Swiss Re

Solving Industry Challenges Through MIT Faculty

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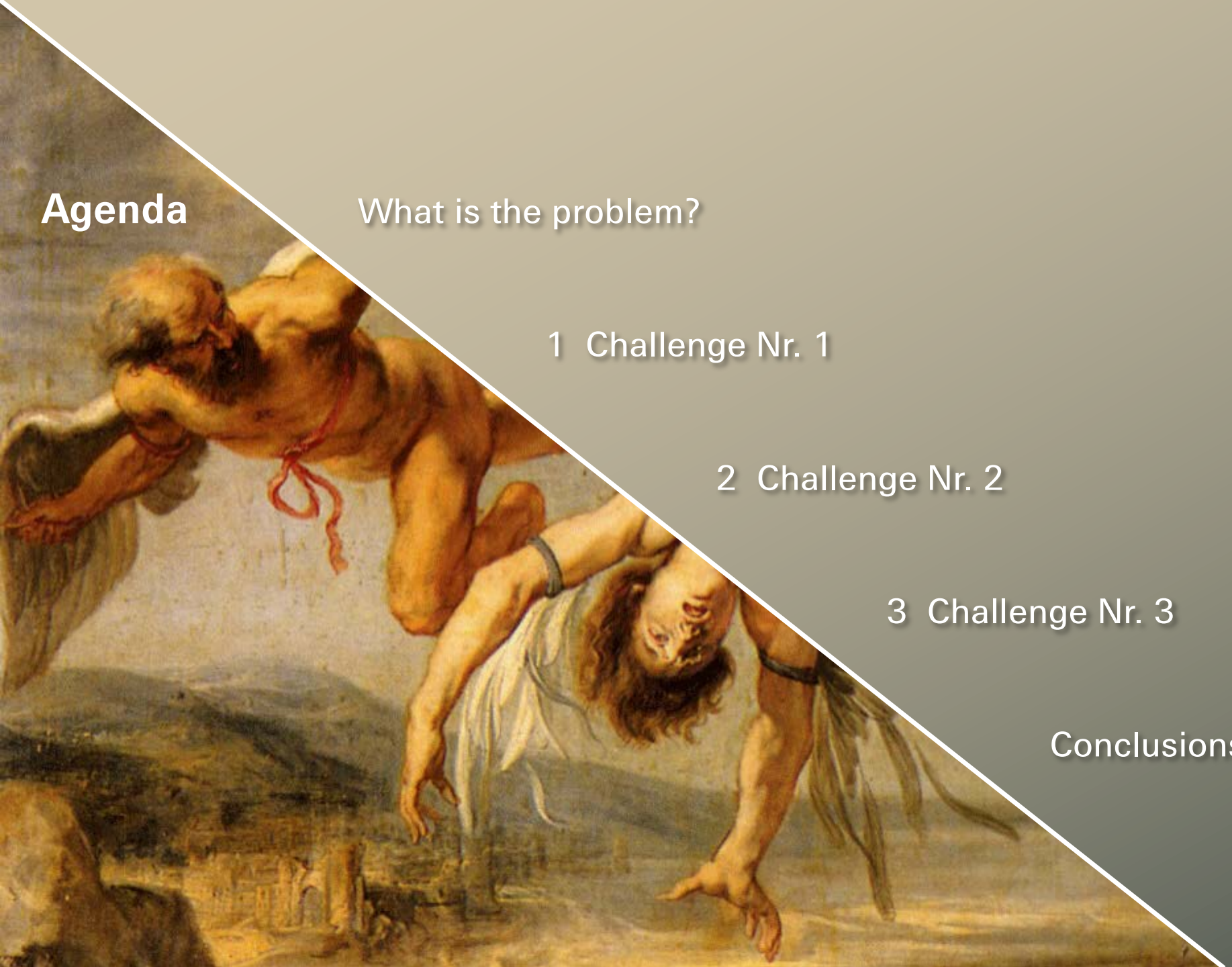
May 30th 2019



Agenda

What is the problem?

