Data Science and AI in Insurance

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DAV Jahrestagung 2021

The impact of AI on the future of insurance: 2030 vision

- Time between invention and implementation has been shrinking (~50% for each GPT wave)
- Difficult to leapfrog over GPTs

"This is a moment of choice and opportunity. It could be the best 10 years ahead of us that we have ever had in human history or one of the worst, because we have more power than we have ever had before."

Erik Brynjolfsson
Director of the MIT Initiative on the Digital Economy

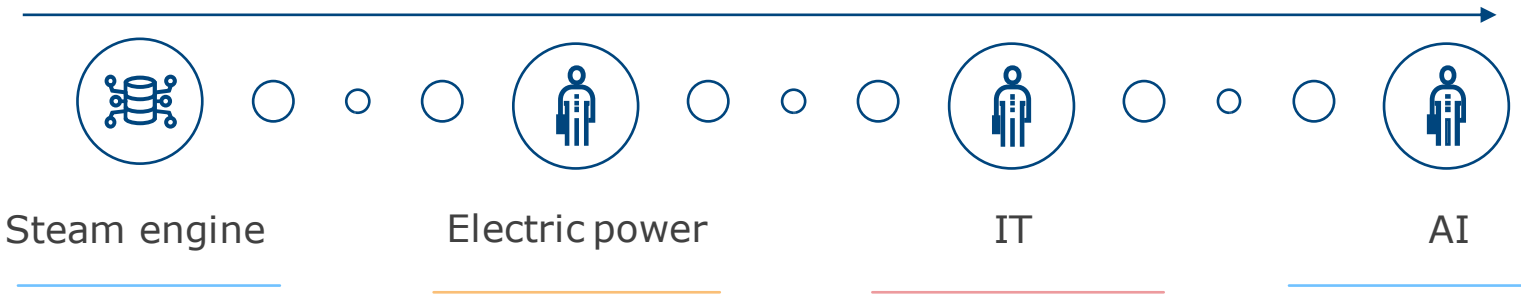

Image: monsitji / Getty Images

Content: https://www.brookings.edu/blog/future-development/2020/01/17/whoever-leads-in-artificial-intelligence-in-2030-will-rule-the-world-until-2100/

PWC's AI study assesses the impact on insurance with a 3.6

AI Impact

- By 2030, 58% of GDP gains (all sectors) will arise from consumption side impacts
- Near term, biggest economic uplift arises from productivity gains (automation, augmentation, …)
- Increased customer demand resulting from the availability of more personalized / higher quality AI enhanced products and services
- **Insurance** is expected to belong to the **top 10%** among sectors with the **highest AI consumption** impact
- With a rapid adoption of use cases **near term** (0-3 yrs)

Image: monsitji / Getty Images

Content: https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html

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PI 2030: automated, usage based, and granular

Distribution

- Faster insurance purchasing based on AI risk profiles, drones, IoT and other external data
- New wave of mass-market instant issue products due to higher AI permeation
- **UBI** products are tailored to individual consumers
- From annual renewal to **continuous cycle** through dynamic adaptions
- Shift towards **microcoverage** products
- #Agents reduced dramatically

Underwriting & Pricing

- Manual underwriting ceases to exist for most LoBs.
- High **automation** through deep learning and machine learning based on more granular data for customers
- Product bundle tailored to the buyer's risk profile and coverage needs
- Regulators review AI-enabled, machine learning–based models

Claims

- Claims head count is reduced by 70-90% compared with 2018 levels
- Achieve straight-through-processing rates of more than 90%
- **Claims** triage and repair services are often triggered **automatically** upon loss.
- Individuals **receive real-time alerts** that may be linked with automatic interventions for inspection, maintenance, and repair

Image: monsitji / Getty Images

Content: based on study by McKinsey & Company: Insurance 2030 The impact of AI on the future of insurance

AI impacts risk areas differently

Life

- Increased **anti-selection risk**, due to predictive methods for future illnesses
- IoT and smart cities generate more data that leads to better underwriting
- Long term care and life styles will change due to sensors and impact medical costs

Property

- More automation changes risk profiles
- Potential for improved risk management through active monitoring of autonomous machines
- **Liability** for claims becomes more **challenging**

Casualty

- Move towards **prevention** as more automation takes place that allows for deterministic monitoring
- Workers compensation changes due to AI advancements, impacting related medical areas as well

Additionally, AI impacts asset management, and the strategic and operational side of insurance.

