

HARNESS THE POWER OF ANALYTICS FOR YOUR
RISK MANAGEMENT PROGRAM

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AGENDA

- What is analytics?
- Big data
- Artificial intelligence: machine learning, vision, and deep learning
- Analytics and utilities
- Collaboration opportunities

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WHAT IS ANALYTICS?

- Discovery, interpretation & communication of meaningful patterns in data
 - Obvious and non-obvious relationships
- Inform fact-based decision-making
- Leverage statistical modeling & computer programming
- Predict, prescribe & improve



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WHAT IS ANALYTICS?

Part of your everyday life

- Social media
- Cell phone usage
- Weather sensors
- Vehicle mpg



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BIG DATA AND ITS IMPORTANCE

Big Data

- The large volume of data (structured and unstructured) that has the potential to be mined for information
- Importance of big data is not only how much you have, but what you do with it – smart data!
- Analytics help organizations harness their own and third party data, leading to
 - Cost reductions
 - Faster decision-making
 - New opportunities, products and services
 - Stronger customer insights

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BIG DATA

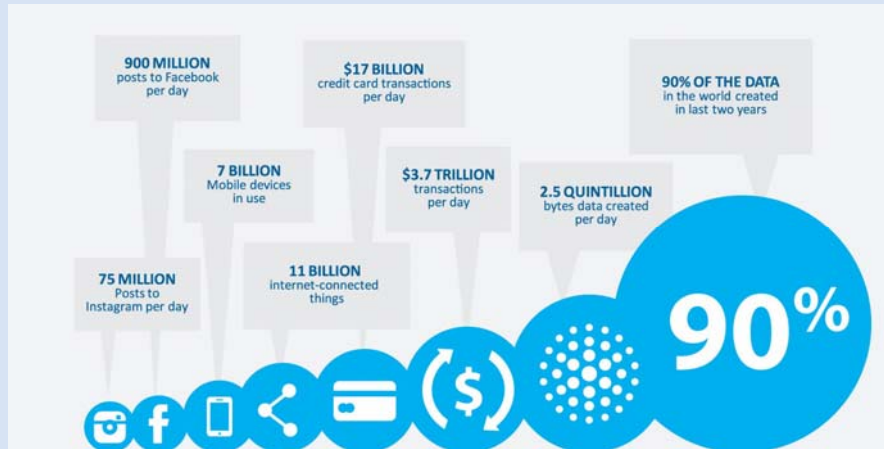
- User-generated vs. machine-generated content
 - Big data exists primarily because of the latter
- Computing power improvements
 - Cheaper, faster, and better
- Enter the Cloud
 - Storage ramifications
 - Accessibility
- Internet of Things



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BIG DATA



International Data Corporation (IDC) estimates that worldwide revenues for big data and data analytics will grow at ~12% and reach ~\$200 billion by 2020

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BIG DATA

- Big data & analytics in utilities industry
- Use patterns to
 - Forecast demand
 - Improve compliance with regulatory requests
 - Prevent fraud and reduce loss
 - Enhance customer service

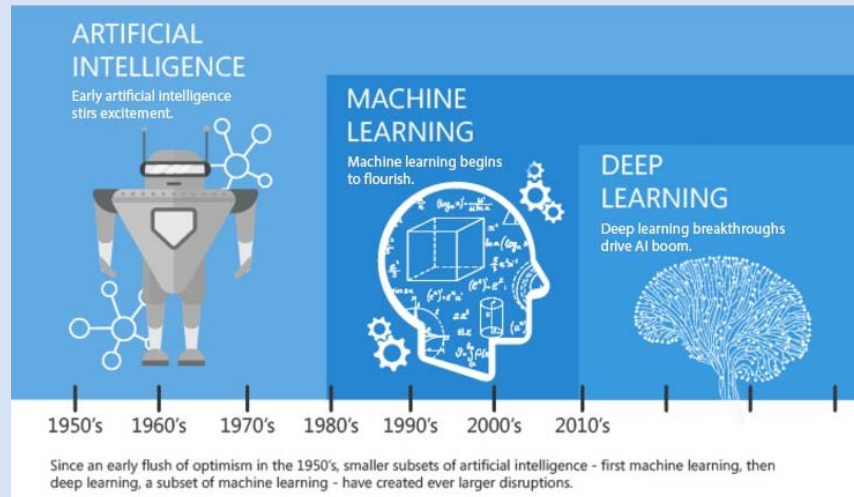


Example: Nest = thermostat monitors

- Collect data and show you when you're using the most energy based on usage
- Opportunity to save energy and money
- Collects data on patterns of when energy is used and predicts when most energy will be needed

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ARTIFICIAL INTELLIGENCE: MACHINE LEARNING, VISION, AND DEEP LEARNING



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“Artificial intelligence is the future. Artificial intelligence is science fiction. Artificial intelligence is already part of our everyday lives.”

