



# PREDICTING BANKRUPTCIES OF LARGE PUBLIC COMPANIES

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# INTRODUCTION

## JCPenney files for bankruptcy



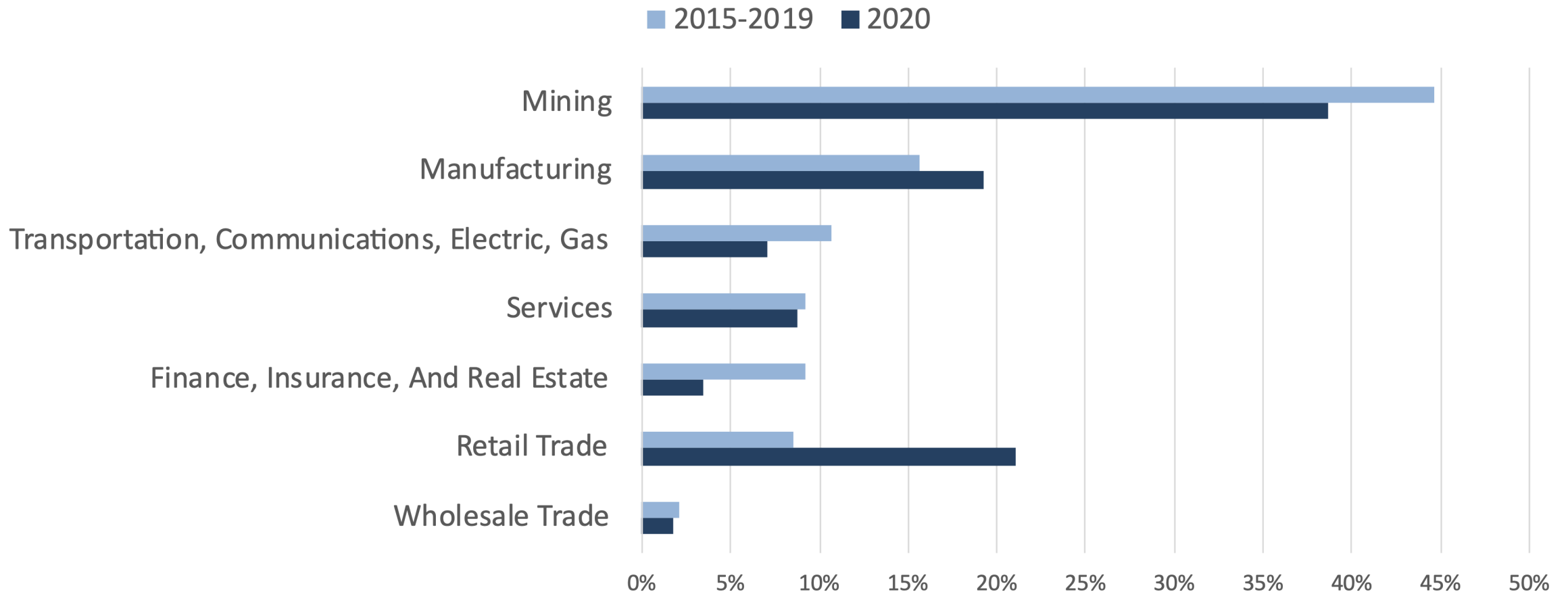
By Chris Isidore and Nathaniel Meyersohn, CNN Business

Updated 10:21 PM ET, Fri May 15, 2020

**New York (CNN Business)** — JCPenney filed for bankruptcy on Friday, the latest retail giant to see its downfall hastened by the coronavirus crisis. The pandemic was the final blow to a 118-year-old company struggling to overcome a decade of bad decisions, executive instability and damaging market trends.

<https://www.cnn.com/2020/05/15/business/jcpenney-bankruptcy/index.html>

# LARGE PUBLIC COMPANY BANKRUPTCIES BY INDUSTRY



# CLASSIFICATION MODEL



Large public companies in U.S.



