Institute and Faculty of Actuaries

Applying AI – from concept to practice

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What will the future bring?

Will machines do all the work?

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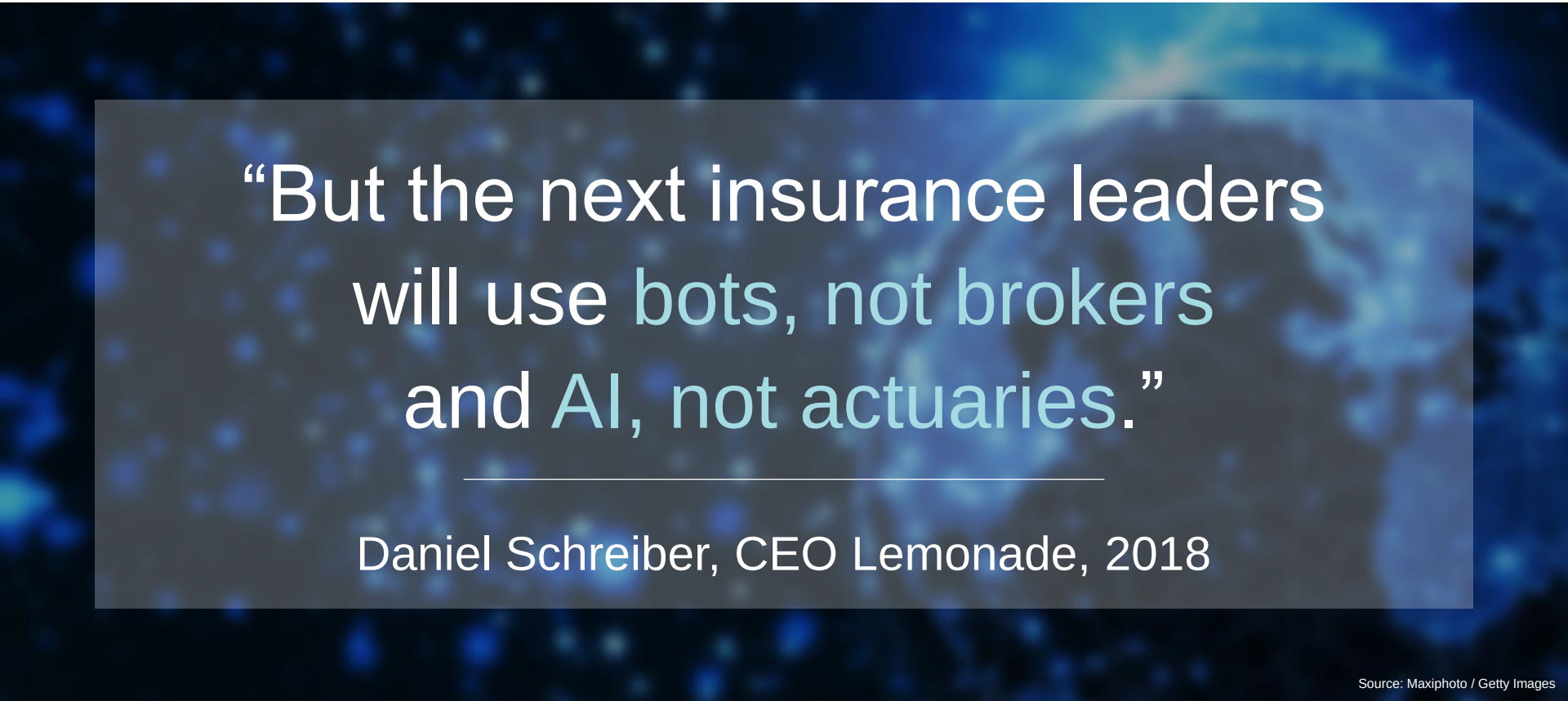
"But the next insurance leaders will use bots, not brokers and AI, not actuaries."