- Michael Copeland (technology journalist)

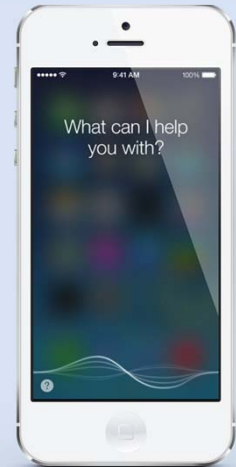
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Artificial Intelligence (AI)

Science of computers emulating functions of the human brain

- Machines are programmed with human-like properties
- The human brain seamlessly calculates our world around us
 - AI is the concept that a computer can do the same
 - Narrow vs. strong AI
- Siri or Alexa



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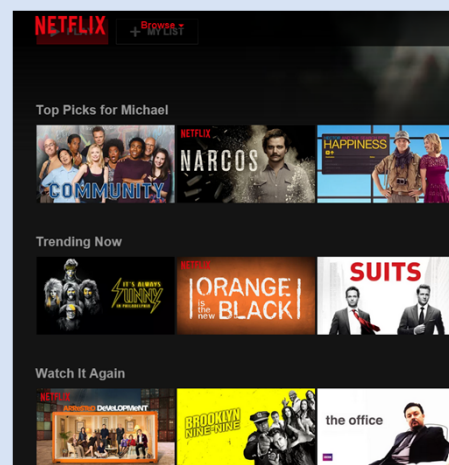
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Machine Learning

Machine learning is the building block of AI

- Method of how machines learn from data
- Computers can be trained to accomplish specific tasks
 - Builders and teachers
 - Processing large amounts of and recognizing patterns within data
 - Learn by example
- Netflix recommendation system



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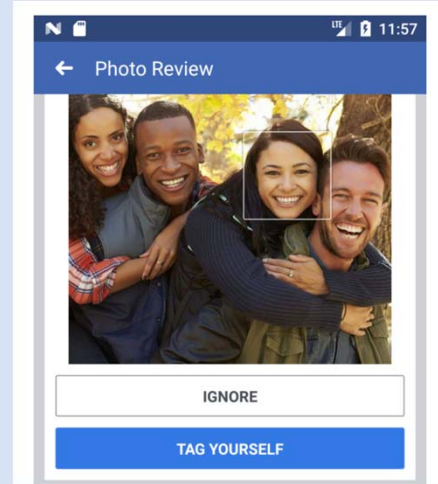
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Machine Vision

Machine vision is part of AI

- Training computers by feeding annotated images
 - Thousands to millions of images
- Complexity of image characteristics improving over time
- Facebook recommends friends for photo tagging



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Deep Learning

Deep learning is the next evolution of machine learning

- Learning based on example – neural network
- Moving from single function of the human brain to multiple functions
- Seeing and recognizing
- Driverless cars



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“Information is the oil of the 21st century, and analytics is the combustion engine.”

– Peter Sondergaard (Gartner Analyst)

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ANALYTICS AND UTILITIES

- Understanding the current state of power grids
 - Utility companies install sensors (PMUs) that monitor the power grid by measuring state of the grid 100x per second
 - Detect disruptions, identify cause and assess impact in real time
 - Consumers receive better service
 - Utilities increase power transmission efficiency and better address uncertainties in supply and demand