Image: monsitji / Getty Images

Content: based on study by SCOR, The impact of artificial intelligence on the (Re)insurance sector

Dissecting Artificial Intelligence

Sense

- Computer Vision
- Audio Processing
- Sensor processing

Comprehend

- Natural Language Processing
- Knowledge Representation
- Inference

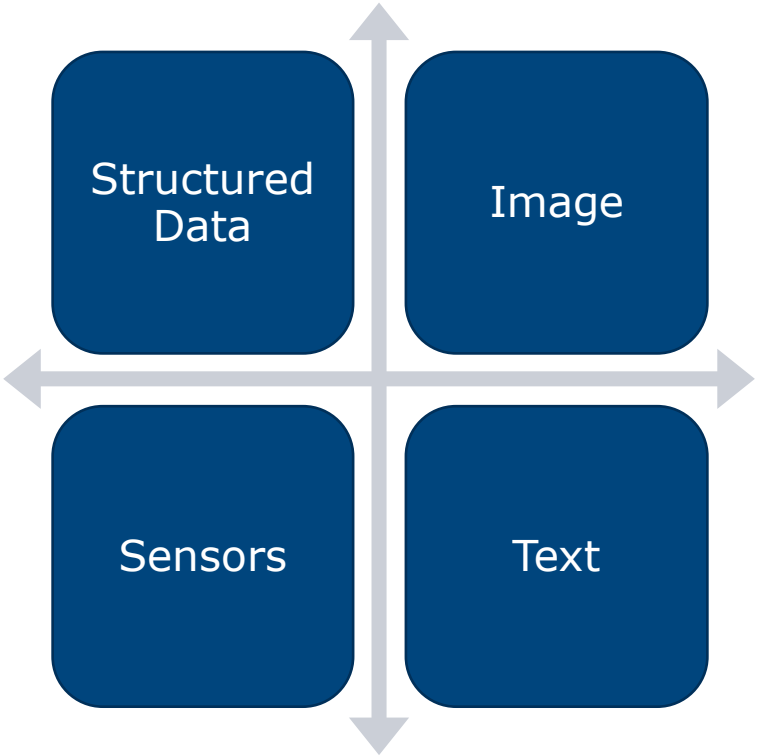
Act

- Physical action
- Virtual action

Learn

- Machine Learning
- Deep Learning

Munich Re AI Data Domains



Example area I

Remote Industries

Use of AI models in Remote Industries

- All Remote Industries services are based on Artificial Intelligence algorithms
- Image based models can be used post cat whereas weather forecast based models can also be applied pre cat

Trained by adjusters

Powered by machines

-5d +1d pre cat

Hurricane loss prediction

+4d +10 d post cat

Hurricane claims management

+6m non cat

Post-hurricane repair identification

Loss Prediction Model Classification and regression based on structured data	✓	✓	
Damage Classification Model Image classification		✓	✓
Roof Damage Segmentation Model Image segmentation		✓	✓

Application of aerial imagery just taken after event provides an unprecedented view on each property

Post-Cat

High resolution aerial imagery with ~5cm/pixel resolution covered in Bahamas

Image: Munich Re Remote Industries

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Application of aerial imagery just taken after event provides an unprecedented view on each property

Post-Cat

Image: Munich Re Remote Industries

Machine learning-based detection of severity of damage to the roof and building structure of each property

Post-Cat

No roof damage

Top layer roof damage

All layers roof damage

Structural roof damage

Major structural damage

Powered by machines

AI trained by adjusters

280 thousand buildings per hour

Tree fallen on roof

Tree fallen near building

Tarp on roof

Debris near building

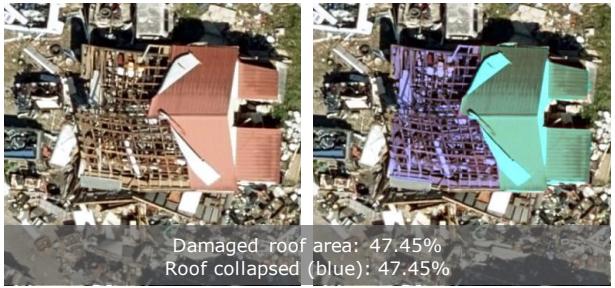
- No roof damage
- Top layer roof damage
- All layers roof damage
- Structural roof damage
- Major structural damage