Daniel Schreiber, CEO Lemonade, 2018



Source: Maxiphoto / Getty Images

The future is already here!
Alibaba disrupted Chinese market

China's Ant Financial amasses 50 million users, mostly low-income, in new health plan *

* Critical Illness product covers 100 health conditions

Reuters, 12. April 2019

A great success…

- Within 9 days after launching, **10m people have subscribed** to the product. Subscription peaked mid 2020 at around 101m, begin 2021 around 90m.
- More than 60 % of their customers had **never before considered** to buy a CI cover.

… with a very simple product.

- Customers of Ant Financial under 60 with **more than 650 "Sesame Credit Points"** can purchase the product **without any further underwriting**. Price differentiated only by age.
- Premiums are **calculated bi-weekly** based on **past claims incurred** plus 8% admin cost loading, without any further acquisition costs.

Alibaba & Co. are creating value … based on data, direct client interaction and high frequency analysis

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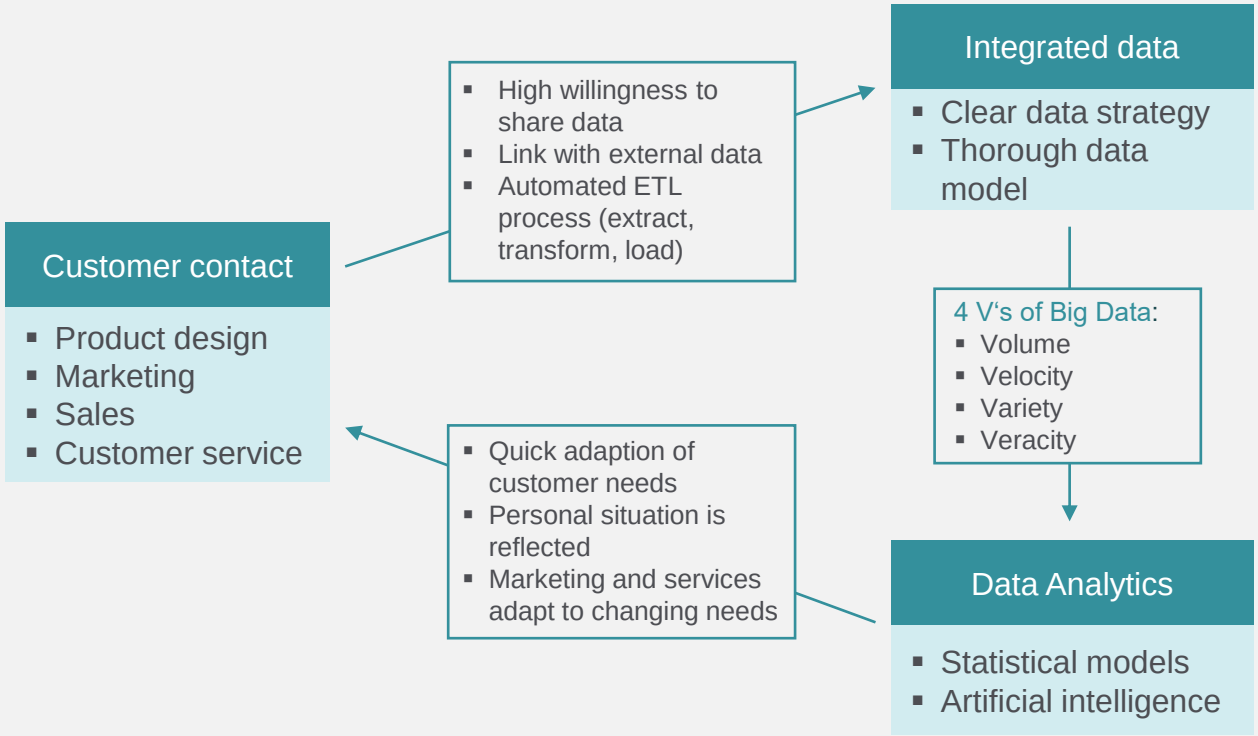

4 V's of Big Data are key:

- **Volume:** The data set should be huge – millions of events
- **Velocity:** Frequency of data processing should be high – daily or weekly
- **Variety:** A heterogeneous data set is key – to be able to predict
- **Veracity:** High quality of data – even with all the legacy systems

How can this work for European life insurers?

