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# Impact of emerging tech and digital ecosystems on the insurance value chain

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May 9, 2019



Chengdu

“Tech is **changing the rules of the game**. Tech transformation is here and accelerating, the only uncertainty is **who will be the winners.**”

*Christian Mumenthaler, Group CEO Swiss Re*



# Our industry continues through a phase of change and digital transformation

## Consumer Behaviour Changes



- Renovated consumer
- Mobile phone dependent
- Changing expectations

## New Business Models Emerging



- Omni-Channel
- Ecosystem
- B2B2C

## Technology & Data Advancement



- Artificial intelligence
- Blockchain
- IoT

# Three major implications for the insurance industry

**Technological advancements**  
(e.g. internet of things, blockchain, AI)

1



**Change of risk pools**

2



**Automation**

3



**Disruption**

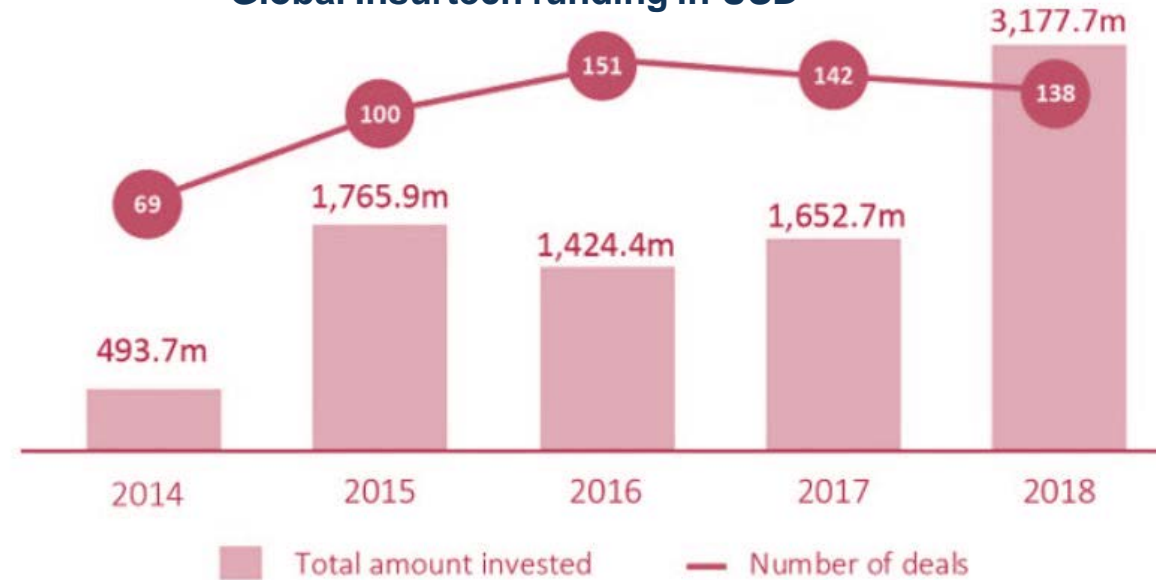
**Catalysts / Inhibitors**  
(e.g. technological diffusion, regulation, consumer, competitors)



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# InsurTech is growing fast across Asia and is here to stay

Global Insurtech funding in USD



Source: Fintech global Jan 2019

## Tech to bridge the Asia protection gap

Asia is one of the most underpenetrated insurance markets in the world.

43% of the world's population but only 13% of total premiums in 2016.