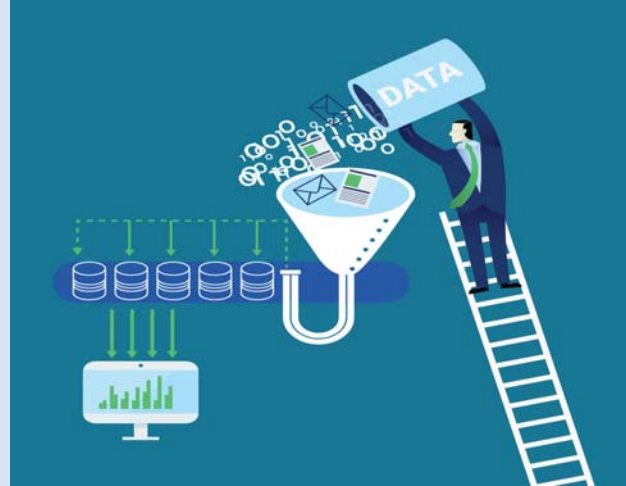
Source: www.sas.com

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ANALYTICS AND UTILITIES

- Collect, archive, organize, analyze and deliver utilities big data for predictive insights
- Feed new learning back into the system
- Through monitoring, can detect events never before seen
- Analyzing different data signatures to determine cause and impact of new events
- Data learned goes back into the monitoring system to handle the next event



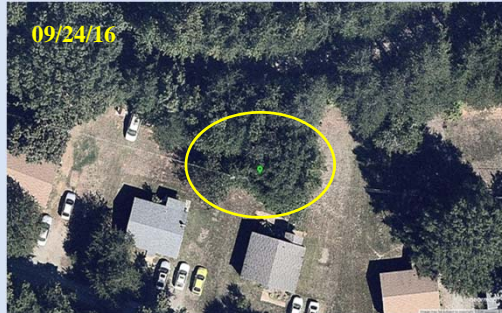
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With our expertise,
Athenium Analytics helps utilities

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COLLABORATION OPPORTUNITIES

- Application of machine vision and imagery to optimize vegetation management and check conditions of pipelines
- Develop machine-learning algorithms to detect and notify of dangerous vegetation growth

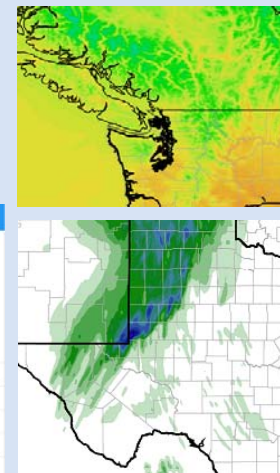


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COLLABORATION OPPORTUNITIES

- Hyper-local weather forecasts merged with big data for demand generation
- Temperature forecasting capabilities enhanced through machine-learning and cloud computing

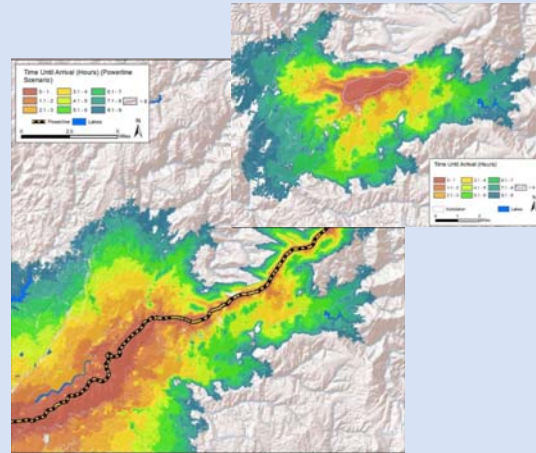


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COLLABORATION OPPORTUNITIES

- Use wildfire model to assess most vulnerable powerline corridors with predictive analytics around:
 - Time it will take for a fire to arrive at infrastructure
 - The rate at which a fire will move away from a line-caused ignition
 - The cumulative heat output that a given area is likely to experience
- Prioritize tree trimming areas
- Predict shut-down times for transmission lines before the fire hits
- Decrease future liabilities from powerline-caused fires

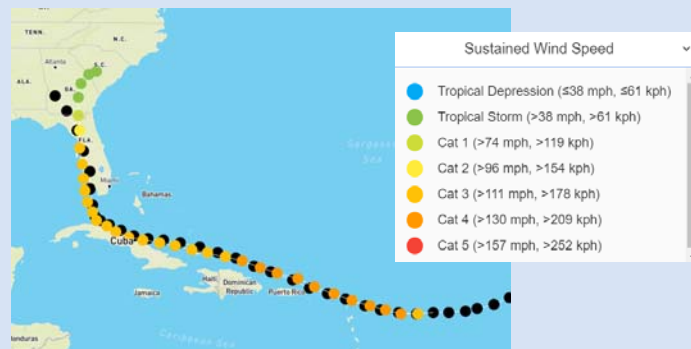


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COLLABORATION OPPORTUNITIES

- Predictive disruption analysis with super-ensemble tropical forecasting
- 10-day track and intensity forecasts utilizing machine-learning techniques