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"[…] everything that can go wrong will go wrong."

"Murphy's Law", Nevil Maskelyne, stage magician, 1908

Source: Maxiphoto / Getty Images

Latest news from Alibaba & Co.

Closed down due to adverse development of claims

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- The quick success and **growth** in the first months **has masked the problem** of the approach
- **No medical underwriting led to anti-selection**
- Without a growing portfolio, **claims rates have been skyrocketing** in 2021
- This started a **vicious circle**:
  1. Premium also started to increase materially
  2. This further amplified the effect of anti-selection
- Most of such **programs have been stopped** in the meantime – also from the competitors

Detailed monitoring of the performance of the portfolio is still key

Example 1: Implicit discrimination

Discriminating pricing for certain groups of persons

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Example

MO COMPARE Motorists fork out £1,000 more to insure their cars if their name is Mohammed

Top firms such as Admiral and Marks & Spencers have been dragged into an insurance race row after giving far lower quotes for drivers with traditionally English names like John

Source: https://www.thesun.co.uk/motors/5393978/insurance-race-row-john-mohammed/

Problem

- "The Sun" reported that motor insurers in UK had up to **69% higher** prices for individuals called **Mohammed** instead of **John** (everything else being the same)
- The **name** was implicitly used by an AI algorithm to differentiate prices – discriminating against the **ethnic origin**

EU Charter of Fundamental Rights is clear on Equality!

Example 1: Implicit discrimination
Avoidance of unfair bias

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Data Ethics applied

Charter of fundamental rights of the EU

Any discrimination based on any ground such as sex, race, colour, **ethnic or social origin**, genetic features, language, religion or belief, political or any other opinion, **membership of a national minority**, property, birth, disability, age or sexual orientation shall be prohibited

Source: Charter of fundamental rights of the EU, Article 21 (1)

Solution

- Test **stability** of process and results on changing input and parameters
- Monitor **behaviour** of model during training and deployment
- Use **statistical tests** for critical parameters as, e.g., those of fundamental rights
- Implement **governance** for testing by divers teams and set-up “bug bounties”

Source: European Commission, Ethics Guidelines for Trustworthy AI, p21f

Critical parameters and features need to be closely monitored

Example 2: Lacking accountability
Biased decisions derived by AI algorithms

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Example

Amazon scraps secret AI recruiting tool that showed bias against women

Source: https://www.reuters.com/article/us-amazon-com-jobs-automation-insight/amazon-scraps-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK08G

Technology & Ideas

Amazon's Gender-Biased Algorithm Is Not Alone

They're everywhere, but nobody wants to know about it.

Source: https://www.bloomberg.com/opinion/articles/2018-10-16/amazon-s-gender-biased-algorithm-is-not-alone

Problem

- 2014 Amazon started to apply **mechanized search** for top talents in applications
- As the training data from the previous 10 years was **biased by a male dominance** in tech industry, so were the results
- Amazon stopped the program 2015, but **other companies still use similar technology** and do not yet question its results

Accuracy and explainability of AI algorithms has to be secured!

Example 2: Lacking accountability
Stop the belief in black box algorithms

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Data Ethics applied

- Identifying, assessing, documenting and minimising **potential negative impacts** of AI systems is crucial
- **Auditability** of AI systems needs to be secured
- Decision-makers must be **accountable** for trade-offs when implementing such AI systems

Solution

- **Validation and testing** of an AI system and its performance as early and as close as possible
- Long-term target: develop **Explainable AI**
- Implement **AI governance framework** (e.g. red teaming, algorithmic impact assessments or ethics panel)

Source: European Commission, Ethics Guidelines for Trustworthy AI, p19f

Ownership for development, deployment and use of AI systems crucial!