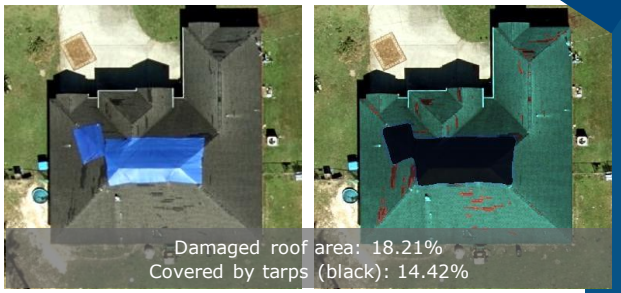
Images: Vexcel / NICB GIC / Munich Re Remote Industries

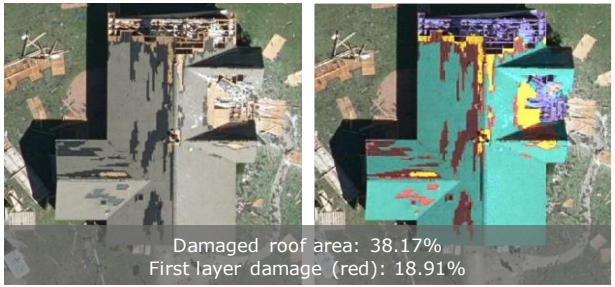
Machine learning at work: semantic segmentation to detect damaged areas of buildings

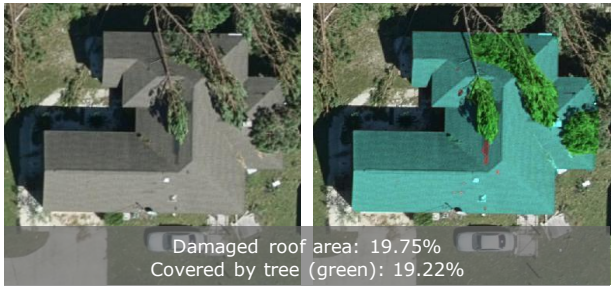
Post-Cat

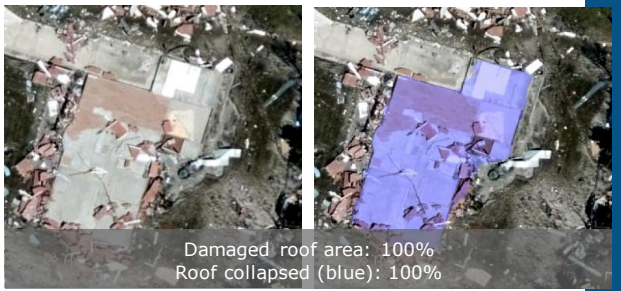

Damaged roof area: 0%
Healthy roof (turquoise): 100%


Damaged roof area: 47.45%
Roof collapsed (blue): 47.45%


Damaged roof area: 18.21%
Covered by tarps (black): 14.42%


Damaged roof area: 38.17%
First layer damage (red): 18.91%


Damaged roof area: 19.75%
Covered by tree (green): 19.22%


Damaged roof area: 100%
Roof collapsed (blue): 100%

Healthy roof
Structural damage
Top layer roof damage
Tarp on roof
All layers roof damage
Tree on roof

