

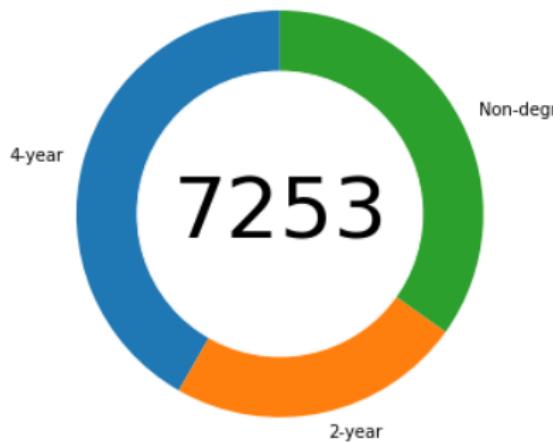
# Predicting school closings from the DOE College Scorecard

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# Number of US Postsecondary Institutions

2012-2013



2016-2017

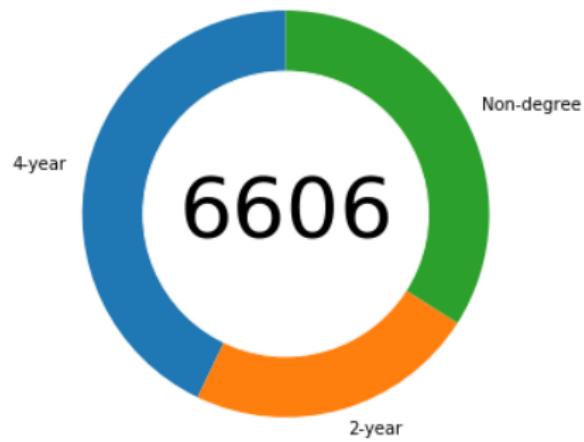


Figure: Distribution of US colleges by degree type for AY 2012-13 (left) and 2016-2017 (right).

Source: U.S. Department of Education, National Center for Education Statistics. (2019). Digest of Education Statistics, 2018 (NCES 2020-009), Chapter 2., <https://nces.ed.gov/fastfacts/display.asp?id=84>

# Closing of US postsecondary institutions



postsecondary  
institutions closed  
between 2012-2013 and  
2016-2017.

**ITT Technical Institute** closed 130+ campuses in 2016, affecting more than 40,000 students and 8,000 faculty

<https://www.insidehighered.com/news/2016/09/07/itt-tech-shuts-down-all-campuses>

**Cincinnati Christian University** stopped "offering accredited degree programs" in Fall 2019 <https://ccuniversity.edu/a-letter-to-our-students/>

# Can we predict which schools are likely to close?

## Why does it matter?

- ▶ Trends predict fewer college-going high-school graduates
- ▶ Rising tuition and student loan debt
- ▶ Financial strain from COVID-19

## Potential stakeholders:

- ▶ Prospective students (and parents)
- ▶ Faculty, staff, and support services
- ▶ College administrators, boards of trustees, and advisors
- ▶ Accrediting agencies, funding agencies and donors
- ▶ Employers looking to hire graduates

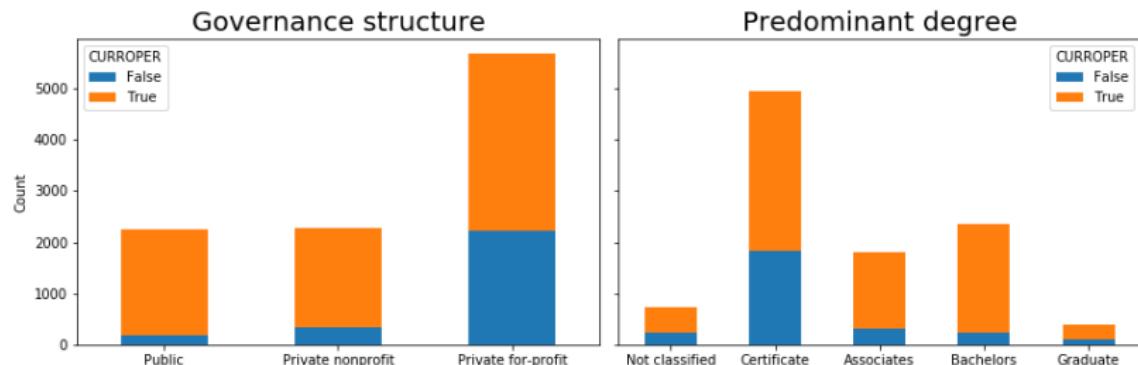
# The Data

## US Department of Education College Scorecard

(<https://collegescorecard.ed.gov/data/>)