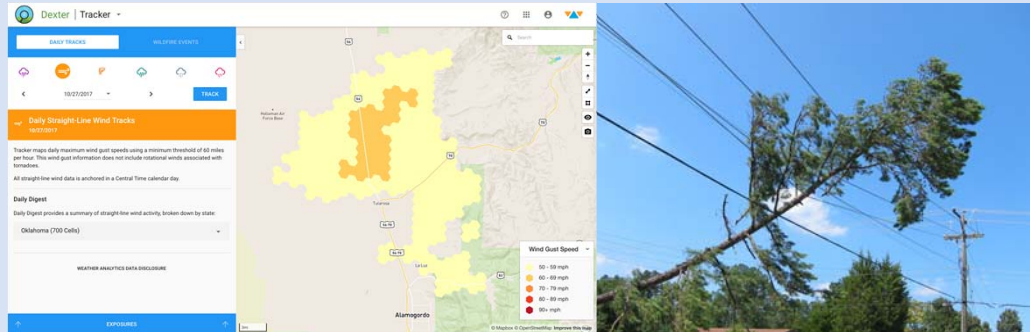


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COLLABORATION OPPORTUNITIES

- Hyper-granular weather event verification in near-real time for storm impact analysis and resource allocation



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TO SUM IT UP

- Big data + high-powered analytics = accomplish business-related tasks
- Athenium Analytics data put to work: **FirstEnergy**

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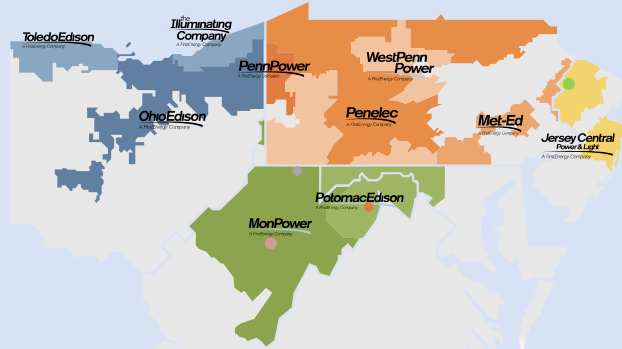
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FIRSTENERGY OVERVIEW

- Ten operating companies serving ~6 million customers across six states
 - One of the largest contiguous service territories in the US
 - Includes 3,790 MW of regulated generation; primarily serving West Virginia
- One of the largest transmission systems in PJM with ~24,500 miles



Regulated Distribution Companies

State	Operating Companies
Ohio	OE, CEI, TE
Pennsylvania	ME, PN ⁽¹⁾ , PP, WPP
New Jersey	JCP&L
West Virginia	MP, PE-WV
Maryland	PE-MD

Regulated Generating Plants

Plant	MW	Fuel Type
Harrison 1-3	1,984	Supercritical Coal
Fort Martin 1-2	1,098	Supercritical Coal
Bath County	487	Hydro
Yards Creek	210	Hydro
OVEC	11	Subcritical Coal
Total	3,790	

⁽¹⁾ Includes 4K customers in New York

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A GROWING PROBLEM



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PROJECT GOALS & SUMMARY

- Historic claims analysis to support a safety outreach campaign
- Analyze a dataset of 1,471 insurance claims against FirstEnergy electric utility companies from 1978 to 2017
- Cluster and re-classify exposures based on claims text descriptors
- Focus on claim outcome and frequency rather than cost
- No geographic data, so exposure trends were analyzed against date, company, and limit

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EXPOSURE CLASSES

WA Class	Occupancy in each
Electrical	Electrocution, EMF
Stray voltage	Stray voltage (sub-class of electrical)
Workers' comp	Workers' compensation (WCA)
Pollution	Pollution, gas plants, chemicals
Auto	Auto, all types
Legal	Legal, including service interruptions, breach of contract, or failure to service
Property	Property and weather, including fire, flood, wind
Other	Other, not otherwise classified – usually mixed claims
Asbestos	Removed – any asbestos claim
WA class	Occupancy in each