Source: UBS Shifting Asia report 2017

## Customer willingness to purchase insurance from big tech firms

40% of APAC customers (excl. Japan) 29.5% Global customers

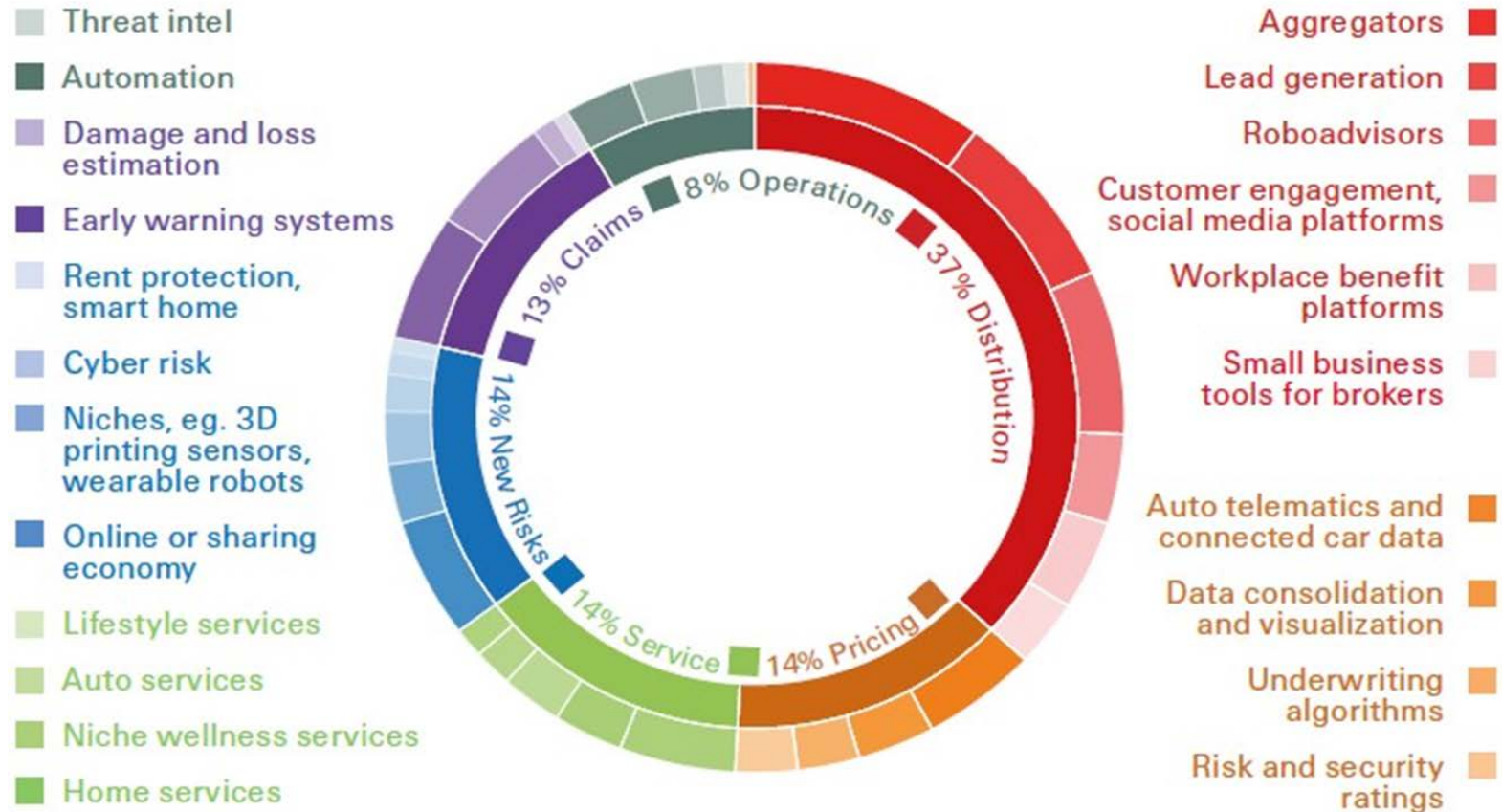
14.5% Japan customers would prefer to buy insurance from a big tech firms than an insurer

Source: Cap Gemini 2018

## Asia Insurtech - 90 deals over the last 5 years



# Insurtech is already covering the entire value chain

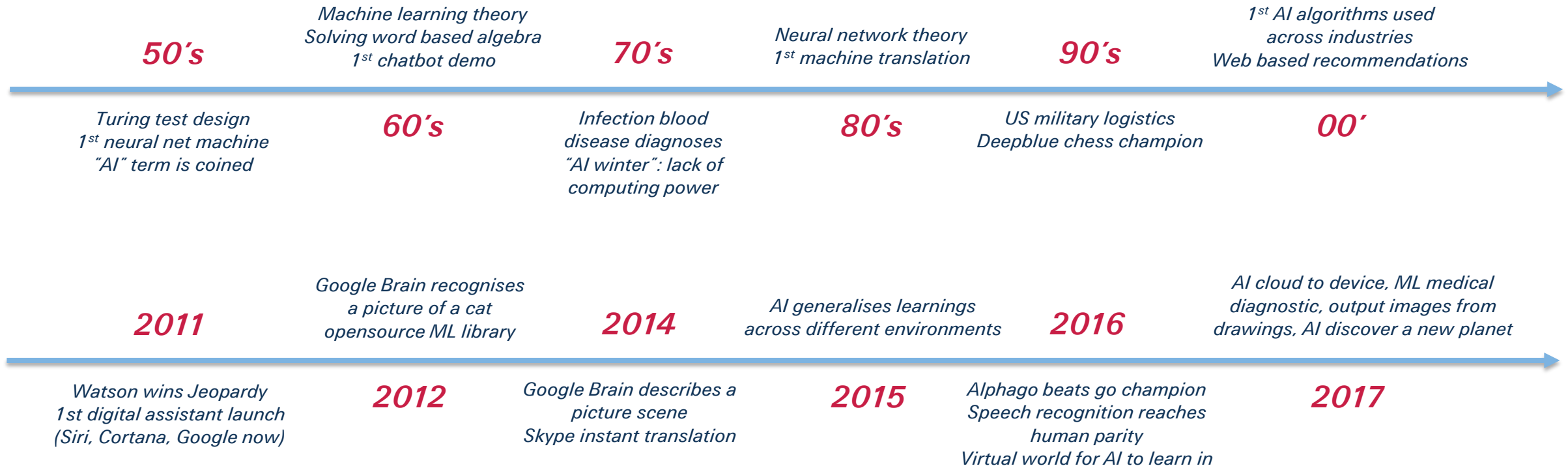


Source: Swiss Re Institute June 2017, based on information from company websites and media reports  
By % share by number of start-up investments 2014-2016