1 Challenge Nr. 1

2 Challenge Nr. 2

3 Challenge Nr. 3

Conclusions

What is the problem?

Insurance industry changes as does the world

Administration and risk developments

Past: Man as the actor

Pen and Paper
Risk coverage

exchange of paper | limited customer insights

Risks Borne by Insureds
Motor

Some Risks Yet to Emerge
Cyber

Insurance Shift

World Shift

Future: Man/ machine collaboration

Machine-assisted Insights Generation & Automation
Risk prediction & prevention

exchange of data | mass customization

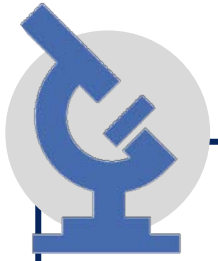
Risks Borne by Machines
Motor

New Vulnerabilities
Cyber

Insurance adopting tech in three phases

Phases of engagement

1

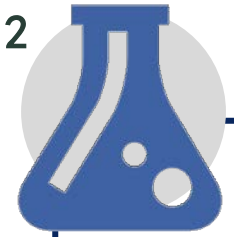


Observation

Observation and categorization of technologies and their impacts

Watch it, don't touch it

2



Experimentation

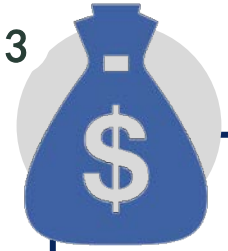
Setting up accelerators, garages, innovation sandboxes

Experimenting with observed technologies

Low ratio of implemented solutions against time committed

Touch it, don't use it

3



Value Generation

Use case-based; hypotheses to be tested

Pre-requisite: Knowing what (high-quality use cases) and how (high-quality Tech)

