



The Fairness in insurance enigma : exploring the maze of regulation

Olivier Côté

7th Ontario-Québec Workshop in Insurance Mathematics



What is fairness?

“A rate is reasonable and not excessive, inadequate, or **unfairly discriminatory** if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer.”

– Casualty Actuarial Society (1988)

“Formally, the principle of **fairness** states that **similar cases should be treated similarly**. [...] The whole problem is to understand what is meant by similar cases.”

– Autorité des marchés financiers (2021), translated

Where do unfairness can unfairness lurk?

Accessibility		“Weblining” (Hernandez et al., 2001)
Service		Unconscious bias (Casualty Actuarial Society, 2022)
Underwriting		Systematic refusal in indigenous reserves (Duchaine, 2020)
Ratemaking		Solidarity or individualization ? (Barry, 2020)
Business adjustments		Non-risk-based discrimination (Guy Thomas, 2012)
Claims		Inequities in claim settlement (Lin et al., 2022).

Why should we care?

The Obama administration released a report in 2016 in which data scientists were urged to analyze “how technologies can deliberately or **inadvertently** perpetuate, exacerbate, or mask discrimination.”

–Kusner et al. (2017)

“Insurance is particularly interesting because the entire industry is based on **discrimination**.”

–Frees and Huang (2023)