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# AI – a sudden acceleration from an initial long journey



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# AI - China the rising superpower

GAFAs/Silicon Valley leading position being trailed by BATX

China's AI Development Roadmap

- 2020: Keep pace with US AI tech
- 2025: Achieve AI breakthroughs
- 2030: Be the AI world leader

China bridging the talent race gap

- 1. USA 13.9%
- 2. China 8.9%

China leading equity AI start-ups funding in 2017

- 1. China 48% USD4.9b 19 invst.
- 2. USA 38% USD4.4b 155 invst.
- 3. Rest of the world 13%

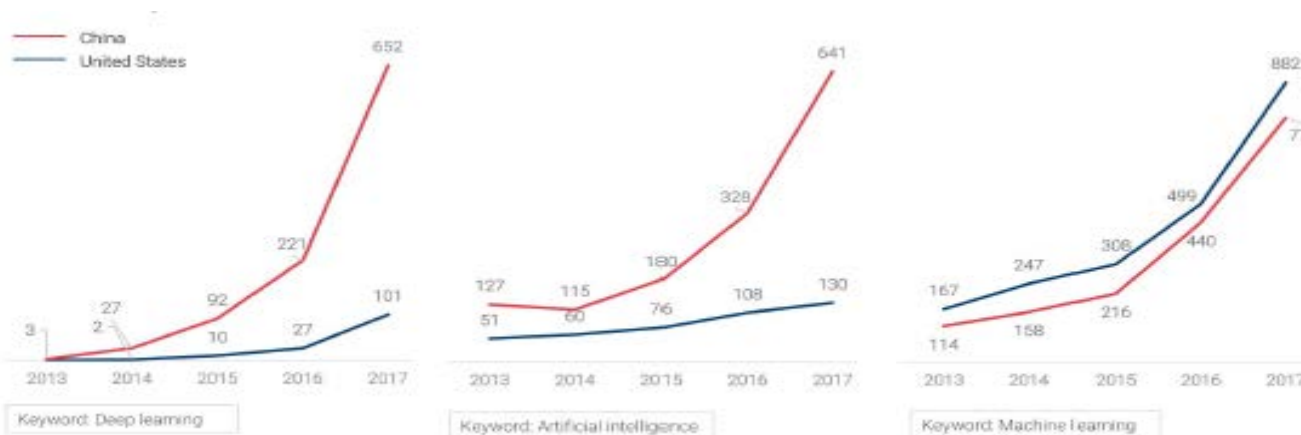
Ping An leading AI applications for insurance

China AI industry today worth USD150b (67% growth yoy)

Source: SCMP

Source: cbinsights

China world leader in AI patents & papers



Source: epo.org

China mobile citizen fuelling data to AI BAT models  
 800 millions Internet users, 95% mobile, 2x more time spend online that US, 57% time spent on BAT apps, 11x more mobile payments than the US

BAT & Ping An positioning themselves for Asia  
 Partnering / funding local leading platforms - epayment, ecommerce, digital health apps, aggregators...  
 PA one connect cloud platform commercialization



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# AI – emerging trends

- Computer vision
- Natural language processing/synthesis
- Predictive intelligence
- Architecture
- Infrastructure

Source: CBInsights



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# Example of application of AI/ML in insurance



## Non-Smoker Model

Web service to deploy the non-smoker model within clients' underwriting platforms

### Challenge

- Smokers are estimated to have a 1.75-3X higher mortality rate than non-smokers, yet many life insurance applicants do not reveal their true smoking status when completing their application.
- To account for this, the insurance underwriting process requires time-intensive, invasive, and costly lab testing to detect smoking in applicants.
- Identifying true non-smokers without lab tests would accelerate underwriting decisions for the many non-smokers in the middle market. There is currently a lack of effective solutions to determine if the applicant is truthfully reporting smoking status.

### Approach

- Based on client underwriting data and external tobacco-related data, a proprietary predictive model was created to predict the likelihood of a self-declared non-smoker applicant holding true at 98% precision.
- A web service was subsequently developed and is being offered to clients to create a consumer friendly application process without lab testing for a greater number of non-smoker applicants that is implemented directly in the client's underwriting system.
- The web service architecture was designed to be additionally leveraged for other clients in the future.

### Achievements

- Completed model and architecture for web service
- Received Missouri regulatory approval and being implemented for first client
- Discussing custom models with 4 clients.

