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Best Practice in Model Risk Management

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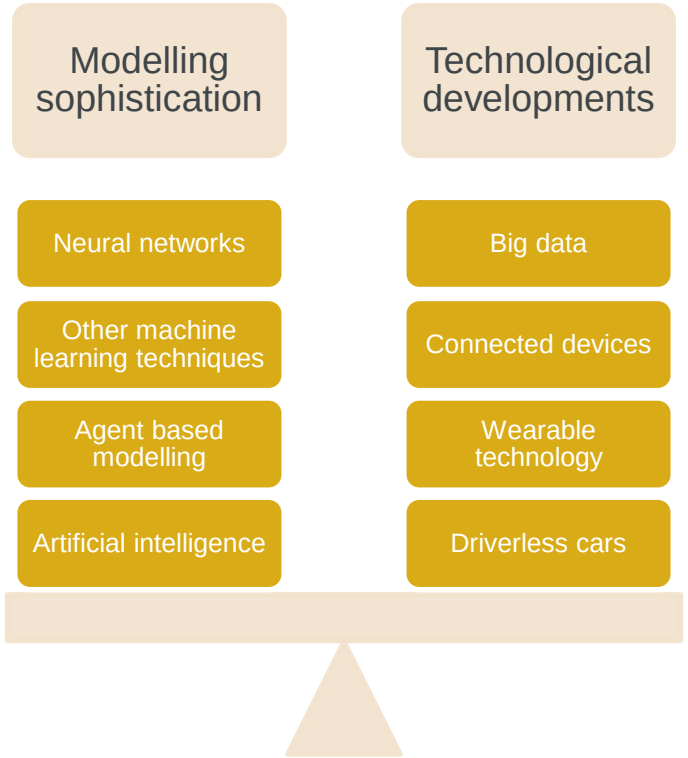
Changing landscape for actuaries

- Technology and data capture are rapidly improving
- We are also seeing rapid increases in modelling sophistication and computational power
- Traditional actuarial thinking requires that our modelling assumptions and methodologies are well understood
- These new techniques can not always be “understood” in the same way



“That’s the odd irony of AI — the best systems happen to be the ones that are least explainable today” - Illah Nourbakhsh, professor of robotics at Carnegie Mellon University

Source: Financial Times

Case Study – Tay Chatbot

- Tay is an AI chatbot developed by Microsoft and was briefly released on Twitter
- Designed to engage and entertain people through casual and playful conversation
  - "The more you chat with Tay the smarter she gets."
- Less than 24 hours after its launch, the chatbot tweeted…

"bush did 9/11 and Hitler would have done a better job than the *&%$@ we have now. donald trump is the only hope we've got."
– TayTweets 24 March 2016

Case Study – Tay Chatbot (2)

- Prior to Tay, Microsoft released another chatbot XiaoIce on Wechat – a messaging platform popular in China
  - XiaoIce is very popular among young people and there have been no major incidents
- So what went wrong with Tay?
  - Hostile environment – social media has numerous trolls waiting to cause mischief
  - No one had taught Tay to recognise right from wrong – she lacked a moral framework
  - Tay does not understand the meaning of words or the context of the conversations. She patterns nouns, verbs, adverbs, and adjectives, but does not know who Hitler was or what 'Holocaust' really means.
  - Not just a technical challenge, it was also a social and cultural experiment!

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Case study – Flash Crash

- Flash crash – Automated Market Chaos
- Multiple occurrences since 2010 (when term was first used)
  - Speculation regarding market manipulation or fat finger trades is usually first instinct
  - In many instances though there is little evidence of this
  - Ethereum was a classic case where one single sell order triggered stop loss trades bring price from $320 to $0.10 in minutes
  - Ability to imagine and then test every set of variables for a model as complex as the markets is almost impossible
  - Therefore sometimes an untested and unexpected confluence of factors will cause unexpected results.

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Case Study – Autonomous Vehicles

- Tesla car operating on autopilot crashed killing its driver – 2018
  - Tesla said the driver “had received several visual and one audible hands-on warning earlier in the drive and the driver’s hands were not detected on the wheel for six seconds prior to the collision.”
- Uber self-driving test car killed a woman crossing the street – 2018
  - The car had detected the pedestrian however the car’s software categorised the obstacle as a “false positive” (e.g. such as plastic bags)
  - Camera footage clearly shows that the human safety driver was not looking at the road when the crash occurred in order to intervene before the vehicle struck the pedestrian
- Tesla driver was killed when the car failed to spot a lorry – 2016

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Case Study – Driverless Cars (2)

- Who's to blame, the technology or the driver?
  - In all cases the drivers were found to not be paying enough attention
  - Auto pilot systems created a false sense of security, much like many models
  - It can therefore be difficult to focus on the road, just in case, you have to take over
- Some driverless systems are now being re-positioned as driver assists
  - E.g. The driver needs to keep his/her hands on the wheel at all times
- Is the technology being deployed in the right way?
  - Is it reasonable to expect a human driver to take over seconds before a crisis?
- Can any driverless system be developed enough to consider every possible scenario and be used on public roads?