Assets over \$100 million



Bankruptcy 2020 despite pandemic

# DATA SOURCES

## ■ Features

- Annual financial report filings
- Securities and Exchange Commission

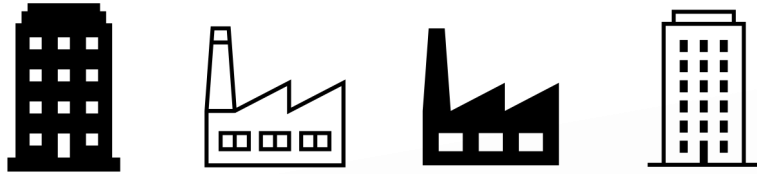
## ■ Target

- List of bankruptcy filings
- Large public companies



**UCLA** School of Law

# MODEL DEVELOPMENT



**BANKRUPTCY**

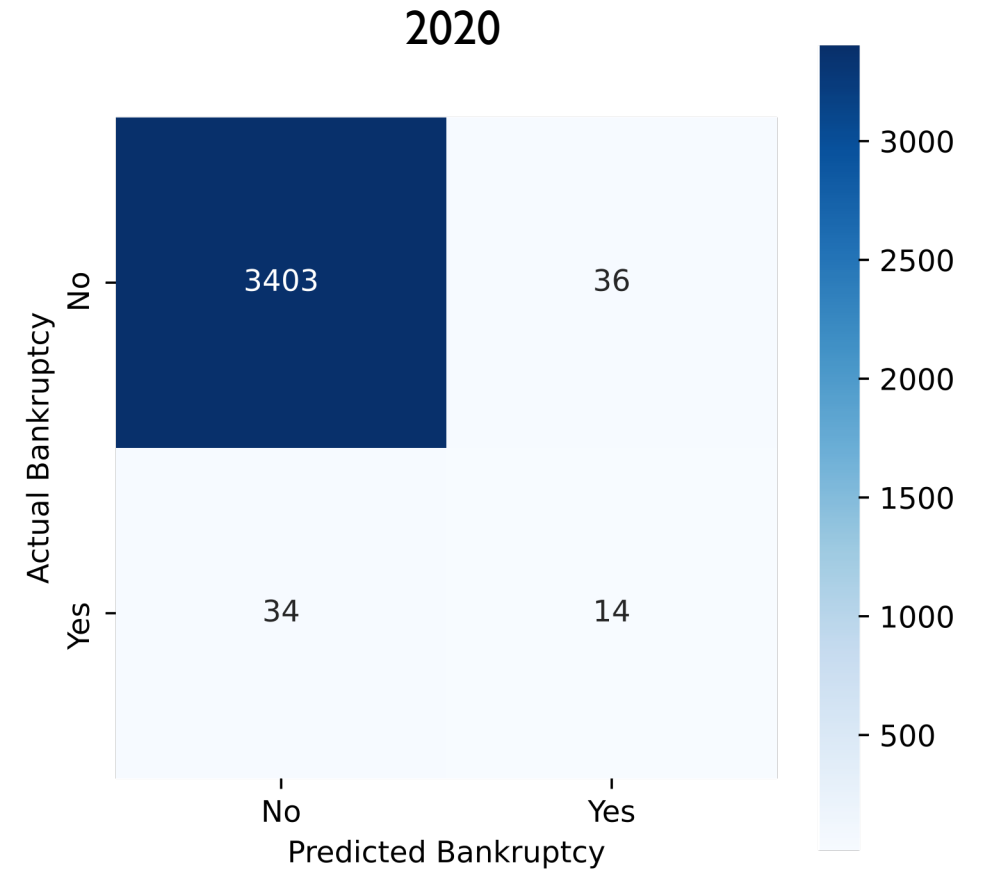
- 2014-2018 annual financial reports
- Calculate accounting ratios
- Bankruptcy within one year of report
- Oversample minority
- Block cross-validation
- Focus on Recall