Powered by machines

AI trained by adjusters

280 thousand buildings per hour

Images: Vexcel / NICB GIC / Munich Re Remote Industries

Image: Munich Re Remote Industries

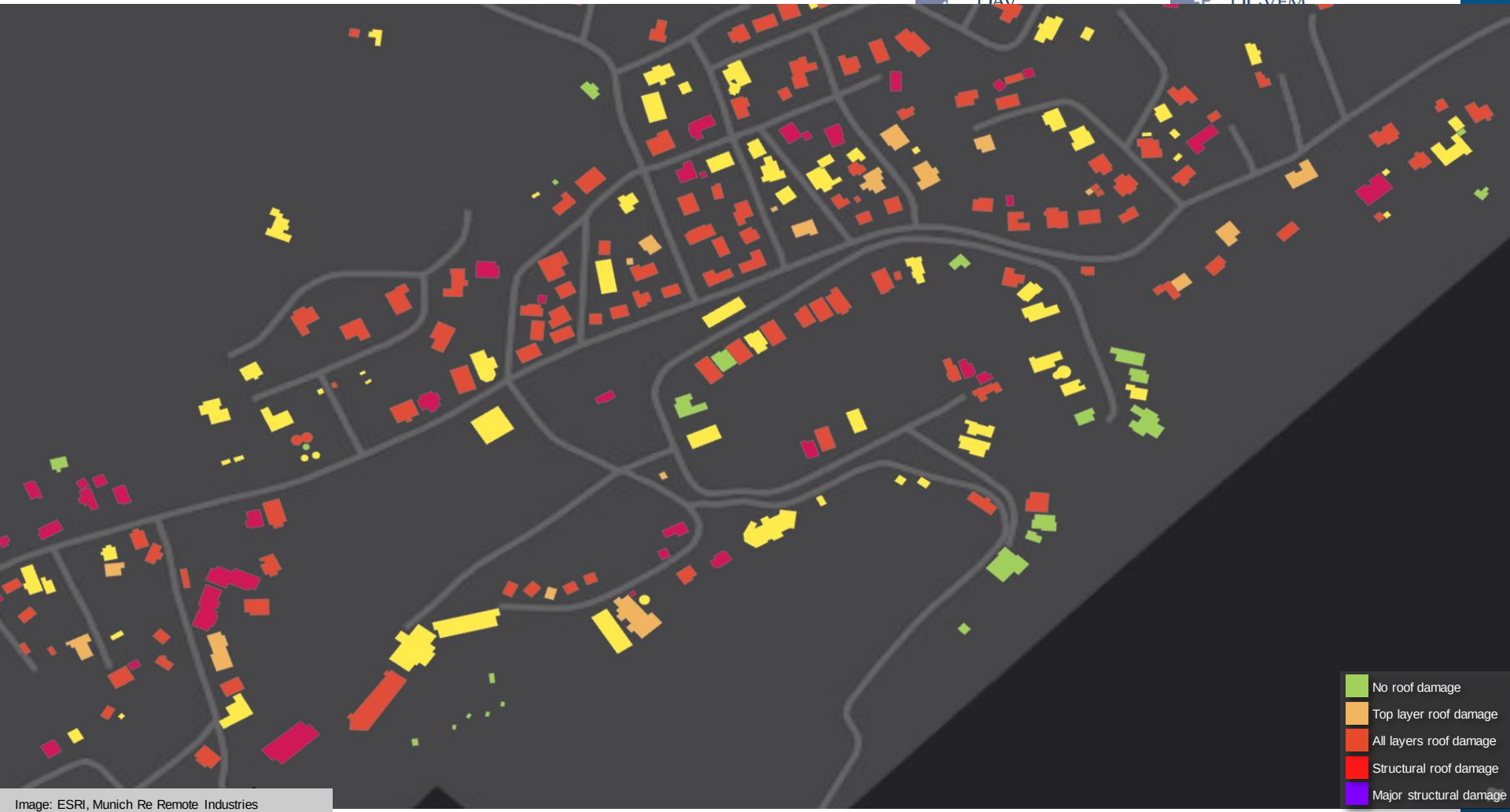


Image: ESRI, Munich Re Remote Industries

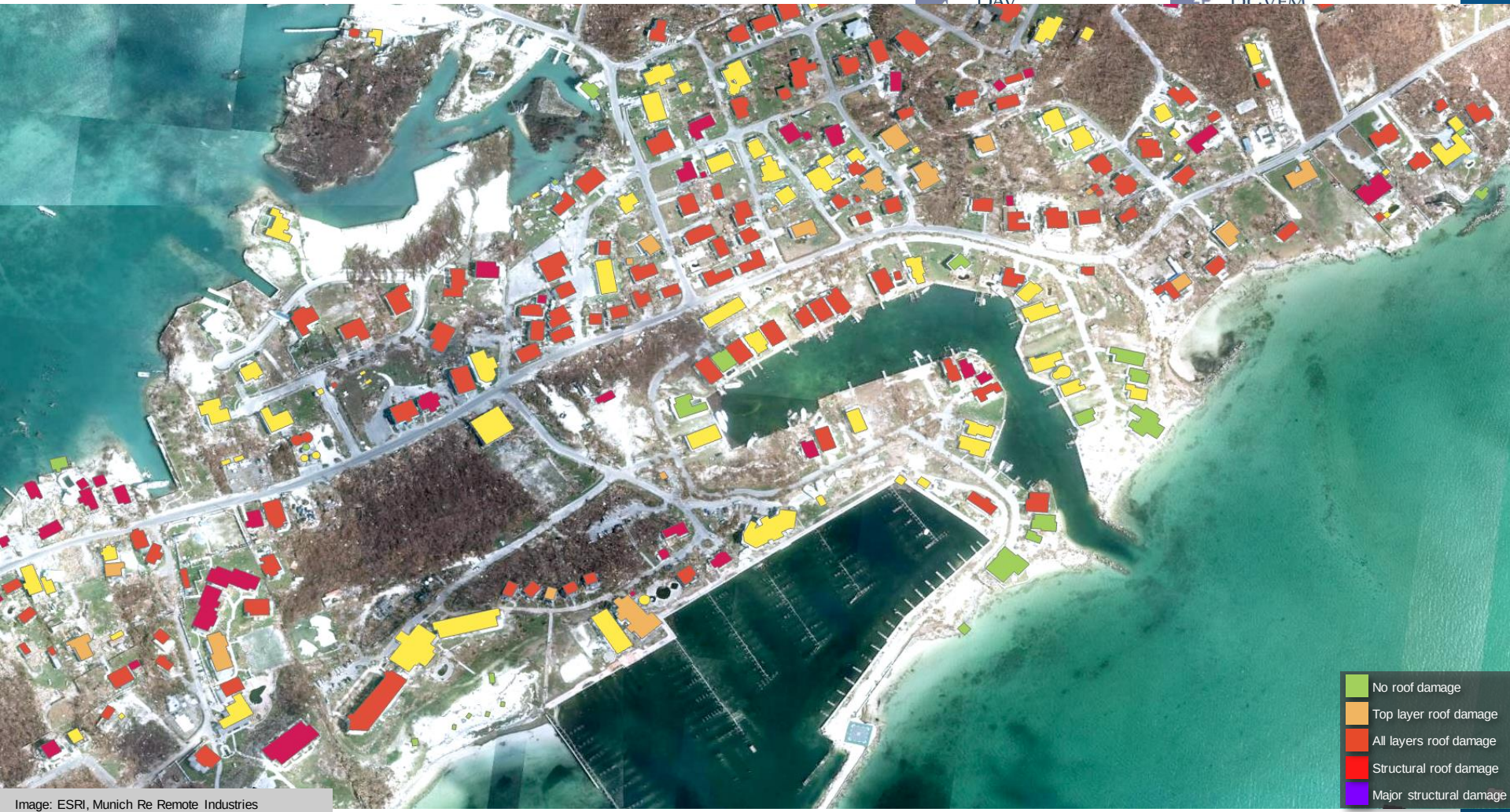


Image: ESRI, Munich Re Remote Industries

Example area II

Natural Language Processing

Analyzing News with the help of NER

Lion Air Flight 610 took off from Jakarta, Indonesia on Monday, October 29th, 2018, at 6:20AM local time. Its destination was Pangkal Pinang, the largest city of Indonesia's Bangka Belitung Islands. Twelve minutes after takeoff, the plane crashed into the Java Sea, killing all 189 passengers and crew.

Nearly five months later, Ethiopian Airlines Flight 302 took off from Addis Ababa, Ethiopia on Sunday, March 10th, 2019, at 8:38AM local time. Its destination was Nairobi, Kenya. Six minutes after takeoff, the plane crashed near the town of Bishoftu, Ethiopia, killing all 157 people aboard.

Both crashed jets were Boeing 737 Max 8s, a variant of the best-selling aircraft in history. When Airbus announced in 2010 it would make a new fuel-efficient and cost-effective plane, Boeing rushed to get out its own version. That version was the 737 Max airplanes. The Air Current has a great (if slightly insider-y) retelling of the Max jets origins.

Analyzing News with the help of NER

Geo-Political Entity
Location
Product
Organisation
Facility
Cardinal
Time
Date
NRPA