Example 3: Social responsibility of life insurance
Reduced accessibility for a product

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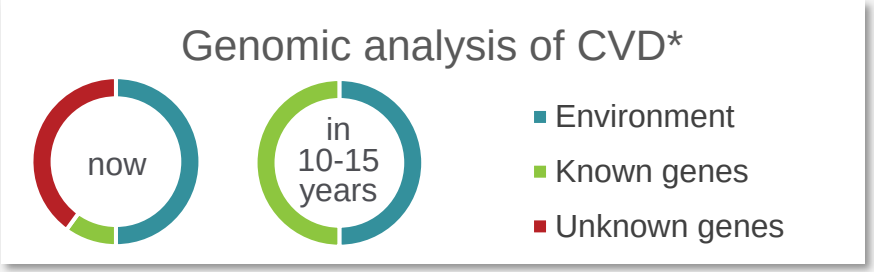
Example

Direct to Consumer Tests (DTC) are becoming cheaper and more publicly accessible



Source: Shutterstock, MunichRe * Cardiovascular Deseases

Problem

- The use of genomic data would **enable fair prices** for certain groups but at the same time **restrict the accessibility** for others
- To avoid discrimination the **access** on such data is sometimes **limited for insurers**
- Potential anti-selection by **information asymmetry** between insurer and insured has to be considered, e.g., in **higher prices** or **exclusions**

Big data and AI should increase the availability of cover, not reduce it!

Example 3: Social responsibility of life insurance
Accessibility and universal design

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Data Ethics applied

- AI systems should consider **“Universal Design” principles**
- **Product design** should allow all people to use AI products or services
- Especially age, gender, **abilities** or characteristics of an individual cannot limit access to a product or service

Solution

- Allow for a **fair pricing and accessibility** when differentiation of certain parameters is not possible for legal or ethical reasons
- If information asymmetry with very material differences in the price leads to relevant anti-selection, the regulator has to ensure other solutions, e.g., **obligatory covers**

Source: European Commission, Ethics Guidelines for Trustworthy AI, p18f

Industry and governments need to solve this topic jointly

The ethics of using data

Let’s ask an expert:

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“Act only according to that maxim by which you can at the same time will that it should become a universal law.”

Immanuel Kant, 1785

Source: Maxiphoto / Getty Images

Responsible AI

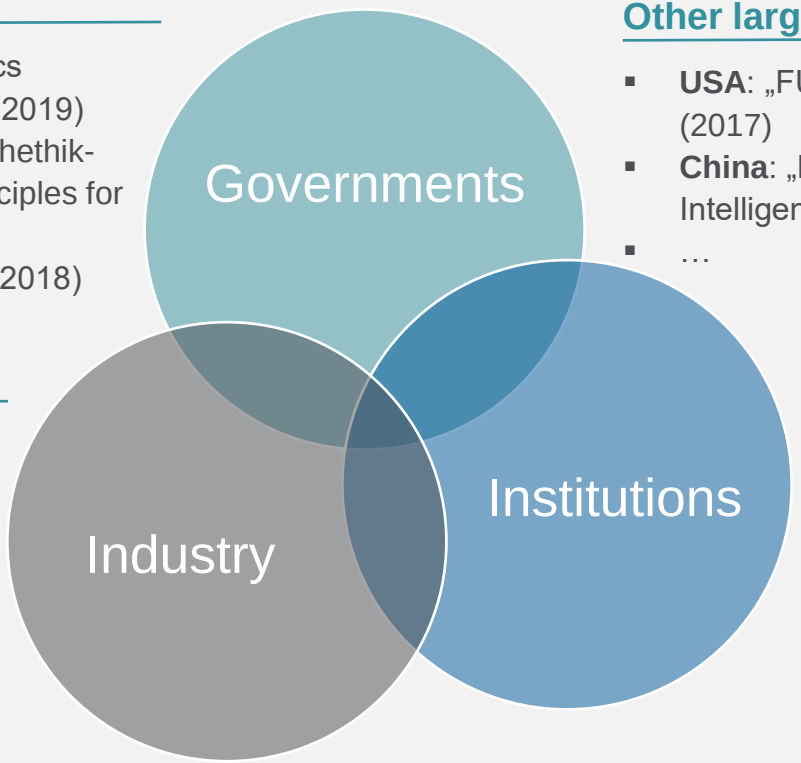
States, institutions and the industry have taken up the topic