Touch it, make some money

1 Challenge Nr. 1

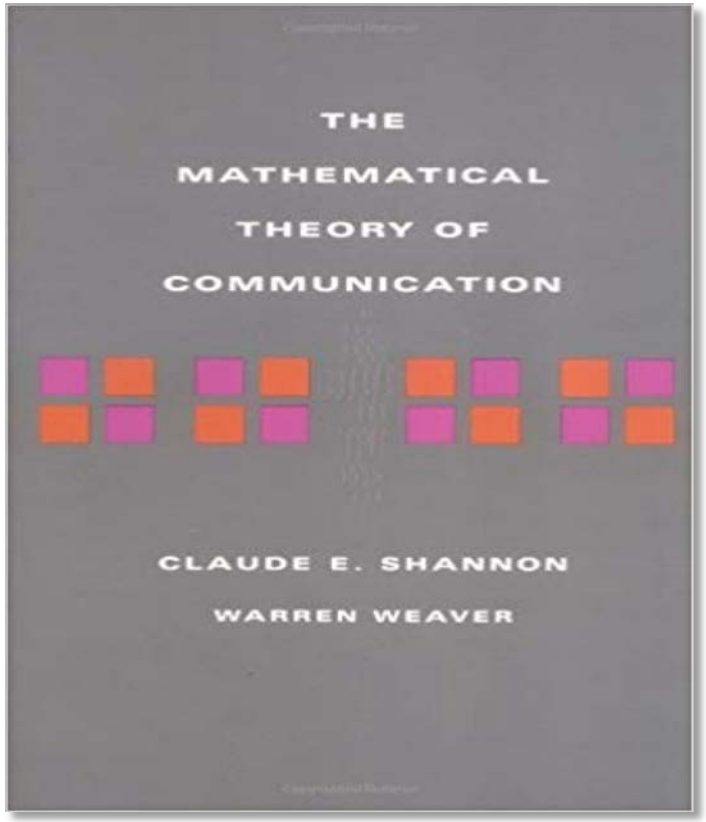
Challenge Nr. 1: Legacy systems

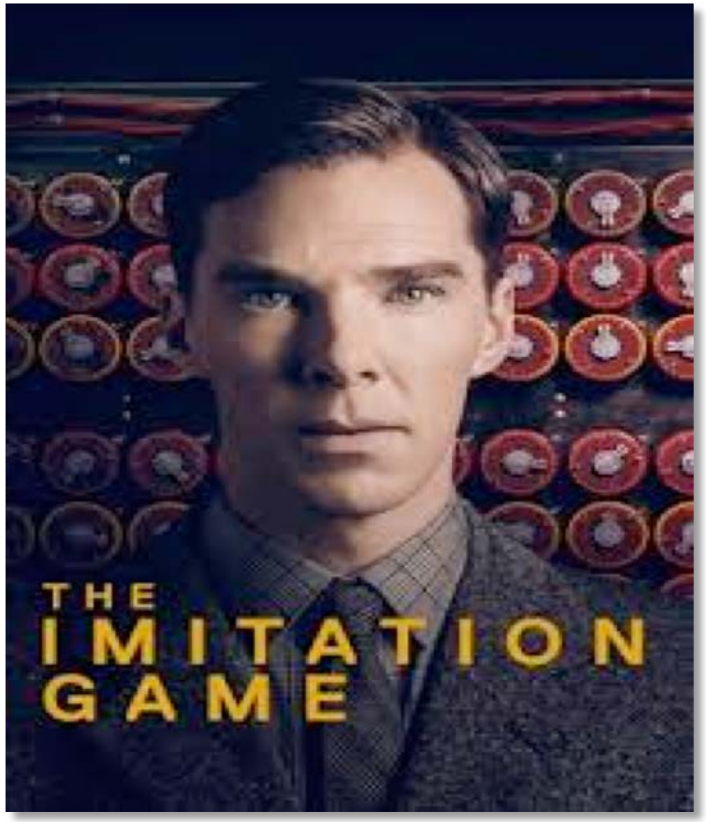
Legacy System challenge

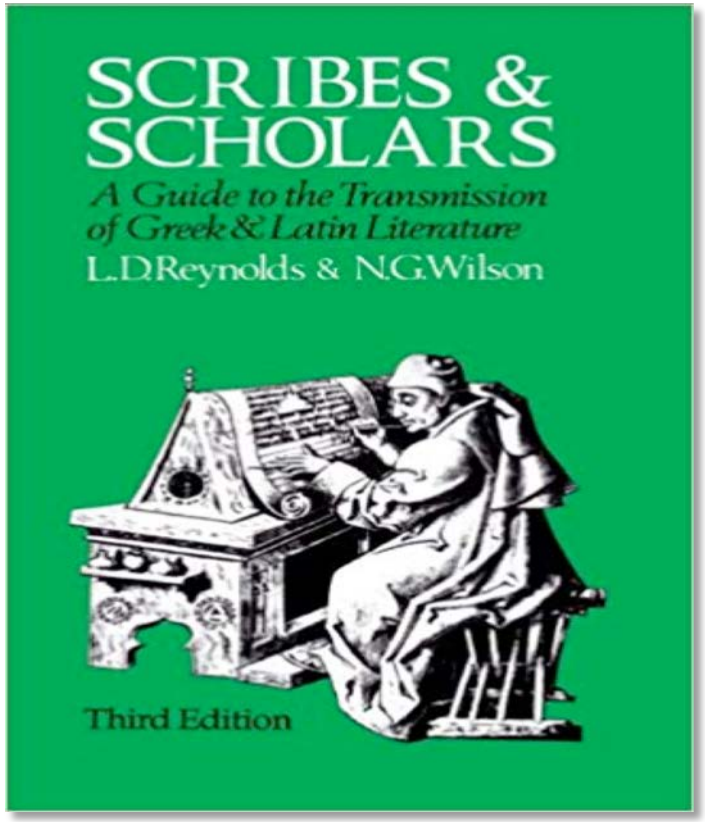
The legacy systems problem can be broken down into seven statements:

1. *Society is irreversibly dependent on data (that is "information") stored on IT systems*
2. *Most IT systems on which society relies are old (legacy)*
3. *To keep the legacy at work programmers are needed who still command the computer languages and hardware architectures originally used to store the data*
4. *Programmers able to do "3" are aging, and have started to die (the relentless "glacier speed" of demography)*
5. *0-15 years down the road the legacy will be in terminal decay, and will be subject to unstoppable cyber-attacks aimed at destroying our society. With nobody around able to fix them, the legacy systems will run out of control. And while humanity will keep fretting that the progress made in advanced artificial intelligence and the most modern computer systems will unravel (something that can be anyway disputed by the most basic understanding of neurobiology), damaged, decayed, and or "infected" old machines will develop a life of their own, and "take over". The real treat does not come from new machines, it comes from the old ones running out of control*
6. *While we fearfully watch "4" and "5" unfolding in slow motion as the "chronicle of a drama foretold", the community of the System Integrators (Accenture, Deloitte, Capgemini, etc.) earns a fortune on keeping the legacy running, and hence has no interest in a systemic solution. This is why they claim all the time that moving away from the legacy is uneconomic (pls. note that at the moment they control the pricing of such a move)*
7. *The legacy systems problem is societal and political as much as it is technical, it is huge and might turn into the next systemic crisis. Whoever can solve will turn very rich, while doing good.*

Serendipity on my desk and on a plane







Framing the problem

***Hypothesis**: Our hypothesis is that the way to solve the problem might be to re-frame it, away from being an IT problem, into a linguistic one. The trick would be to conceptualize the problem as a one of de-codification and translation (with looking at code and embedded processes as the grammar & syntax needing reconstruction) as opposed to an IT and/or process design issue. This would be similar to what a philologist would do when preparing a critical edition of antique/ medieval texts, except that the philologist would have to deal with the ambiguity and (historic as well interactive) context dependency of natural languages, while we would have not (computer code is unambiguous/ ultimately reducible to 0s and 1s and multiples of 8s/ sort of the dream of a logical positivist). You could also think of it as backward looking predictive analytics, taking today's reality as the (known) prediction, embedded data as the other constant, and regard rules as the "variable to be reconstructed" by using machine learning to go backward through the code line by line. This would be similar to the approach used to crack the Enigma during WWII.*

First hypothesis: ask the ultimate expert nr. 1

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Second hypothesis: ask the ultimate expert nr. 2