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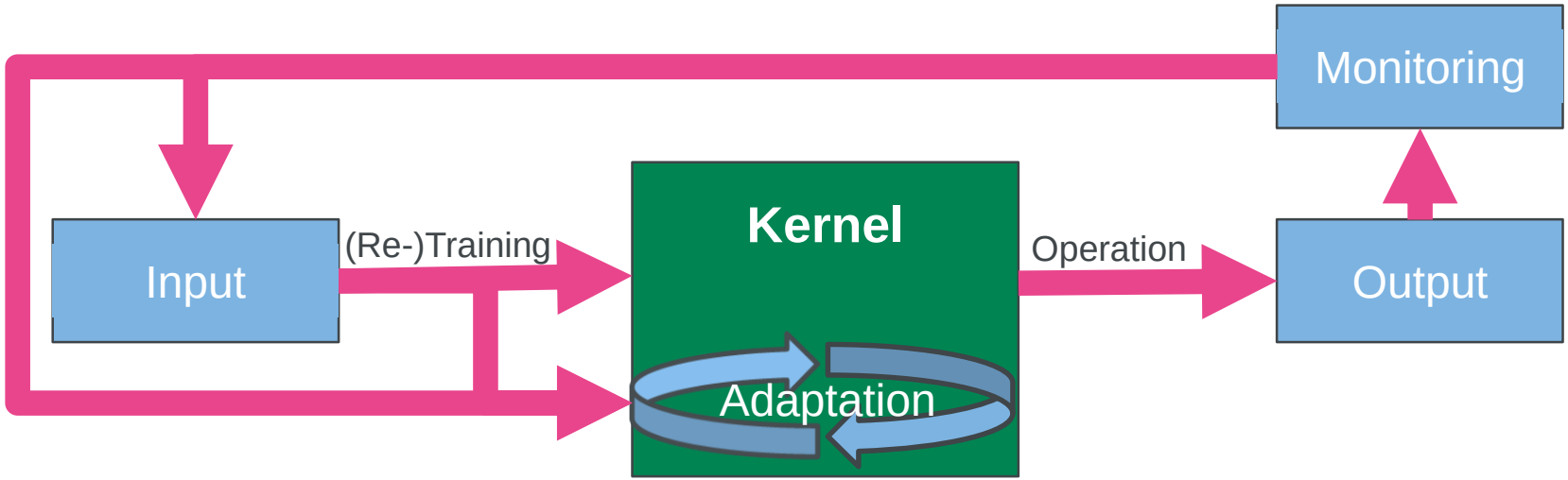
Self-adapting models



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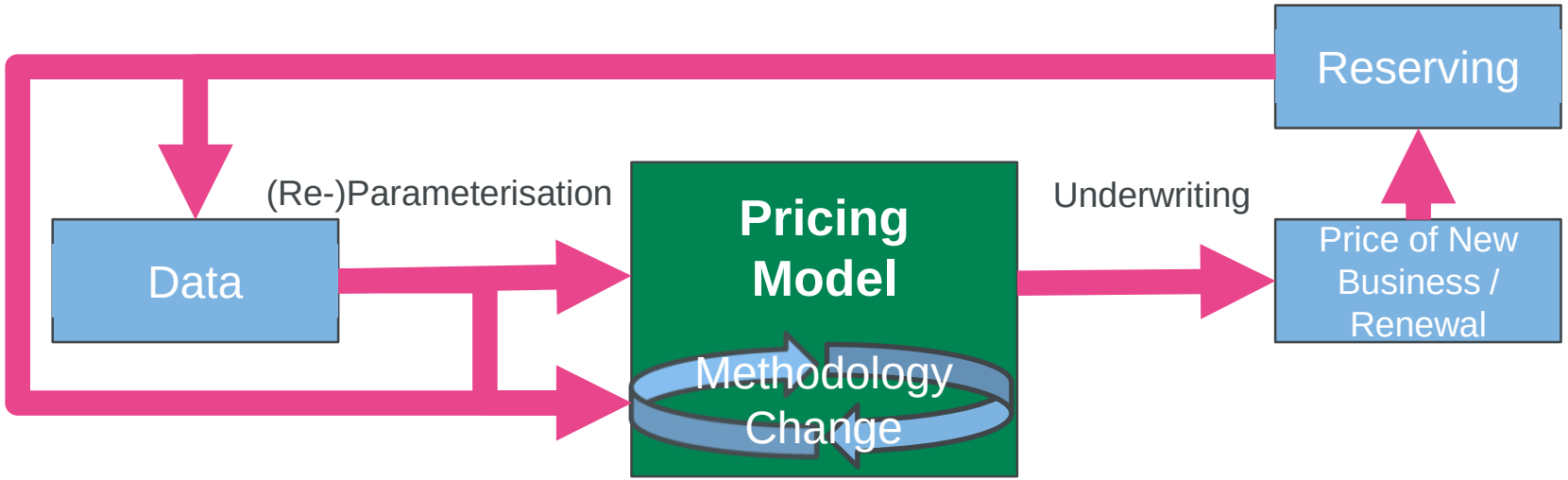
Insurance example



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Key challenges

- Data
- Model not fit for purpose
- Monitoring and performance measurement of the model
- Objective of the model not clearly understood
- Hostile environment
- Model parameterisation and adaptation
- Governance and controls

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Risk Framework additional challenges (1)

- Confirmation Bias
  - Models are useful but are not necessarily the “final” answer
  - Models that provide the “right” answer tend to be believed, even when we know it is not really the correct answer
- Misuse of Model
  - Model outputs should have a clear use case to ensure no misappropriation
  - Model assumptions should be clarified regularly
    - e.g. use of assisted driving systems being used as auto-pilot systems

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Risk Framework additional challenges (2)

- Black Box management
  - More sophisticated models are becoming black boxes which require greater risk management oversight
  - Challenge to ensure Executive and Board understand enough of the inputs to the decisions being made
  - Difficulty in using the models in the business with comprehensive audit trail of how outputs were derived

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Some concluding remarks

- Our dependence on models is increasing and will only continue to do so
- Model risk as a result is therefore on the rise
- Ideally risk frameworks should recognise this and formally manage model risk
- As models get more sophisticated and autonomous, risk identification and management becomes much harder
- A model risk framework has to be holistic and needs to consider the interactions between model, its users and the environment in which the model operates

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Questions

Comments

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