Europe

- **European commission**: “Ethics Guidelines for Trustworthy AI” (2019)
- **Germany**: Gutachten der Datehethik-commission (2019), BaFin principles for the use of AI (2021)
- **UK**: “Data Ethics Framework” (2018)
- …

Industry

- **Google**: „Responsible AI Practices“ (2018), „AI Ethics Board“ (2014)
- **Microsoft**: „Fairness Accountability Transparency and Ethics group” FATE (2017)
- …



Other large state actors

- **USA**: „FUTURE of Artificial Intelligence Act” (2017)
- **China**: „New Generation Artificial Intelligence Development Plan“ (2017)
- …

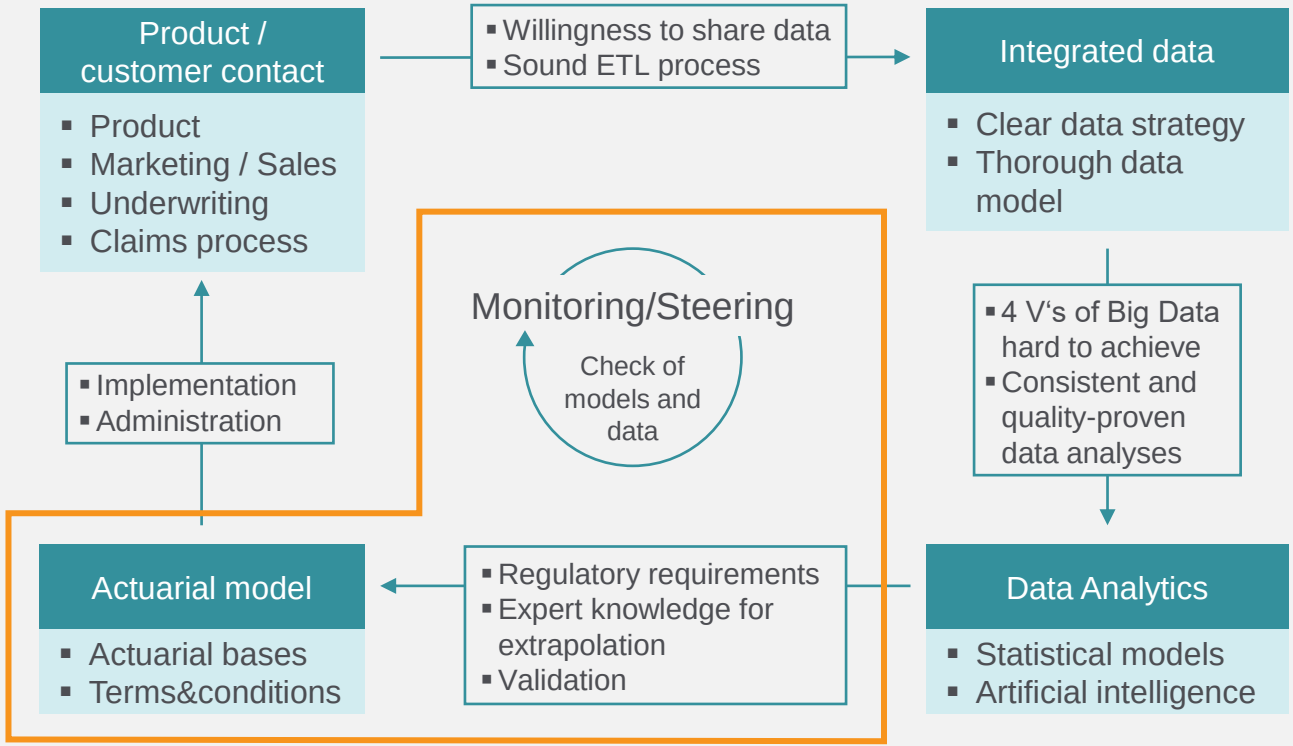
Institutions

- **Academic** in origin: Ethics in Artificial Intelligence Initiative, AI4ALL, AI Ethics Lab (2015/17/18)
- **Industry** sponsored: Partnership on AI (2016), Open AI (2015)
- …

Source: appliedAI’s “Landscape of ethical use of AI”

A concrete way of implementation for insurance

Actuaries and Risk Managers need to play an important role



Actuaries will play a major role in this new data-driven business model for insurers.