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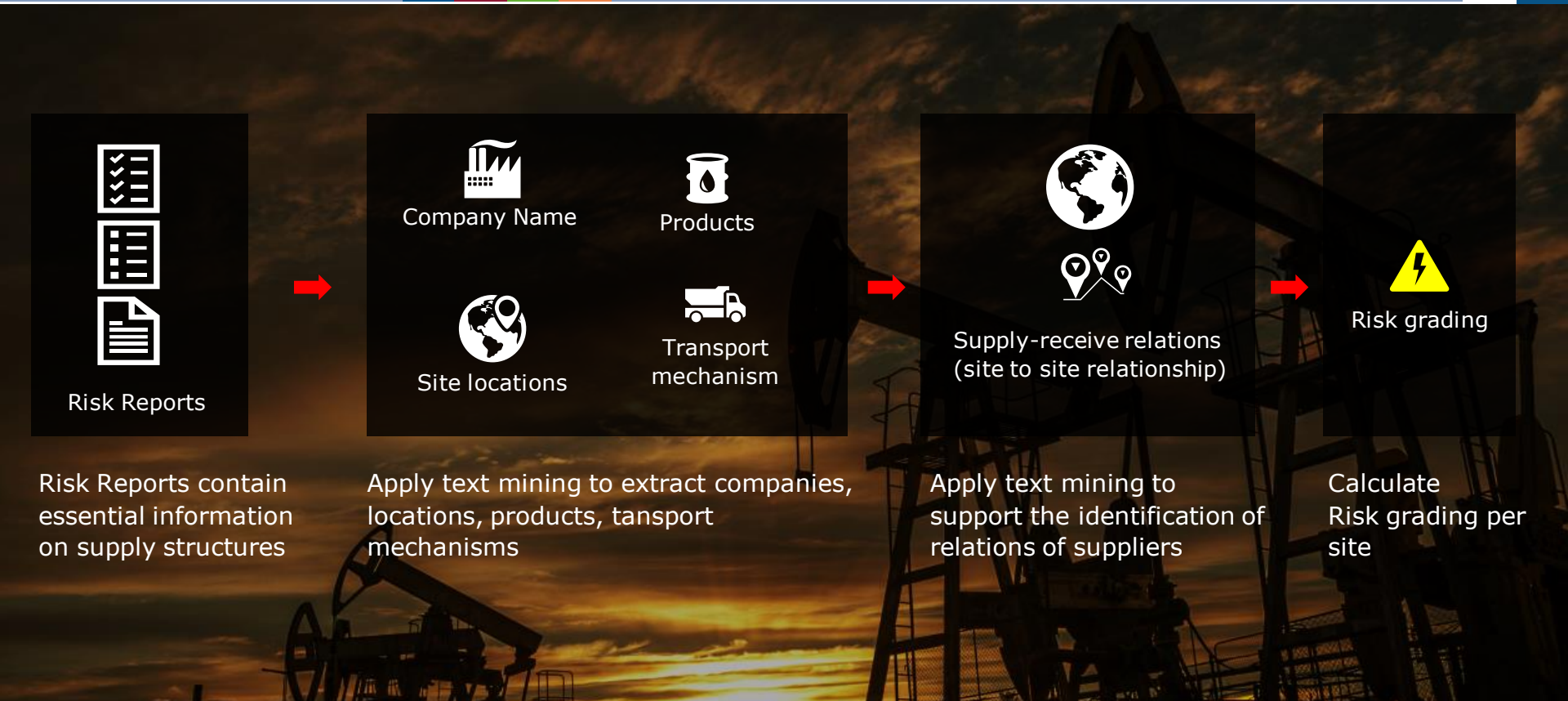
Enhance risk assessments by making supply chain information from Oil & Gas companies transparent