- ▶ **Target variable** - currently operating (CURROPER)
- ▶ 10,200 observations x 32 features
  - ▶ 7441 schools operating in 2013
  - ▶ 2759 closed schools from 2010-2013
- ▶ School identifiers - OPEID, name, location
- ▶ Institutional features - governance, predominant degree, highest degree,
- ▶ Student features - enrollment, completion rates, median debt,
- ▶ Financial info - cost, tuition revenue, institutional expenditure, average faculty monthly salary

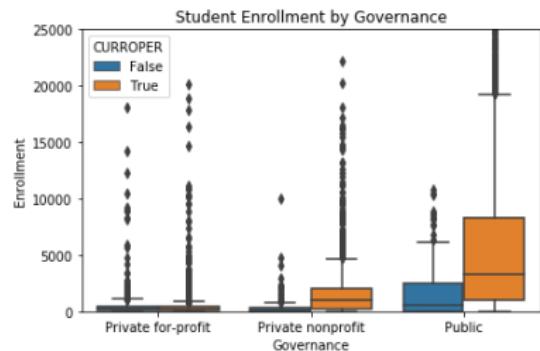
# Features of analyzed schools



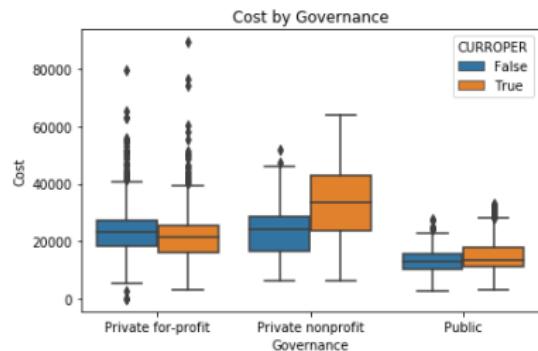
Distribution of schools in the data by governance (left), predominant degree (right), and whether they are currently operating (CURROPER).

# Features of analyzed schools

## Enrollment



## Price



Enrollment (left) and cost (right) of schools by governance structure and whether they are currently operating (CURROPER). In general, public schools are larger and less expensive than private schools. Private non-profit schools are slightly larger and more expensive than private for-profit schools, though private for-profit schools show more variation in enrollment and cost than private nonprofit schools.

# Recommendation

## Primary recommendation

Increase weekday and weekend rates to \$86.

- ▶ \$1.75 million in additional revenue assuming 350,000 customers

## Alternative proposal

Increase weekend rates to \$87; leave weekday rates at \$81

- ▶ 250,000 weekend customers - \$1.5 million
- ▶ 300,000 weekend customers - \$1.8 million

# Data Processing

**Missing** data - 13 of 27 columns contained missing data

- ▶ Filled with 0 if 'None' was a likely response
- ▶ Filled with column mean elsewhere

**Outliers** were analyzed and maintained

- ▶ Half of the resorts had at least one outlying value
- ▶ One 'yearsOpen' value changed from 2019 to 1

**Dropped** Region column - duplicates state information

**K-means analysis** - 3 clusters

# Modeling

Separate models for **weekday** and **weekend** prices

Linear regression model

## Model Performance Measures

Model	Weekday		Weekend		Features dropped
	EVS	MAE	EVS	MAE	
1	0.9353	5.2027	0.9413	4.8545	
2	0.9171	5.5386	0.9340	5.1694	state
3	0.9185	5.5315	0.9362	5.1068	state summit_elev

## Model 3 Results

	Weekday	Weekend
Prediction	\$76.41	\$87.57
Actual	\$81	\$81

Table: Actual and predicted ticket prices

	Weekday		Weekend	
	Factor	Coefficient	Factor	Coefficient
1	AdultWeekend	20.900254	AdultWeekday	20.049070
2	clusters	2.297560	clusters	2.622573
3	Snow Making_ac	1.742646	vertical_drop	2.011784
4	averageSnowfall	1.262723	triple	1.380078
5	Runs	1.210851	daysOpenLastYear	1.241385

Table: Top 5 predictive features and coefficients

## Weekend price by Resort size (acres of skiable terrain)

All US Resorts

Montana Resorts

Current **weekend** ticket price by acres of skiable terrain for all US ski resorts (left) and for ski resorts in Montana (right). The larger black dot represents Big Mountain Resort.

## Weekend price by Resort size (number of runs)

All US Resorts

Montana Resorts

Current **weekend** ticket price by number of runs for all US ski resorts (left) and for ski resorts in Montana (right). The larger black dot represents Big Mountain Resort.

# Conclusions

- ▶ In Montana - current Big Mountain price is highest; second largest resort with many runs
- ▶ Nationally - current weekend prices are below model predictions.
- ▶ Raising weekend ticket prices to \$86-\$87 would bring in sufficient additional revenue to cover the operating cost of the new chairlift.