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Risk and Insurance

From Data Issues to Insurance Solutions: Machine Learning's Potential

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Overview

1 The Importance of Asking the Right Questions

2 Machine Learning in Insurance: Potential Use Cases

3 Types of Data Issues

4 Enhancing Data Quality

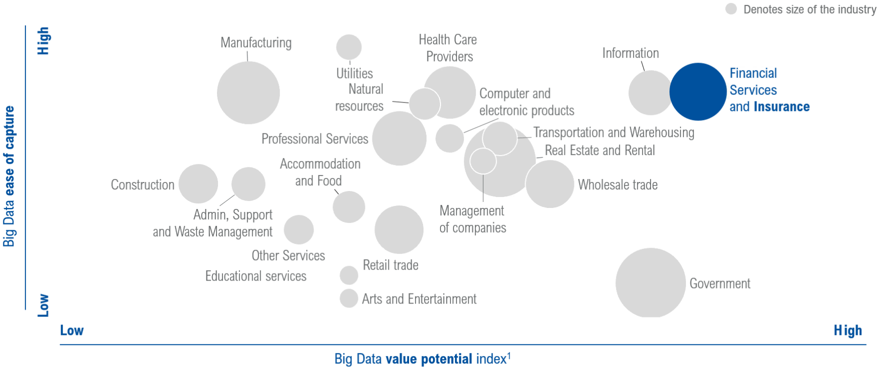
5 Synergy: Machine Learning & Expert Judgments

6 Practical Example

Potential of Data & Analytics

1 Determined by industry average of transaction intensity, amount of data per firm, variability in performance, customer and supplier intensity, and turbulence
Source: McKinsey

Potential of Data & Analytics



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The Importance of Asking the Right Questions

Start with the End in Mind
Define clear business goals before data considerations.

Demand Analysis
Identify data essentials by understanding business needs.

Different Problems, Different Data
Tailor data collection to the specific insurance issue.

The Risk of Wrong Data
Irrelevant data increases noise and wastes resources.

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Machine Learning in Insurance: Potential Use Cases

Fraud Detection

Identifying potentially fraudulent activities by analyzing patterns that deviate from the norm.

- Detailed claim information
- Behavioral data
- Previous fraud markers

Customer Churn Prediction

Forecasting the likelihood of a customer discontinuing their policy before its expiration.

- Detailed contract information
- Renewal history
- Customer service interactions

Loss Reserving

Predicting the claim developments and the ultimate claim amount for a portfolio of claims.

- Detailed claim information
- Sufficient loss history
- Macroeconomic indicators

Optimized Pricing

Adjusting insurance premiums using a vast array of factors to attract and retain customers while ensuring profitability.

- Detailed claim information
- Detailed contract information
- Macroeconomic indicators

Types of Data Issues

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Data Issue	Description	Example
Completeness	All attributes of a variable are available.	Height: NA
Consistency	Consistent values for the same entity.	Date: 05.09.2016 / 20160905
Validity	Data matches with the syntax of its definition.	Age: -3
Accuracy	Data is correct.	Birthday: 05.09.1919
Timeliness	Data is received at the right time and interval.	Event: 14:14, Notice: 23:59

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Enhancing Data Quality

Data Imputation
ML can predict and fill missing values based on patterns in existing data.

Anomaly Detection
Automatically identify and flag outliers or inconsistencies.

Data Validation
Use predictive models to verify and correct data entries in real-time.

Temporal Analysis
ML can track and update time-sensitive data, ensuring timeliness.

Feature Engineering
Extracting more relevant information from existing data, thereby improving its value.

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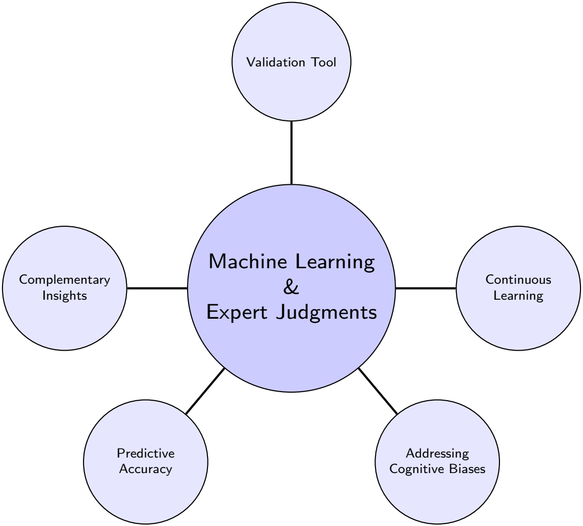

Practical Example

Research Objective

Enhance the accuracy of claim development predictions by leveraging individual claim and contract information through ML.

Traditional Approach

Classic actuarial methods are based on simple heuristics that use aggregate data to make predictions.

New Approach

Our research deploys machine learning models to tap into the richness of individual claim & contract data, ensuring a more granular and informed prediction.

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Example:

Accident Year	Development Year					
	1	2	3	4	5	6
1	100	150	180	200	210	215
2	95	140	170	190	200	-
3	90	135	165	185	-	-
4	85	130	160	-	-	-
5	105	90	-	-	-	-
6	75	-	-	-	-	-

Practical Example: Results

- Chain Ladder
- Neural Net

Accident Year	Development Year					
	1	2	3	4	5	6
1	0	0	0	0	0	0
2	0	0	0	0	0	2.1% / 1.4%
3	0	0	0	0	2.8% / 0.1%	5.4% / 0.6%
4	0	0	0	9.2% / 4.0%	10.4% / 4.1%	13.0% / 3.1%
5	0	0	3.2% / 2.2%	10.1% / 3.9%	11.9% / 3%	13.8% / 0.7%
6	0	6.2% / 0.2%	4.2% / 1.3%	2.3% / 1.0%	4.6% / 3.3%	7.7% / 3.7%