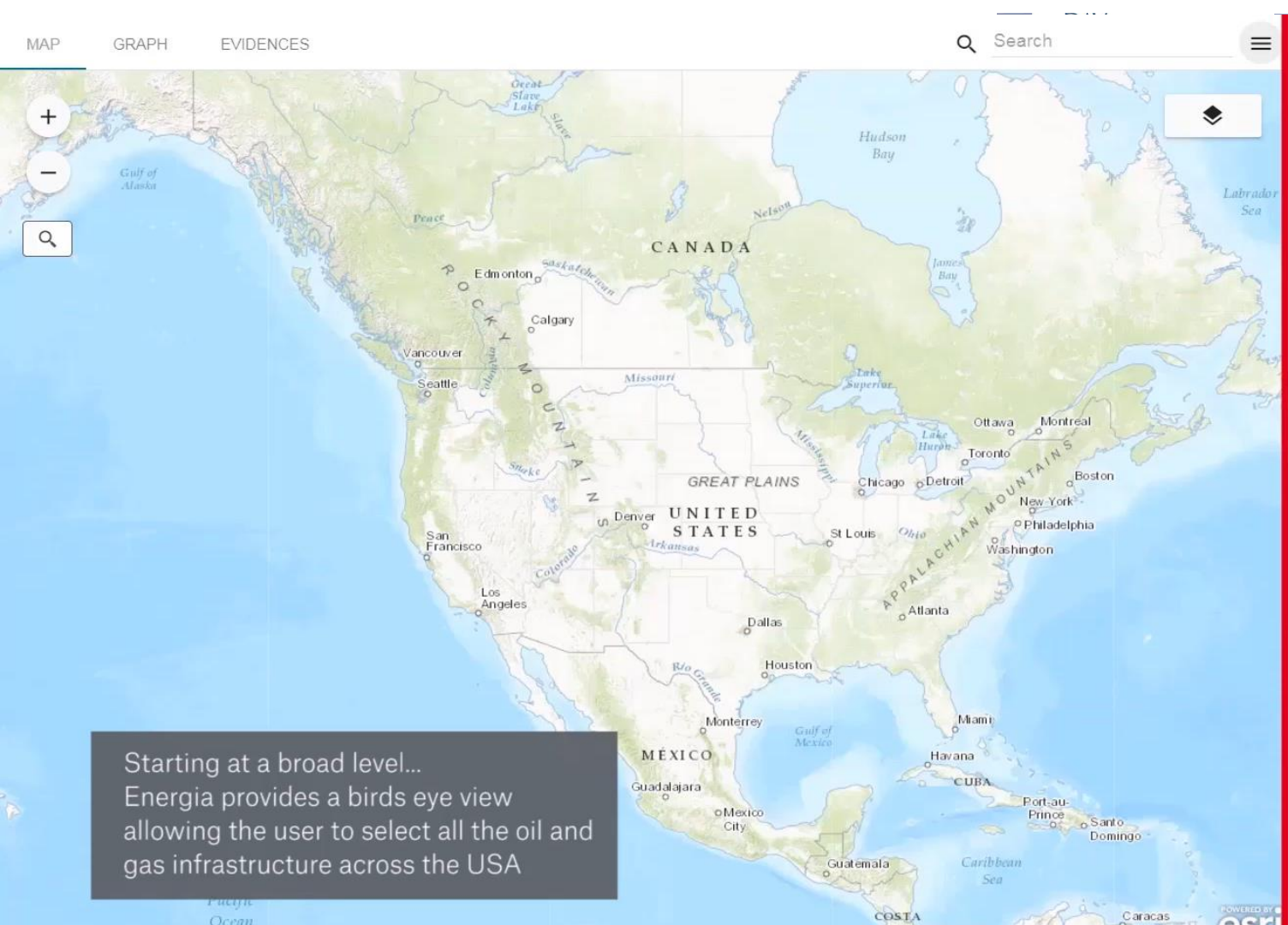


Risk Reports contain essential information on supply structures

Apply text mining to extract companies, locations, products, tansport mechanisms

Apply text mining to support the identification of relations of suppliers

Calculate Risk grading per site


MAP
GRAPH
EVIDENCES
Search
CANADA
Edmonton
Calgary
Vancouver
Seattle
ROCKY MOUNTAINS
GREAT PLAINS
UNITED STATES
Denver
San Francisco
Los Angeles
Chicago
Detroit
Ottawa
Montreal
Toronto
Boston
New York
Philadelphia
Washington
St Louis
Atlanta
APPALACHIAN MOUNTAINS
Dallas
Houston
Monterrey
MÉXICO
Guadalajara
Mexico City
Miami
Havana
CUBA
Port-au-Prince
Santo Domingo
Guatemala
Caribbean Sea
COSTA
Caracas
Hudson Bay
Labrador Sea
Gulf of Alaska
Gulf of Mexico
Pacific Ocean
Starting at a broad level...
Energia provides a birds eye view allowing the user to select all the oil and gas infrastructure across the USA
Options
Relations
342
Site Types
Terminal
1627
Gas Processing Plant
589

Derive credit risk information for small and medium enterprises based on news articles

Challenge

- Deliver a single invoice insurance product covering small-medium company debtors.
- Only little traditional rating information for SMEs is available.
- Rating information can be expensive and outdated
- Goal: Derive risk scores from news text to complement or replace traditional credit information

Solution

- Index and pre-process >10 mio German news articles per year
- **Identify German companies** in text with deep-learning
- Leverage semantic search to **score articles** for bankruptcy-related content
- Train a model to perform weekly predictions whether companies will go bankrupt in the next 90 days based on article scores