# RESULTS

- Missing data
- Random Forest model
- Refined bankruptcy list

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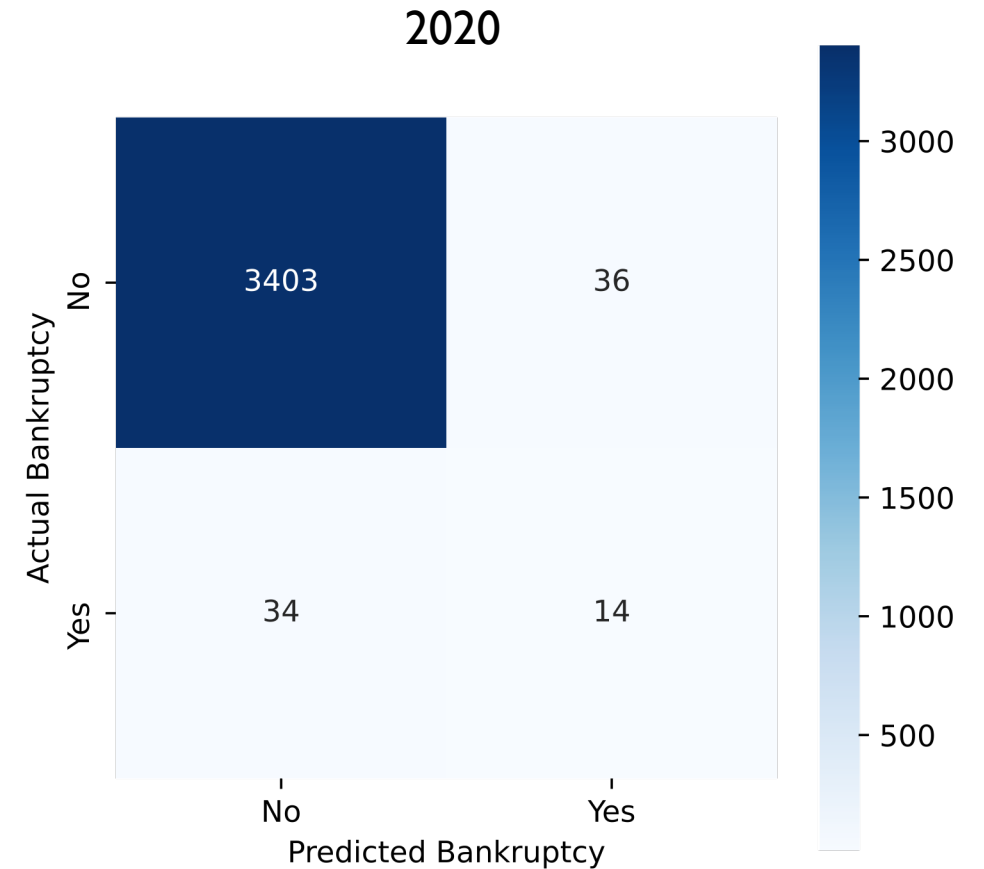
- Missing data
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# RESULTS

- Features Most Used
  - Mining Industry
  - Net Income/Loss
  - Earnings per share (EPS)
  - Return on assets (ROA)



# CONCLUSIONS

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2. Inconclusive if 2020 bankruptcies were predictable.
3. Companies can delay submitting their required reports to the SEC and can customize report inclusions.

# FUTURE WORK



- Financial data sources
- Different algorithms
- News articles



THANK YOU!



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# APPENDIX

## PREDICTING BANKRUPTCIES OF LARGE PUBLIC COMPANIES

# DATA SOURCES

- U.S. Securities and Exchange Commission (SEC) annual financial 10-K report filings from public companies.
  - 2014Q1 – 2019Q3, Google Public Cloud U.S. SEC Public Dataset
  - 2019Q4 – 2020Q3, SEC website <https://www.sec.gov/dera/data/financial-statement-data-sets.html>
  - SEC EDGAR filings search
- UCLA Bankruptcy Research Database
  - <https://lopucki.law.ucla.edu/spreadsheet.htm>



# DATA HANDLING

- Large public companies are supposed to file their 10-K reports with the SEC within 90 days of fiscal year end. Many ask for extensions. Obtained reports submitted to the agency through 2020Q3 to include the data for fiscal years ending 2019.
- Almost all companies keep resubmitting previous year 10-K data. Forward fill and backward fill of missing values was done within same company and report end date. Then the financial data was filtered to only one entry per company and report date.
- Filled missing balance sheet entries with assumption company has balanced financials.
- Three companies who had bankruptcies in 2020 did not file any 2019 reports with the SEC: Neiman Marcus, Centric Brands, and AAC Holdings, INC.

# MODEL DEVELOPMENT

- Data was split strategically into three block cross-validation sets:
  - Training 2014 and 2015 data, validation on 2016 financial data and bankruptcies in 2017
  - Training 2015 and 2016 data, validation on 2017 financial data and bankruptcies in 2018
  - Training 2016 and 2017 data, validation on 2018 financial data and bankruptcies in 2019
- Final model trained on all training and validation data 2014-2018
- Test holdout of 2019 financial data and bankruptcies in 2020

# FINAL MODEL FEATURES

## Financial Statement Values

- Assets
- Assets Current
- Liabilities
- Liabilities Current
- Net Income/Loss
- Stockholders Equity
- Operating Income Loss
- Earnings Per Share Diluted

## Accounting Ratios

- Debt ratio
- Debt equity ratio
- Current ratio
- Leverage
- Return on equity
- Return on assets
- Gross profitability ratio

**For all Accounting Ratios,  
deviation from industry division**

## Industry Divisions

- Agriculture, Forestry and Fishing
- Mining
- Construction
- Manufacturing
- Transportation, Communications, Electric, Gas and Sanitary service
- Wholesale Trade
- Retail Trade
- Finance, Insurance and Real Estate
- Services