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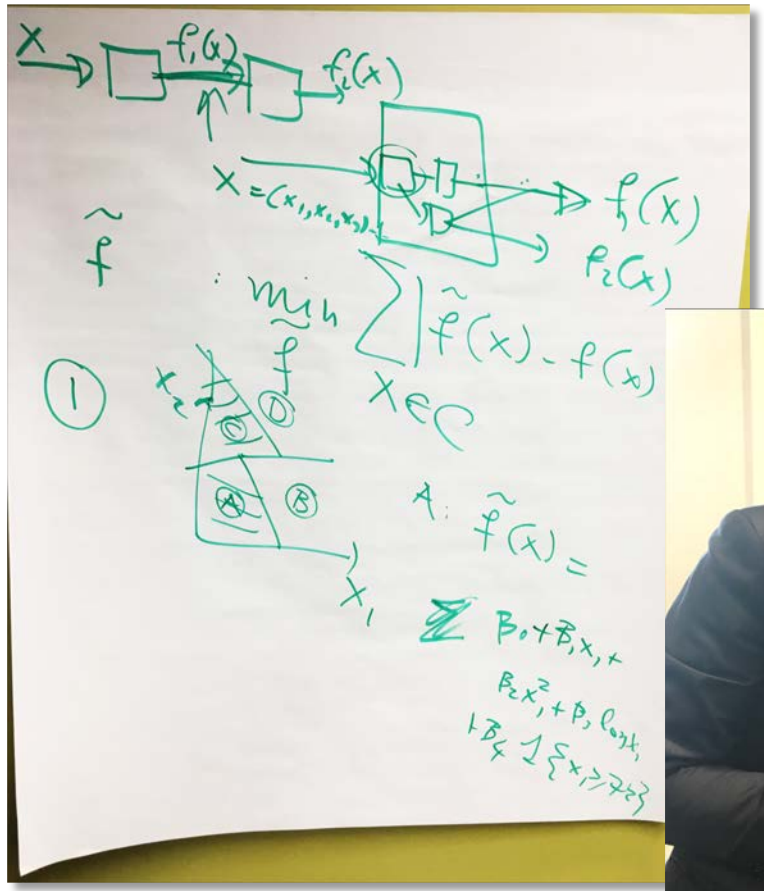
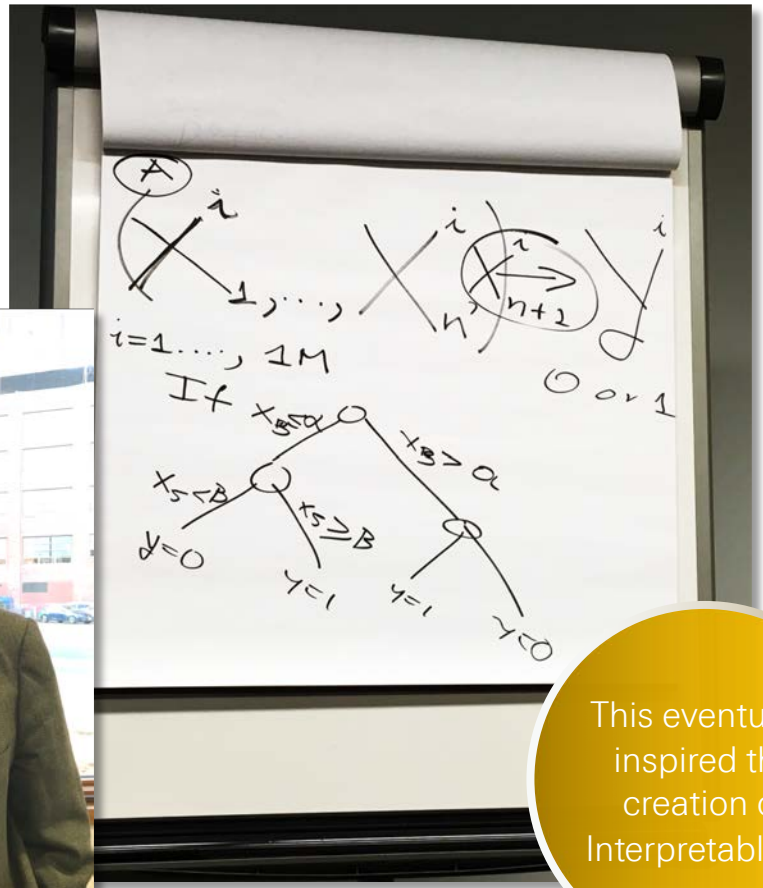
Reason to cheers