Achievements

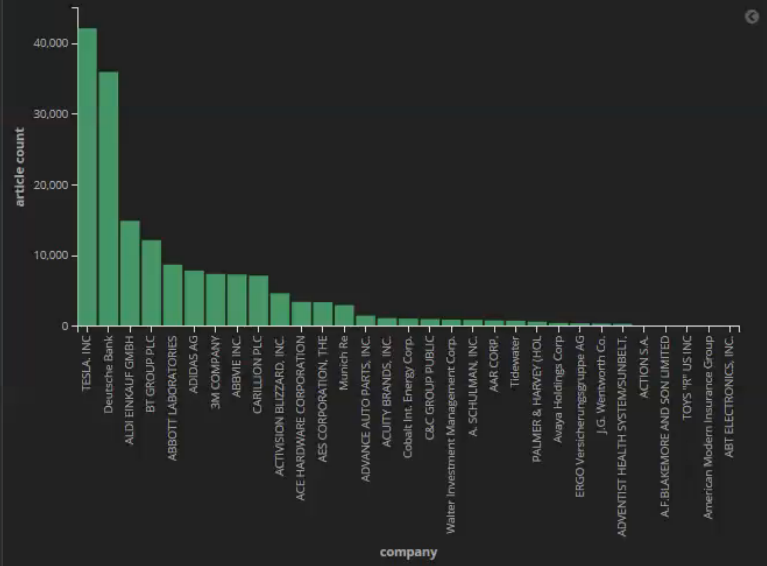
- News-based credit-related scores for over 70,000 German companies
- Scores used in a risk model for pricing credit insurance, thus expanding the scope of the insurance product to unrated companies
- Risk model is **able to predict bankruptcy**, thus potentially enhancing the quantification of the risk for credit insurance

Search... (e.g. status:200 AND extension:PHP)

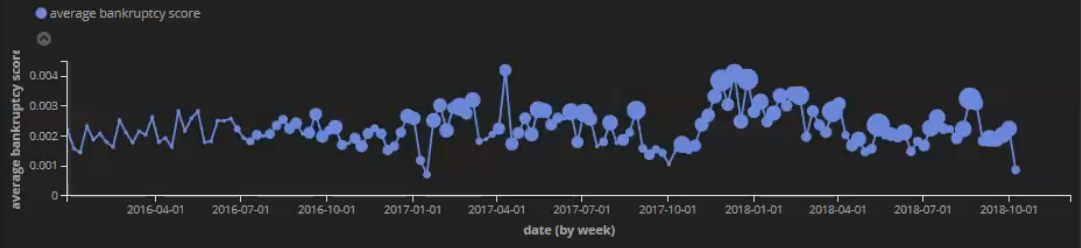
Options

Add a filter +

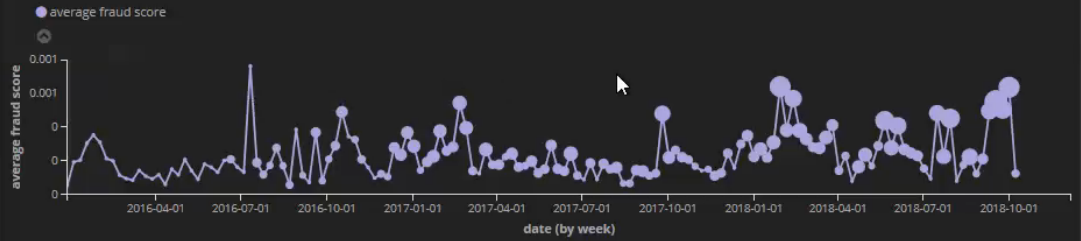
Companies



Bankruptcy Score Timeline



Fraud Score Timeline



Articles

1-50 of 526,326

Time	title	complete_text	bankruptcy_score	fraud_score
April 10th 2016, 00:00:00.000	Conways to celebrate golden anniversary	Ray and Carol (Schweitzer) Conway will celebrate their 50th anniversary Sunday, April 24, 2016. The couple were married April 24, 1966, at United Methodist Church in Osborne. They are the parents of two daughters and their spouses, Maria and Perry Mick, of Ellis, and Allison and Paul Lee, of Wichita. They are blessed with five grandchildren, Rachel, Jared and Sarah Mick, Jazmin Lee and Brianna and husband Travis Brandt, and great-grandson, Maverick. Ray and Carol started their married life in Osborne, then moved to Beloit in 1971. Ray served two years in the Army and worked at Fuller Chevrolet for 341/2 years. Ray keeps busy with his garden ing and sharpening business at home. He is a board member of Chautauqua Isle of Lights. Ray also likes seeing people and helping them at Ace Hardware part time.	0	0
April 17th 2017, 00:00:00.000	New city superstore to open next month	Superstore bosses have revealed that a new Aldi superstore in Norwich is due to open next month. The discount supermarket chain was given permission for a store on part of the car park in Hall Road retail park in Norwich last year, to the annoyance of their rivals. The new store, close to Pets	0	0

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Thank you