# TRUE POSITIVES

Company	Bankruptcy
CHAPARRAL ENERGY, INC.	8/16/20
CHESAPEAKE ENERGY CORP	6/28/20
COVIA HOLDINGS CORP	6/29/20
EXTRACTION OIL & GAS, INC.	6/14/20
FORESIGHT ENERGY LP	3/10/20
GNC HOLDINGS, INC.	6/23/20
LONESTAR RESOURCES US INC.	9/30/20
LSC COMMUNICATIONS, INC.	4/13/20
MCCLATCHY CO	2/13/20
MCDERMOTT INTERNATIONAL INC	1/21/20
PIER 1 IMPORTS INC/DE	2/17/20
PIONEER ENERGY SERVICES CORP	3/1/20
SUPERIOR ENERGY SERVICES INC	12/7/20
ULTRA PETROLEUM CORP	5/14/20

# FALSE NEGATIVES

Company	Bankruptcy	Company	Bankruptcy
AKORN INC	5/20/20	J C PENNEY CO INC	5/15/20
ASCENA RETAIL GROUP, INC.	7/23/20	J CREW GROUP INC	5/4/20
BRIGGS & STRATTON CORP	7/20/20	JASON INDUSTRIES, INC.	6/24/20
CALIFORNIA RESOURCES CORP	7/15/20	LIBBEY INC	6/1/20
CARBO CERAMICS INC	3/29/20	OASIS PETROLEUM INC.	9/30/20
CBL & ASSOCIATES PROPERTIES INC	11/1/20	PENNSYLVANIA REAL ESTATE INVESTMENT TRUST	11/1/20
CEC ENTERTAINMENT INC	6/24/20	PYXUS INTERNATIONAL, INC.	6/15/20
DENBURY RESOURCES INC	7/30/20	QUORUM HEALTH CORP	4/7/20
DIAMOND OFFSHORE DRILLING, INC.	4/26/20	ROSEHILL RESOURCES INC.	7/26/20
FRONTIER COMMUNICATIONS CORP	4/14/20	RTW RETAILWINDS, INC.	7/13/20
FTS INTERNATIONAL, INC.	9/22/20	STAGE STORES INC	5/10/20
GLOBAL EAGLE ENTERTAINMENT INC.	7/22/20	STEIN MART INC	8/12/20
GULFPORT ENERGY CORP	11/13/20	TAILORED BRANDS INC	8/2/20
HERTZ GLOBAL HOLDINGS, INC	5/22/20	TOWN SPORTS INTERNATIONAL HOLDINGS INC	9/14/20
HI-CRUSH INC.	7/12/20	TUESDAY MORNING CORP/DE	5/27/20
HORNBECK OFFSHORE SERVICES INC /LA	5/19/20	UNIT CORP	5/22/20
INTERNAP CORP	3/16/20	WHITING PETROLEUM CORP	4/1/20

# FALSE POSITIVES

Company	Bankruptcy	Company	Bankruptcy
ALTA MESA RESOURCES, INC. /DE	9/11/19	LILIS ENERGY, INC.	
APACHE CORP		NINE ENERGY SERVICE, INC.	
BASIC ENERGY SERVICES, INC.		NORTHERN OIL & GAS, INC.	
BRISTOW GROUP INC	5/11/19	PAR PACIFIC HOLDINGS, INC.	
CENTRUS ENERGY CORP		PARKER DRILLING CO /DE/	12/12/18
CHAPARRAL ENERGY, INC.	5/9/16	PG&E CORP	1/29/19
COMSTOCK RESOURCES INC		PROSPER MARKETPLACE, INC	
CONSOL COAL RESOURCES LP		RIVIERA RESOURCES, INC.	
CSI COMPRESSCO LP		SANDRIDGE ENERGY INC	5/16/16
DEAN FOODS CO	11/12/19	SMTA LIQUIDATING TRUST	
EP ENERGY CORP	10/3/19	SOUTHWESTERN ENERGY CO	
EP ENERGY LLC	10/3/19	SUMMIT MATERIALS, INC.	
HALLADOR ENERGY CO		SUNDANCE ENERGY INC.	
HARVEST OIL & GAS CORP.		TELLURIAN INC. /DE/	
HEXION INC.	4/1/19	U.S. SILICA HOLDINGS, INC.	
HIGHPOINT RESOURCES CORP		U.S. WELL SERVICES, INC.	
KEY ENERGY SERVICES INC	10/24/16	ULTRA PETROLEUM CORP	4/29/16
LEGACY RESERVES INC.	6/18/19	WINDSTREAM HOLDINGS, INC.	2/25/19