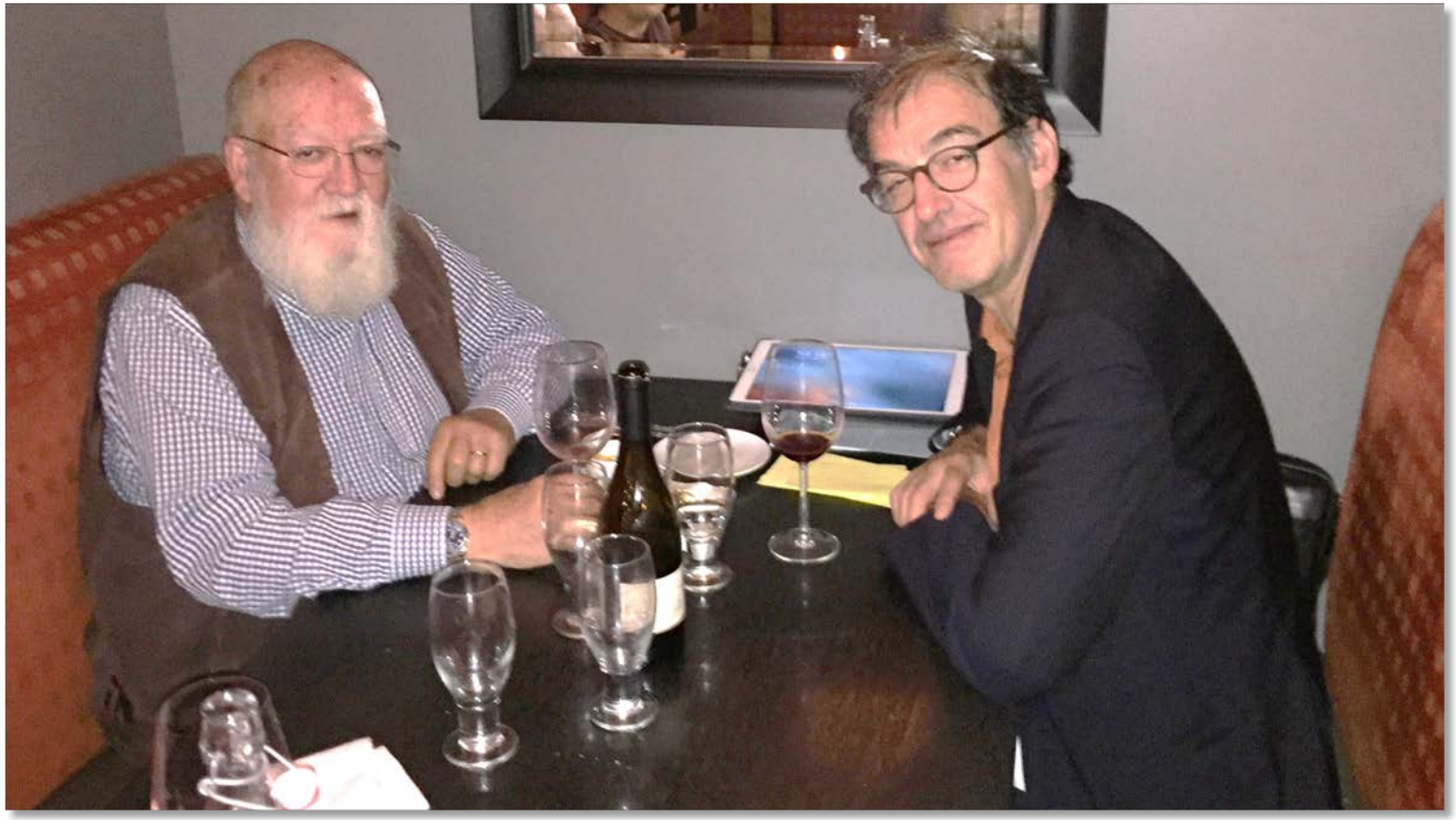




This eventually inspired the creation of Interpretable AI

2 Challenge Nr. 2

One last thing



- On Sep. 11, 2017 had the opportunity to meet Prof. Daniel Dennett. He is not a member of the MIT Faculty (he teaches at Tuft), but MIT was able to arrange.
- Original intention was to discuss a problem of philosophy. I tried, but failed.
- Towards the end of the meeting Prof. Dennett touched on the moral problem of “Algorithmic Liability”.
- This sparked quite some new thinking on Swiss Re’s end, which eventually lead to a significant reframing of the Cyber insurability problem…