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EXPOSURE STATISTICS – NON-WCA

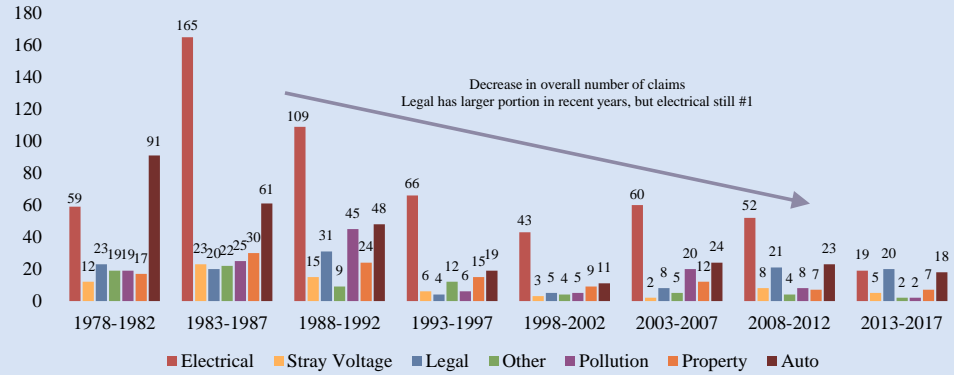
% of non-WCA 1978-2017

Electrical	41%
Auto	21%
Legal	9%
Pollution	9%
Property	9%
Other / Mixed	5%
Stray Voltage	5%

% of non-WCA 2008-2017

Electrical	36%
Legal	21%
Auto	21%
Property	7%
Stray Voltage	7%
Pollution	5%
Other / Mixed	3%

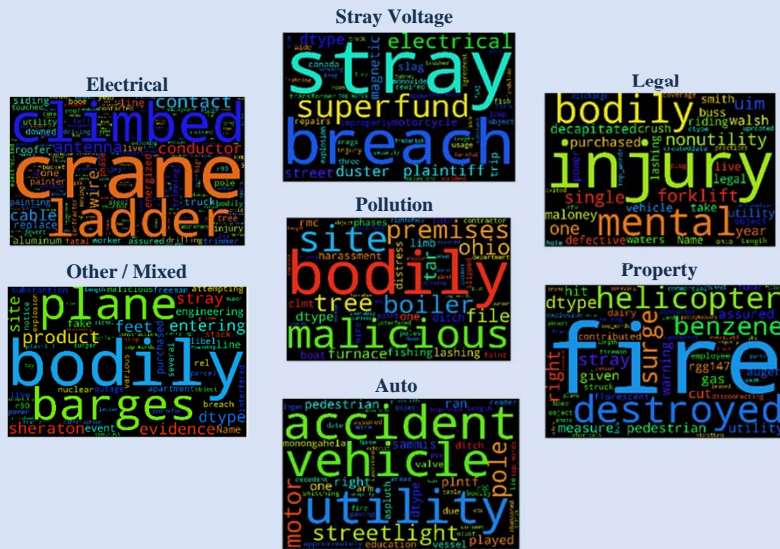
FirstEnergy Loss Trends, after LDA



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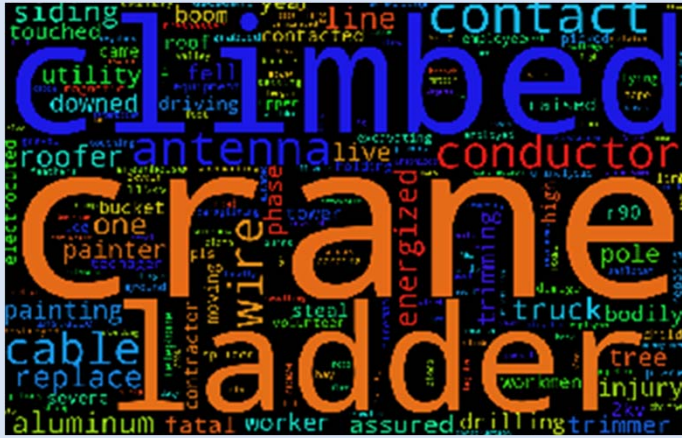
WORD CLOUDS BY EXPOSURE

In word clouds, certain noun forms are given preference, based on the highest-frequency verb forms near the nouns. As a result, nouns will be more prominent than verbs in word clouds.