**Business sponsor:**  
 Neil Spaworth  
 DSA Lead  
 Nitor Hawk

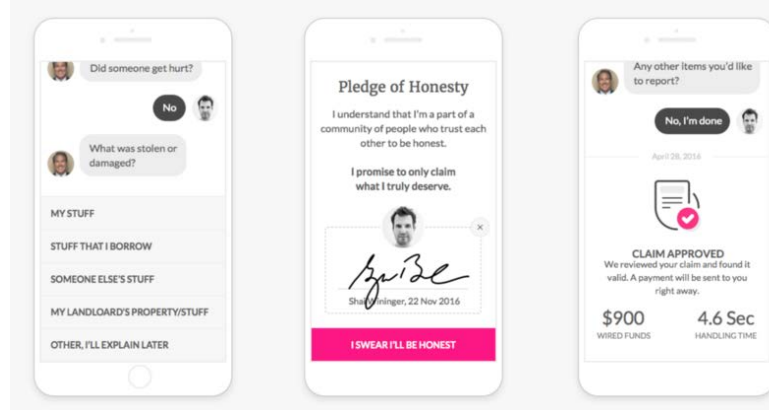
**Time to market:**  
 6 months

**Link to 9R Tech Strategy:**  
 Produce new solutions for clients

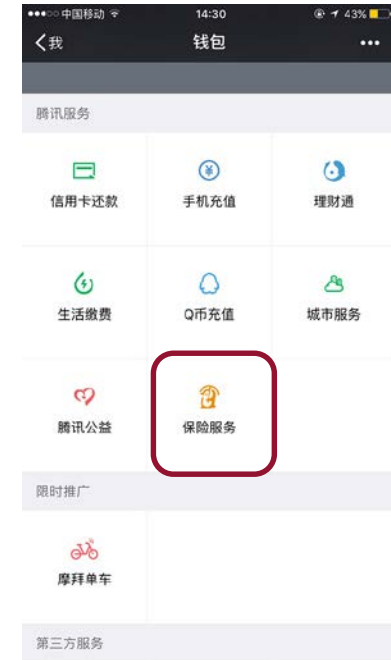
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Underwriting: smoker or not



Claim: fraudulent or not



Sales: customer segmentation



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# AI refining data for solutions across the value chain



raw data

## Insurance data example



sales / campaign



in-force



claim



channel

## Alternative data example



online browsing



wearable / fitness



social media



Data refined by AI

*propensity to buy*

*propensity to claim*

*propensity to lapse*

*probability of fraudulent claim*



Solutions enabled by AI

*Contextual distribution to micro segments, sense customer needs, Identify sale triggers, sales compliance*

*Alternative data, digital health data for more precise and automated UW*

*More dynamic risk engineering processes (e.g. regular risk assessment, dynamic pricing mechanism)*

*Better identification, prediction and management of risk to prevent/reduce/delay claims*