Rethinking the problem as a result

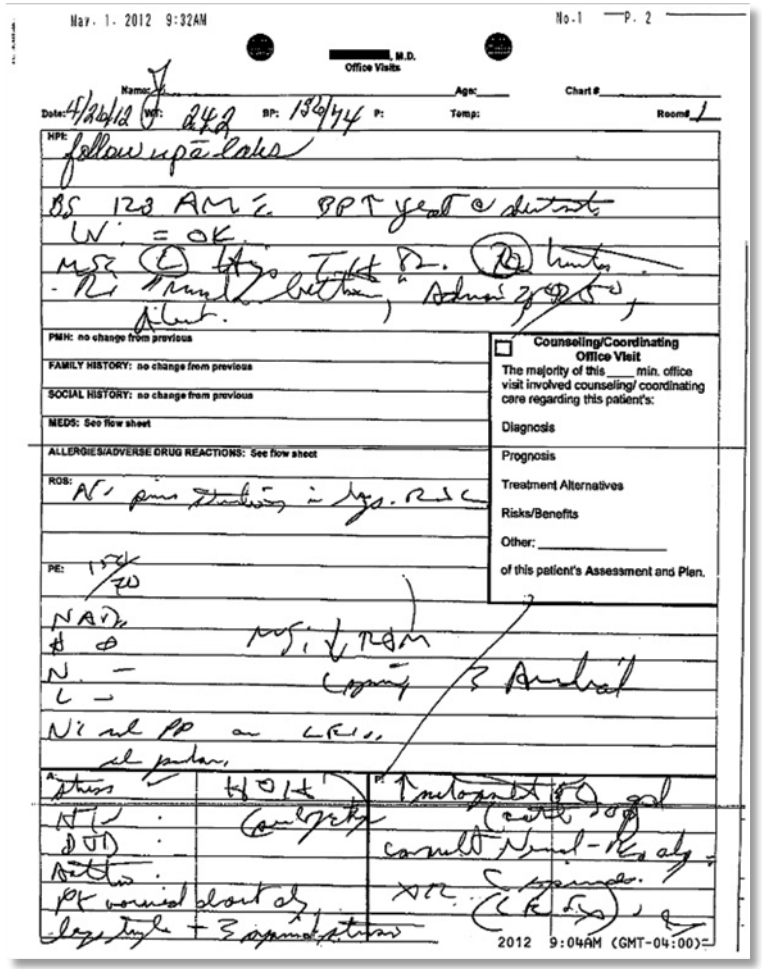
Four lenses through which we should look at Cyber Risk

Malevolent attacks	IT System Failures	Algorithmic risk	Human Errors
A cyber attack is an intentional exploitation of computer systems, networks, and technology-dependent enterprise	IT systems can fail for a variety of reasons including hardware or software glitches, power surges, physical perils and botched upgrades	Algorithms risk resulted from algorithmic complexity, algorithmic interoperability, and algorithmic malpractice	

Human Factors

3 Challenge Nr. 3

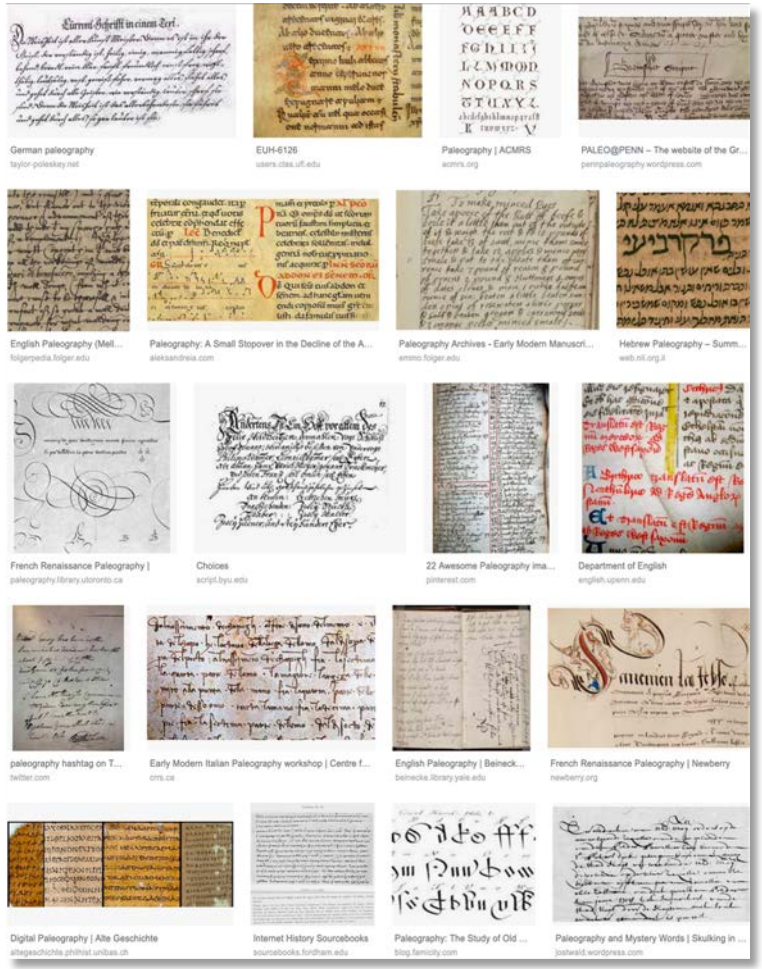
Can you please transcribe?