Actuaries will be needed in particular for

- the interpretation of the results,
- potentially needed extrapolation of data and
- quality checks of data, assumptions and models.

Actuaries and Risk Managers are key to **control** bots and AI

Machines will do all the work?

Perhaps, but Actuaries and Risk Managers will control them

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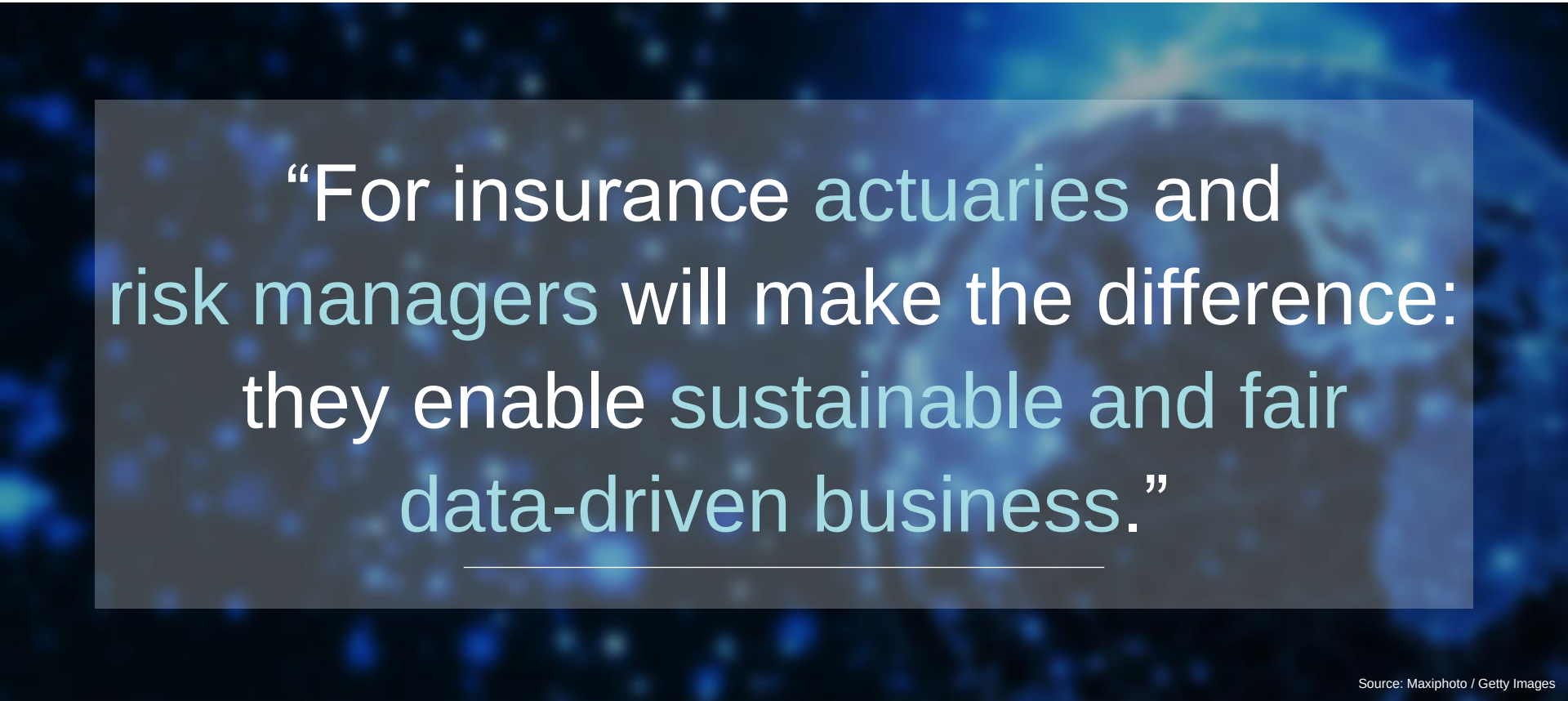