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ELECTROCUTION

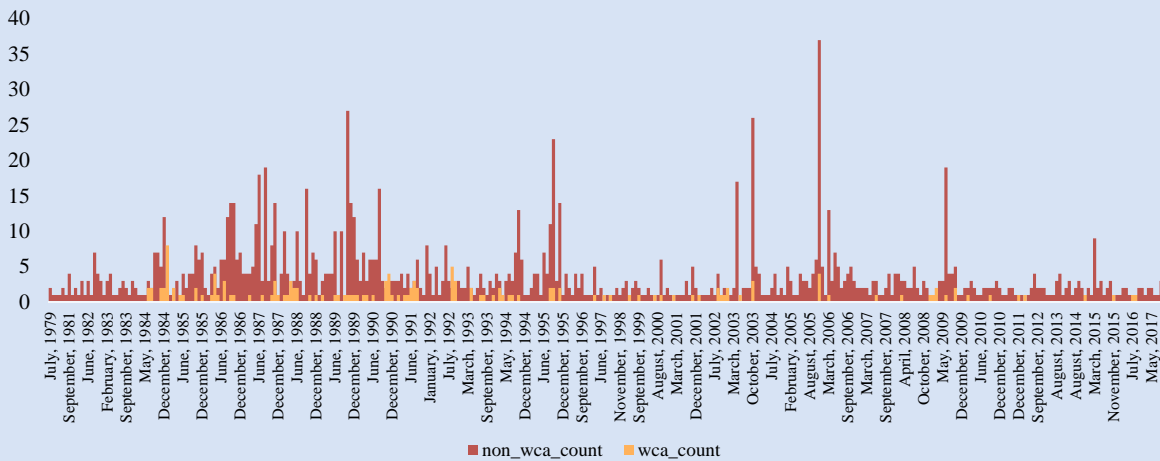


Word	Count
Contacted / contact	367
Line / lines	267
Wire	108
Fell	92
Overhead	85
Pole	70
Conductor	63
Energized	62
Truck	61
Electrocuted	59
Working	58
Ladder	56
Crane	56
Tree	55
Contractor	51
Cable	48
Power	48
Electrical	48
Ground	41
Aluminum	38

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LOSSES, BY MONTH

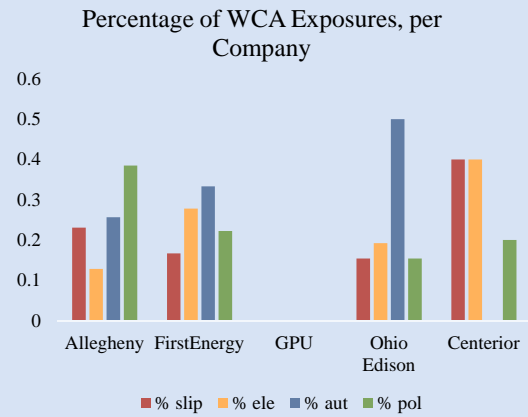
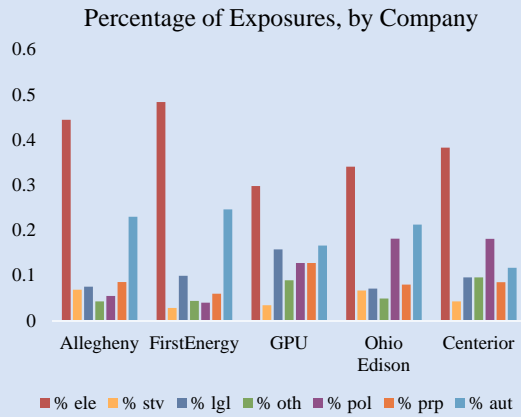
Reported counts by month, comparison between WCA and non-WCA claims



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LOSSES, BY COMPANY

A potential way to implement a safety campaign is to focus on companies / locations with a high percentage of a certain exposure



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WHAT'S NEXT...

- Mine and improve the data
 - Geographic locations
 - Demographics
 - Weather
 - Time
- Increase peer participation
- Analyze
- Create programs

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