*Automate claims / risk retrocession / capital management*

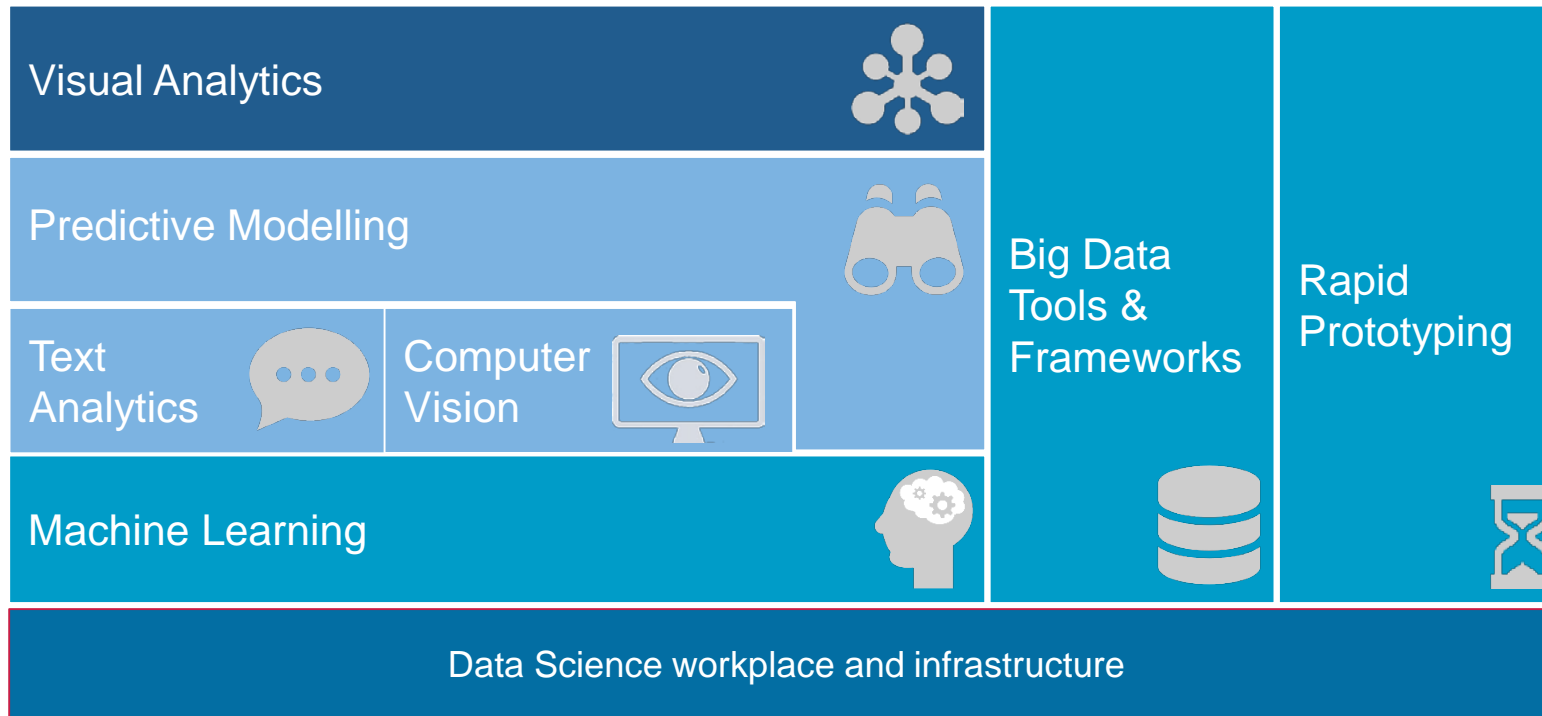


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# Swiss Re's world-class data science capabilities to deliver state-of-the-art data analytics and AI solutions



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# Swiss Re's AI-enabled solutions launched across globe



## Predictive Underwriting for Bancassurance

Using financial transaction data to automatically classify standard vs substandard risks



## Stork – Lean Flight Delay Insurance

Can we create a new fully automated parametric delay insurance products using worldwide flight data?



## Early Warning System

Alert experts as early as possible about emerging topics impacting our business



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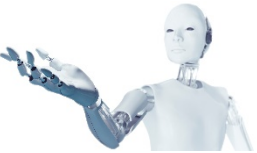




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# Relationship between AI/ML and actuarial science



	 <h2 style="text-align: center;">Actuarial</h2>	 <h2 style="text-align: center;">AI/ML Data science</h2>
 <h3 style="text-align: center;">Focus</h3>	<ul style="list-style-type: none"> <li>• The <b>Law of Large Numbers</b> is a key principle</li> <li>• As the number of exposure units, or policyholders, increases, the probability is higher that the actual loss per exposure unit will equal the expected loss per exposure unit. The focus of actuarial modelling is how to set the right premium for a risk pool (a cohort of policies).</li> <li>• Balance between data insight vs. business knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• A model is built to learn the pattern from historical data. And the model is applied in new data to predict the probability that certain event would happen on individuals.</li> <li>• Focus on model's generalization capability.</li> </ul>
 <h3 style="text-align: center;">Methodology</h3>	<ul style="list-style-type: none"> <li>• A global explanation is important e.g. male is x% more likely to claim than female. GLM can fulfill <b>global explain-ability</b>.</li> <li>• Less use of unsupervised learning approaches.</li> </ul>	<ul style="list-style-type: none"> <li>• A wider selection of techniques are commonly used in machine learning. Some are more complicated, e.g. random forest, and cannot give coefficients as GLM does.</li> <li>• Unsupervised learning is applied when no clear target variable is available.</li> </ul>
 <h3 style="text-align: center;">Data</h3>	<ul style="list-style-type: none"> <li>• Actuaries predominantly focus on attributes directly applicable to problem statement.</li> <li>• Reliant on data but has to fill in gaps with expert knowledge.</li> </ul>	<ul style="list-style-type: none"> <li>• Usually looks at as many attributes as available</li> <li>• Structured, unstructured, labelled, unlabeled</li> </ul>
 <h3 style="text-align: center;">Application</h3>	<ul style="list-style-type: none"> <li>• Actuarial modelling combines data analysis and subject matter expertise.</li> <li>• Problems solved are almost always financial.</li> <li>• Risk-oriented</li> </ul>	<ul style="list-style-type: none"> <li>• Raw outcome is usually a probabilistic score.</li> <li>• Involved in wide range of problems not just financial, e.g. optimizing customer experience</li> <li>• Opportunity-focused</li> </ul>