NN/ML/DL and other cognitive computing applications are increasingly being successfully deployed across industry verticals, predominantly with the aim of automating knowledge work. While good progress is being achieved on the algorithmic front, the practical deployment of these technologies is often impeded by the current limited ability of machines to transpose Text images into processable code. We call this the "Transcription Problem" (TP)

Academic interest in the topic has faded during the last decade, for most A) regard the problem as fundamentally solved, and B) there is a widespread belief that the upcoming digitization will make the problem obsolete altogether. Unfortunately, both above assumption are proving at least partly wrong...

Unexpected datasets



Idea

We put forward the hypothesis that a general purpose transcription machine can be built by combining computer science, particularly ML, with paleography. This would consist of merging three elements: 1) the availability in the public domain of an enormous corpus of text images (from ancient manuscripts to contemporary texts) for which professionally conducted transcriptions into ASCII code or similar exists, 2) enough computational power for a machine to ingest this corpus and utilize it as training ground, 3) enough computational power to process full words as opposed to single characters, and 4) advances in NLP allowing to verify the correctness of full word recognition from the adequacy to the context in which each is embedded

Not the whole story, but substantial

Historical documents confer superior performance to **general handwriting recognition**

Interpretable AI

	Pre-trained neural network	General handwriting recognition network
Description	• CNN (Convolutional Neural Network) • Bidirectional LSTM (Long Short-Term Memory) • CTC (Connectionist Temporal Classification)	• Automated splitting of every line in 2 parts: end-to-end CER improvement from **39%** to **27%** • Complete control over pre-trained network's architecture
Data	 IAM handwriting database: **13,353** labeled lines of modern handwriting	   IAM + **11,473** lines from Bentham's manuscripts ⇒ **24,826**
Neural network performance	CER (Character Error Rate): **18.9%**	CER (Character Error Rate): **11.6%**

Results to date look so promising that we are already discussing the creation of a new company dedicated to commercialize the solution

Conclusions

Some advice to conclude

Successful interactions with MIT can be astonishingly productive, but getting there is not obvious. Here some insights I can share about how I did it, resp. what I have learnt (note that this is the Corporate perspective, but the reverse applies for researchers):

- Navigating MIT is difficult for Corporates, The first thing you need is a good guide. With the ILP MIT offers the best program that there is to that end. Make sure you take advantage of it.
- ILP membership is necessary, but not sufficient. Make sure you are clear about the problem you are trying to solve. Without a clear problem framing there never will be a solution. In other words: if you do not know where you want to go, no guide can help you.
- Be persistent, be relevant! MIT has many of the world's best researchers. Yet they are in high demand, and they are difficult to get. Be well prepared, and never waste their time. Apply the "silver bullet principle", that is: be aware that getting the opportunity to meet any of these people is like receiving a silver bullet. You either put it to good use, and they will give you a new one at the end of the meeting, or you waste it, and you will never see them again.
- Embrace serendipity when it occurs. You might be able to meet some luminaries by accident, take the opportunity when it occurs! (even if that means changing your schedule). Also, discussions might touch on unplanned topics that are top of mind of your conversation partner. If these are relevant for your business jump on them. Discussing top of mind topics is much easier.
- You need to invest time, to show presence, and to build a reputation. I personally come to MIT at least once a quarter, and have spent 50+ days here since I started coming in early 2015, not to mention the time spent preparing. Also, reciprocate whenever you can (as I am doing e.g. today).