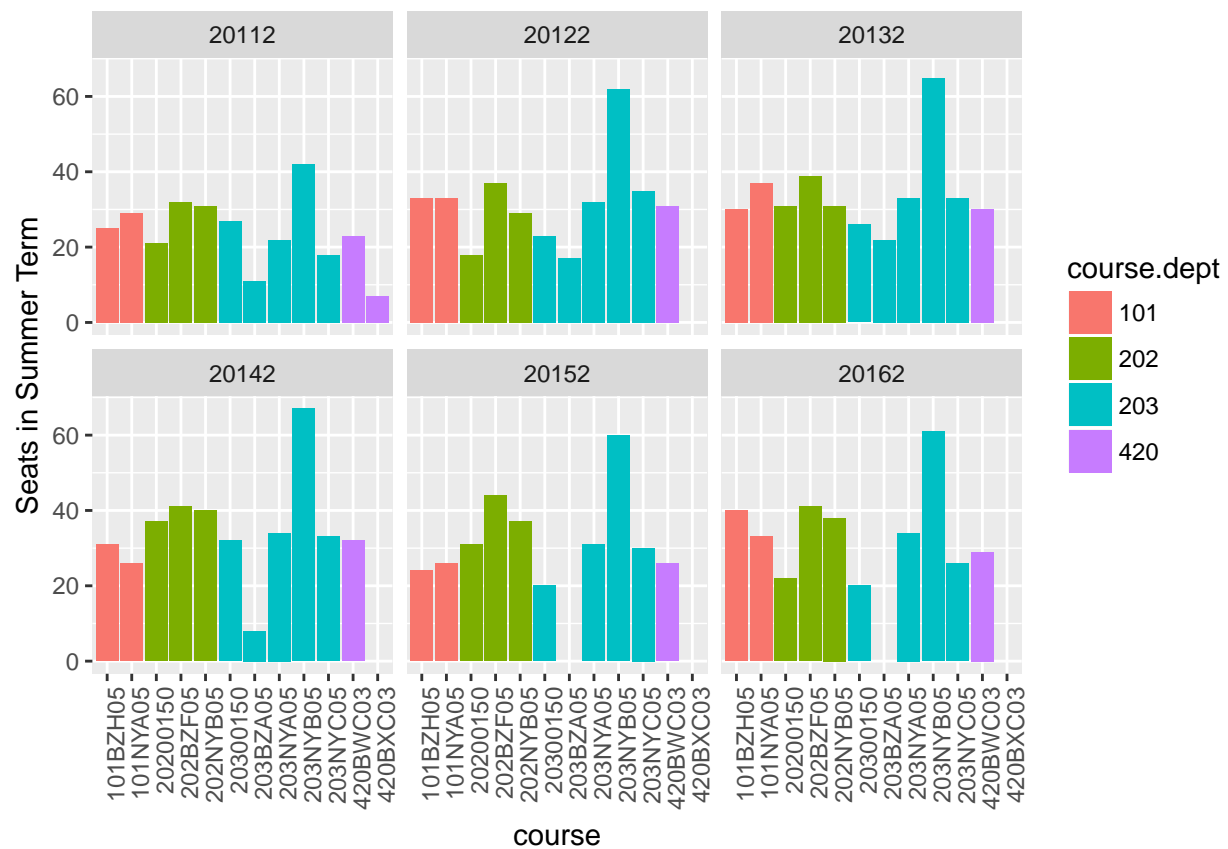


## 8.1.4.2 Fall





## 8.1.4.3 Summer

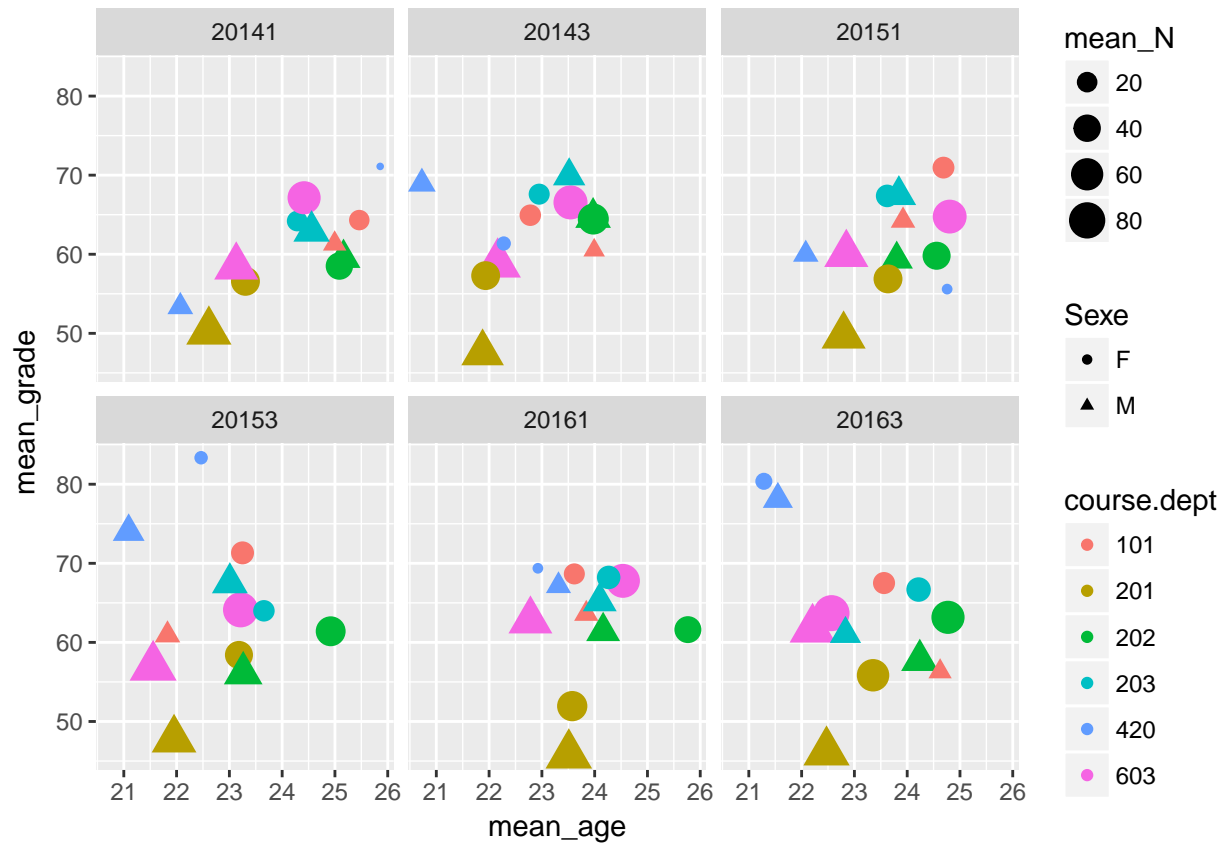


## 8.2 Students

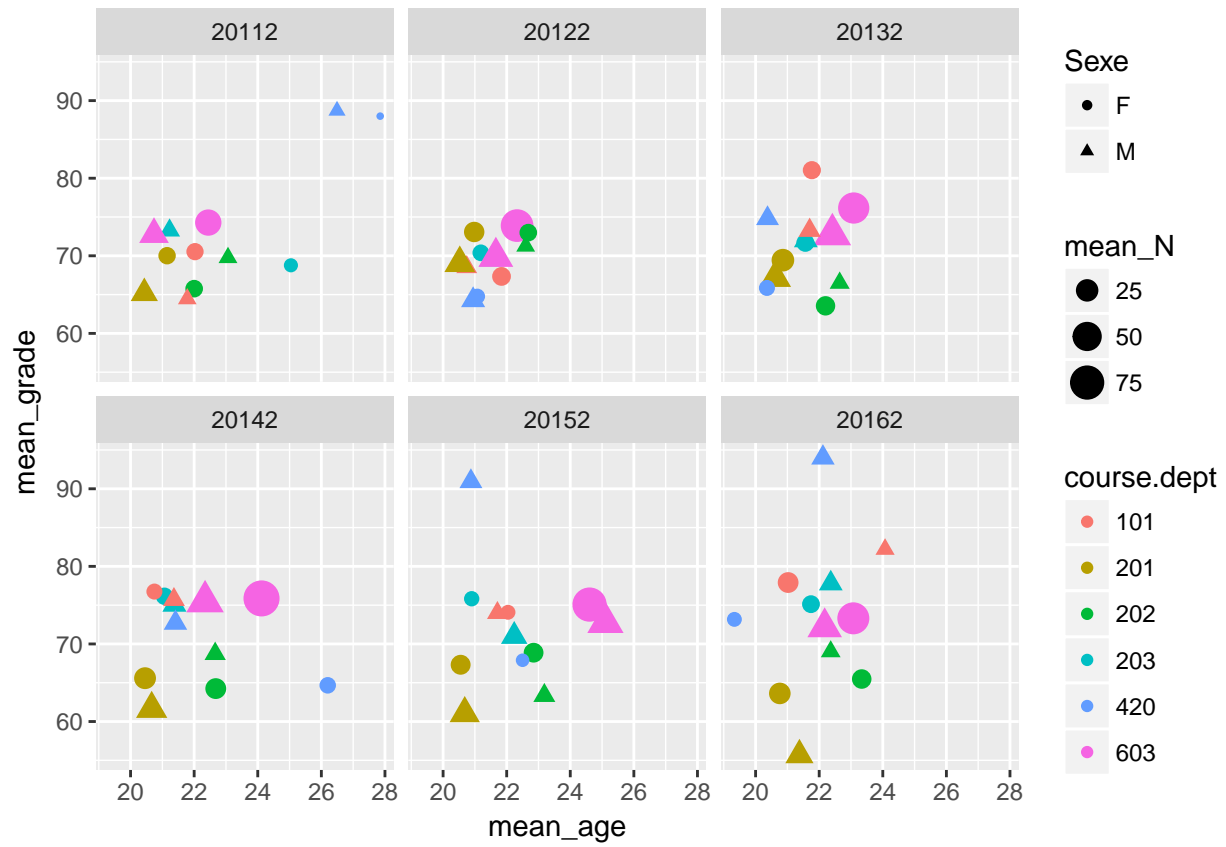
## 8.2.1 Demographics

Who are the students using continuing education services?

- are there gender differences?
- are there age differences?
- do these demographics change over time?
- are there seasonal variations?
- are there differences in different departments?



What is impact of condensed summer term?



### 8.2.2 Success Rates

To come...



## Chapter 9

# Final Words

We have finished a nice book.



# Bibliography

Jorgensen, S., Fichten, C., and Havel, A. (2009). *Predicting the At Risk Status of College Students: Males and Students with Disabilities. Final Report Presented to PAREA, Spring 2009.*