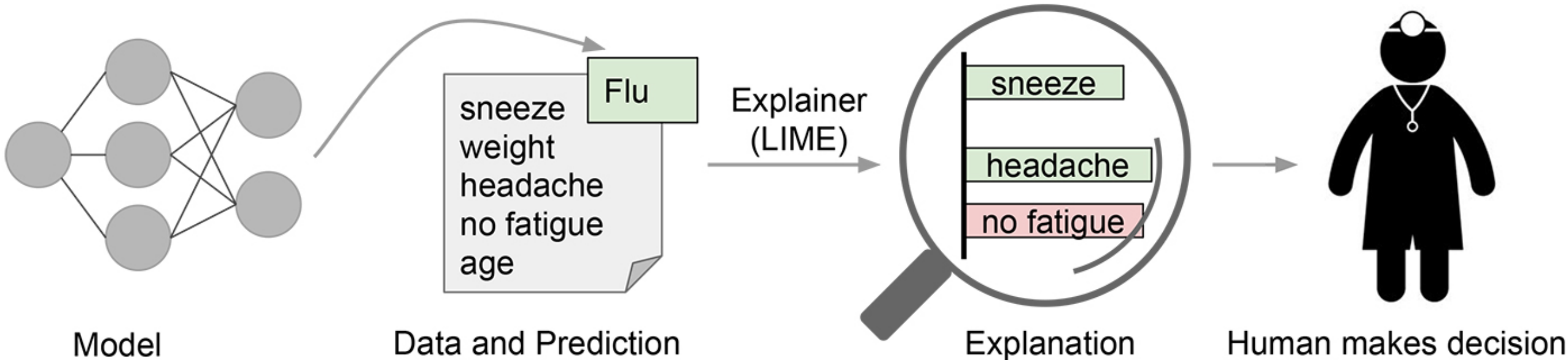
SORRY, KID, OUR MACHINE LEARNING CRM WITH PREDICTIVE ANALYTICS SAYS YOU'RE GETTING COAL THIS YEAR.