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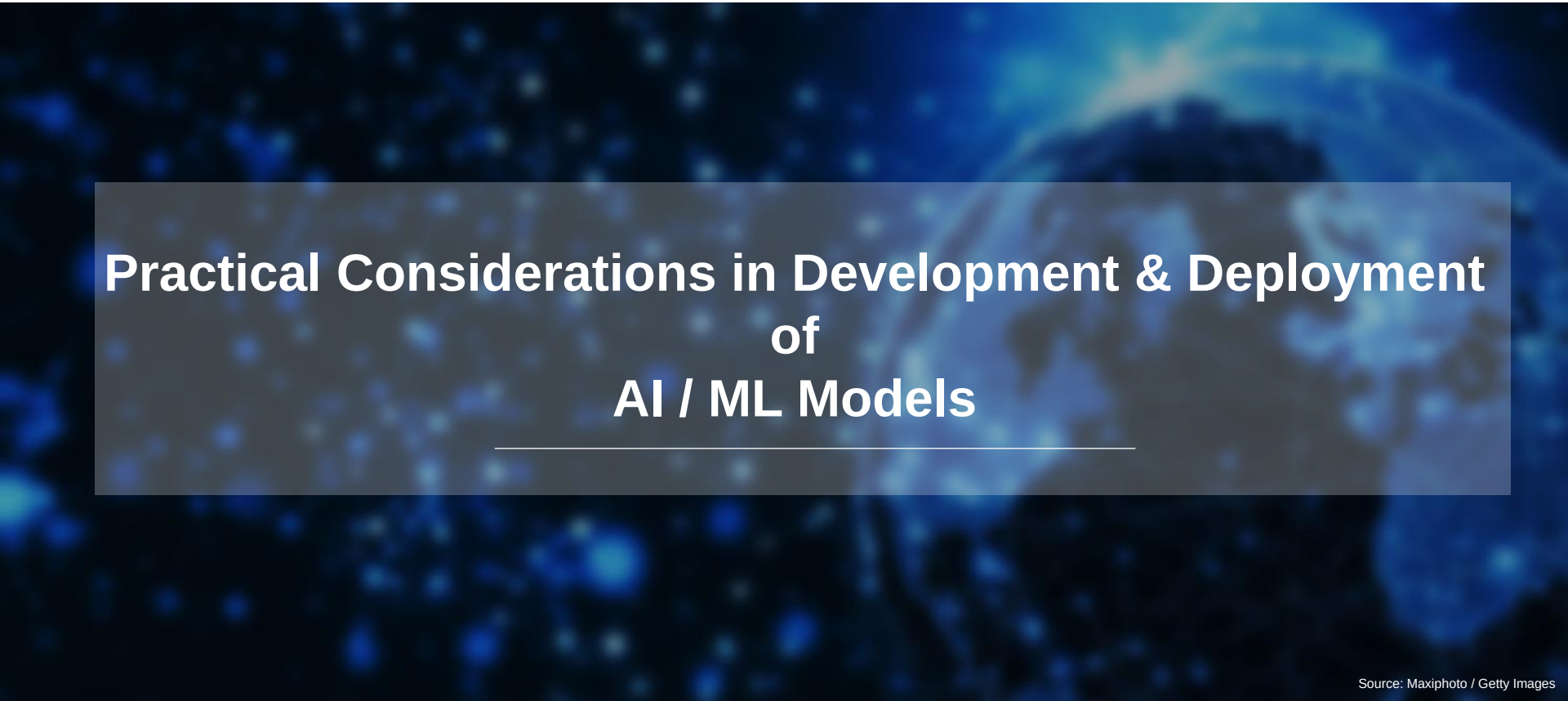
Practical Considerations in Development & Deployment of AI / ML Models



Source: Maxiphoto / Getty Images

Practical considerations in Development & Deployment of AI/ML Models

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- Understanding the business problem
- Data
- Lack of understanding / appreciation of complexity at the decision makers level
- Model explanation
- System Integration issues
- Governance
- Monitoring the performance
- Cost vs benefit

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We are looking forward to your questions

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