TOM FISH BURNE



# Local explain-ability

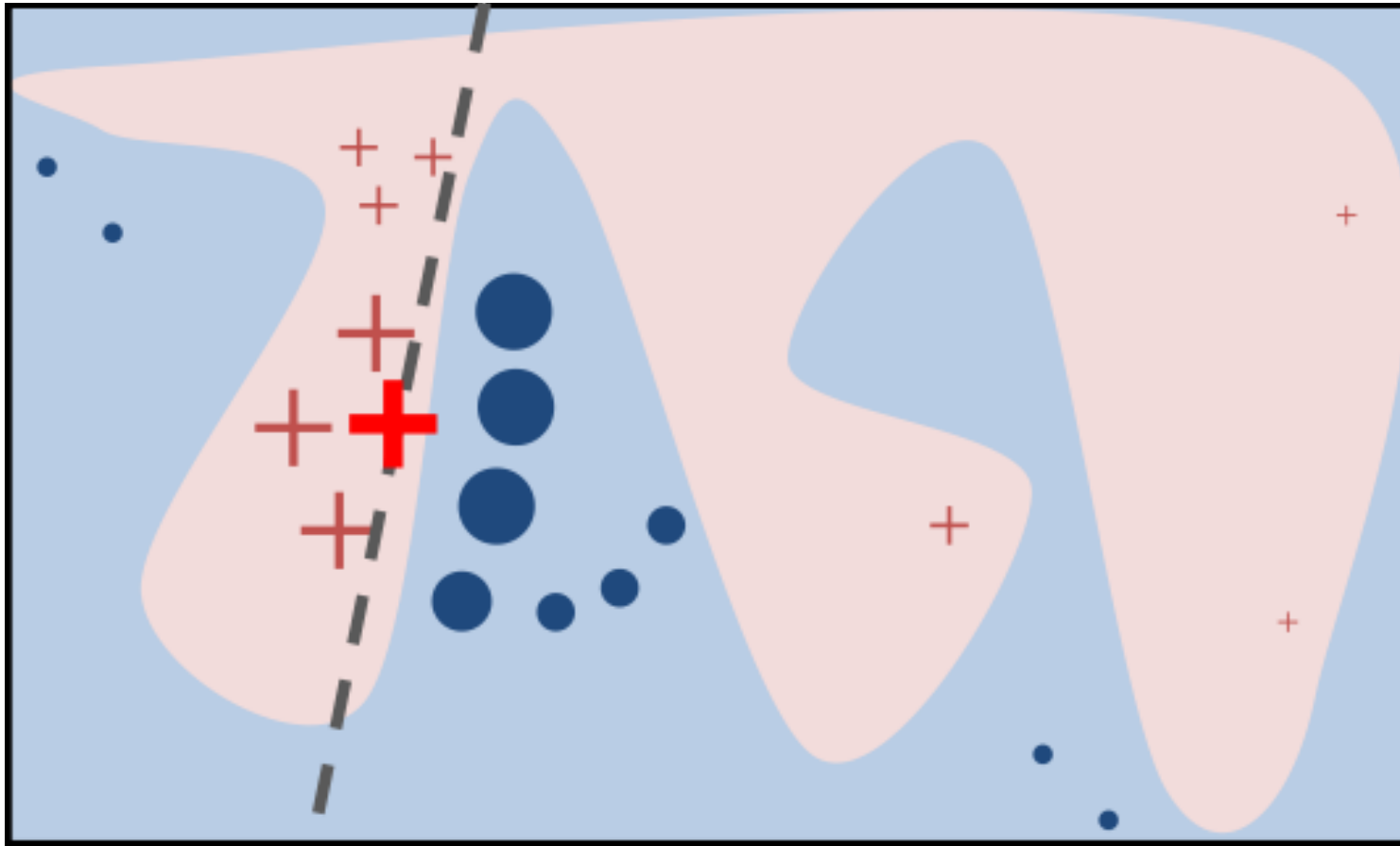
A flu prediction example



<https://www.oreilly.com>

The three highlighted symptoms may be a faithful approximation of the model for patients who look like the one being inspected, but they probably do not represent how the model behaves for \*all\* patients

# One possible way to implement model local explainability



- Blue/pink box is the decision boundary of the highly non-linear model
- The dashed line is the learned local model to explain the decision for **+**.
- Local model can be a GLM model, which has good global explainability.



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# Challenges in insurance industry



Regulating the internet giants

# The world's most valuable resource is no longer oil, but data

*The data economy demands a new approach to antitrust rules*



Print edition | Leaders >

May 6th 2017



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The latest news from Google AI

## Open Sourcing BERT: State-of-the-Art Pre-training for Natural Language Processing

Friday, November 2, 2018

- BERT is a huge model, with 24 Transformer blocks, 1024 hidden layers, and 340M parameters.



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## Leaderboard

SQuAD2.0 tests the ability of a system to not only answer reading comprehension questions, but also abstain when presented with a question that cannot be answered based on the provided paragraph. How will your system compare to humans on this task?

Rank	Model	EM	F1
	Human Performance <i>Stanford University</i> (Rajpurkar & Jia et al. '18)	86.831	89.452
1 Jan 15, 2019	BERT + MMFT + ADA (ensemble) <i>Microsoft Research Asia</i>	85.082	87.615
2 Jan 10, 2019	BERT Synthetic Self-Training (ensemble) <i>Google AI Language</i> <a href="https://github.com/google-research/bert">https://github.com/google-research/bert</a>	84.292	86.967
3 Dec 13, 2018	BERT finetune baseline (ensemble) <i>Anonymous</i>	83.536	86.096
4 Dec 16, 2018	Lunet + Verifier + BERT (ensemble) <i>Layer 6 AI NLP Team</i>	83.469	86.043
4 Dec 21, 2018	PAML + BERT (ensemble model) <i>PINGAN GammaLab</i>	83.457	86.122
5 Jan 10, 2019	BERT Synthetic Self-Training (single model) <i>Google AI Language</i> <a href="https://github.com/google-research/bert">https://github.com/google-research/bert</a>	82.972	85.810

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# The General Data Protection Regulation (GDPR)



- No Autonomous Modeling and Decision
- Interpretability of Model Decisions
- Users' Right for Data to be Forgotten
- Data Privacy By Design
- Explicit Consent for Data Usage

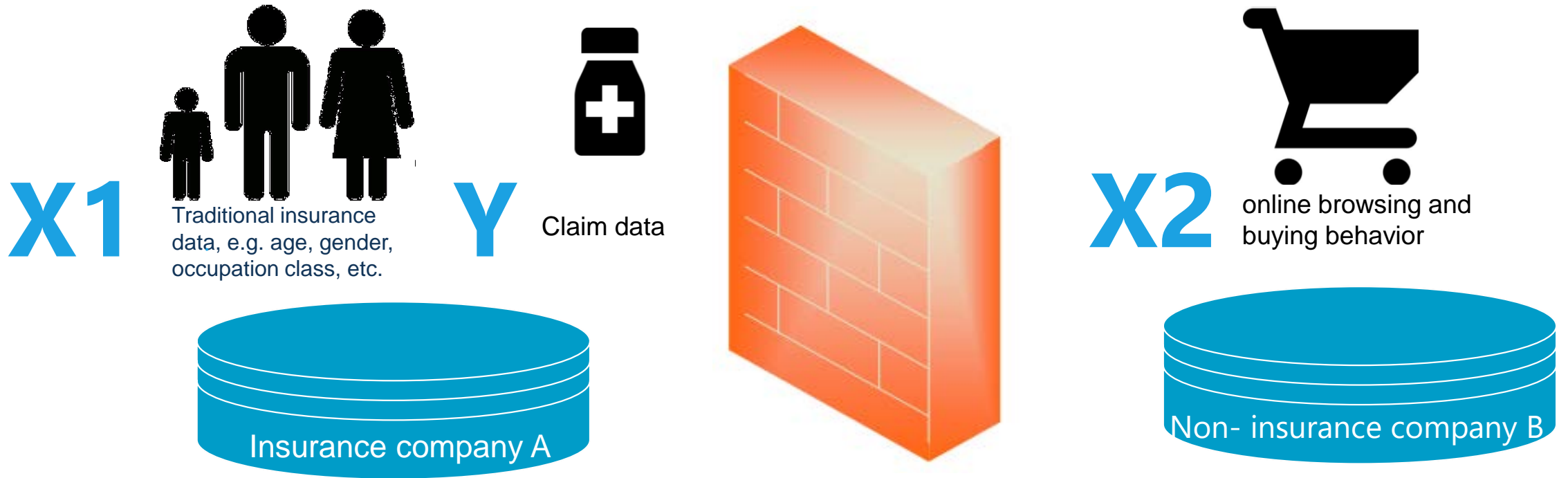
# China's Cyber Security Law and the General Principles of the Civil Law

- Enacted in 2017
- Requires that Internet businesses must not leak or tamper with the personal information
- When conducting data transactions with third parties, they need to ensure that the proposed contract follow legal data protection obligations.





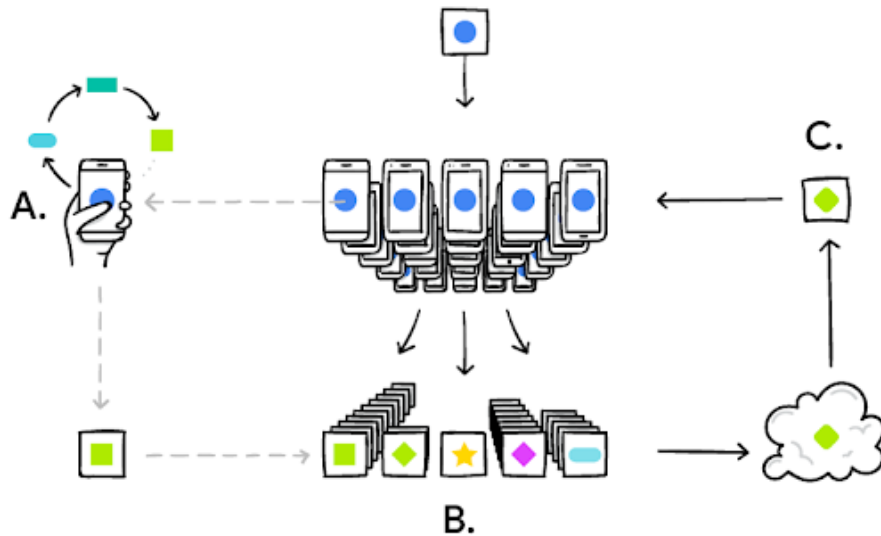
# Challenges in insurance industry



# Federated Learning (originally proposed by Google) may be a promising solution

- Google Gboard query suggestion\*:

- your device downloads the current model, improves it by learning from data on your phone, and then summarizes the changes as a small focused update.
- Only this update to the model is sent to the cloud, using encrypted communication, where it is immediately averaged with other user updates to improve the shared model.
- All the training data remains on your device, and no individual updates are stored in the cloud.

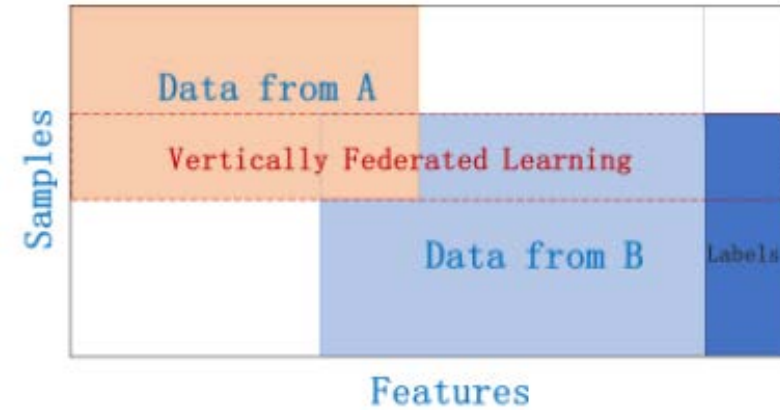


\* <https://ai.googleblog.com/2017/04/federated-learning-collaborative.html>

# Different types of FL



**Horizontal FL:** when different parties' datasets have big overlap in features but small overlap in users



**Vertical FL:** when different parties' datasets have small overlap in features but big overlap in users



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# Summary



# Key takeaways

- With access to data, the impact of technology / AI on insurance will grow tremendously
- The advance of AI will require more collaboration between actuaries, data scientist and business stakeholders to improve accuracy of risk models
- AI models are coming with new challenges that will require innovative mindset from all insurance eco-system partners



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