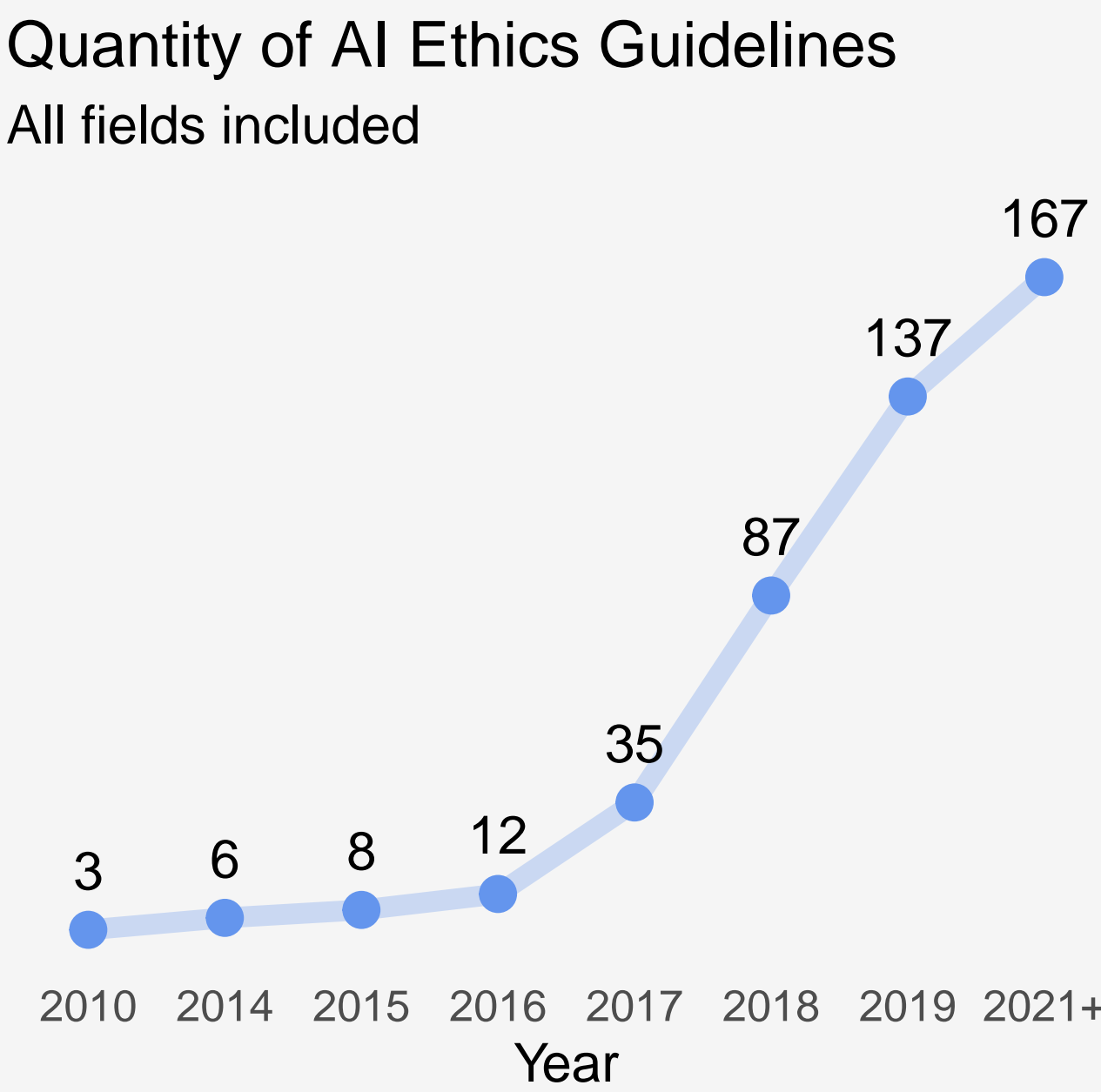


Figure 1 – AlgorithmWatch (2020)

Three reasons why the actuarial community should care about fairness

- Maintain public trust
 - “The use of AI in finance raises consumer concerns who feel particularly **vulnerable**.” –Autorité des marchés financiers (2021)
- Responsability of the modeller
 - “The statistician cannot evade the **responsibility** for understanding the process he applies or recommends.” –Fisher (1956)
 - “A model's **blind spots** reflect the judgments and priorities of its creators.” –O’Neil (2016)
- Regulation
 - Regulation and recommendations are diversified and numerous around the globe.

Regulation in the world

- The General Data Protection Regulation (European Union, 2016) specifies prohibited variables in the **European Union**, notably including ethnic origin and gender.
- The **United Kingdom** has adopted a version similar to the GDPR with the Data Protection Act 2018.
- The United States showcases a mosaic of regulatory stances (Xin and Huang, 2023), ranging from stringent anti-discrimination measures (e.g., California) to prohibitions regarding a few highly sensitive variables (e.g., Texas).

Regulation in Canada

- New Brunswick** : Prohibition of demanding differentiated rates based on **age**, **gender**, or **marital status**.
- Nova Scotia** : Prohibition of demanding differentiated rates based on **age** or **marital status**.
- Newfoundland and Labrador** : Prohibition of demanding differentiated rates based on **non-fault accident history**, **age**, **sex**, and **marital status**.
- Ontario** : Prohibition of demanding differentiated rates based on **credit history**, **occupation**, or **homeowner status**.

The (among many acts) Data Protection Act suggests incoming discussions regarding algorithmic fairness :

“An organization must not use information that has been de-identified [...] to identify an individual except [...] to conduct **testing of the fairness** and accuracy of models, processes and systems that were developed using information that has been de-identified” –Bill C-27 (House of commons of Canada)

Regulation in Québec

According to CDPDJ, discrimination based on these 14 characteristics is prohibited :



“Every person has a right to [...] equal recognition [...] of his human rights [...] without distinction [...] based on **race**, **colour**, **sex**, **gender identity or expression**, **pregnancy**, **sexual orientation**, **civil status**, **age** [...], **religion**, **political convictions**, **language**, **ethnic or national origin**, **social condition**, a **handicap** or the use of any means to palliate a handicap.” – Charter of human rights and freedoms, Québec

There are exceptions for **age**, **sex** or **civil status** if

- the “use thereof is warranted” ;
- it is considered a “risk determination factor based on actuarial data”

Is **price optimization** included in “profiling”?

“**Profiling** means the collection and use of personal information [...] for the purpose of analyzing that person's [...] economic situation, health, **personal preferences**, interests or behaviour.” – Act respecting the protection of personal information in the private sector, Québec

This would force companies by law to **inform** of such practice and of the means available to **disable** such profiling?

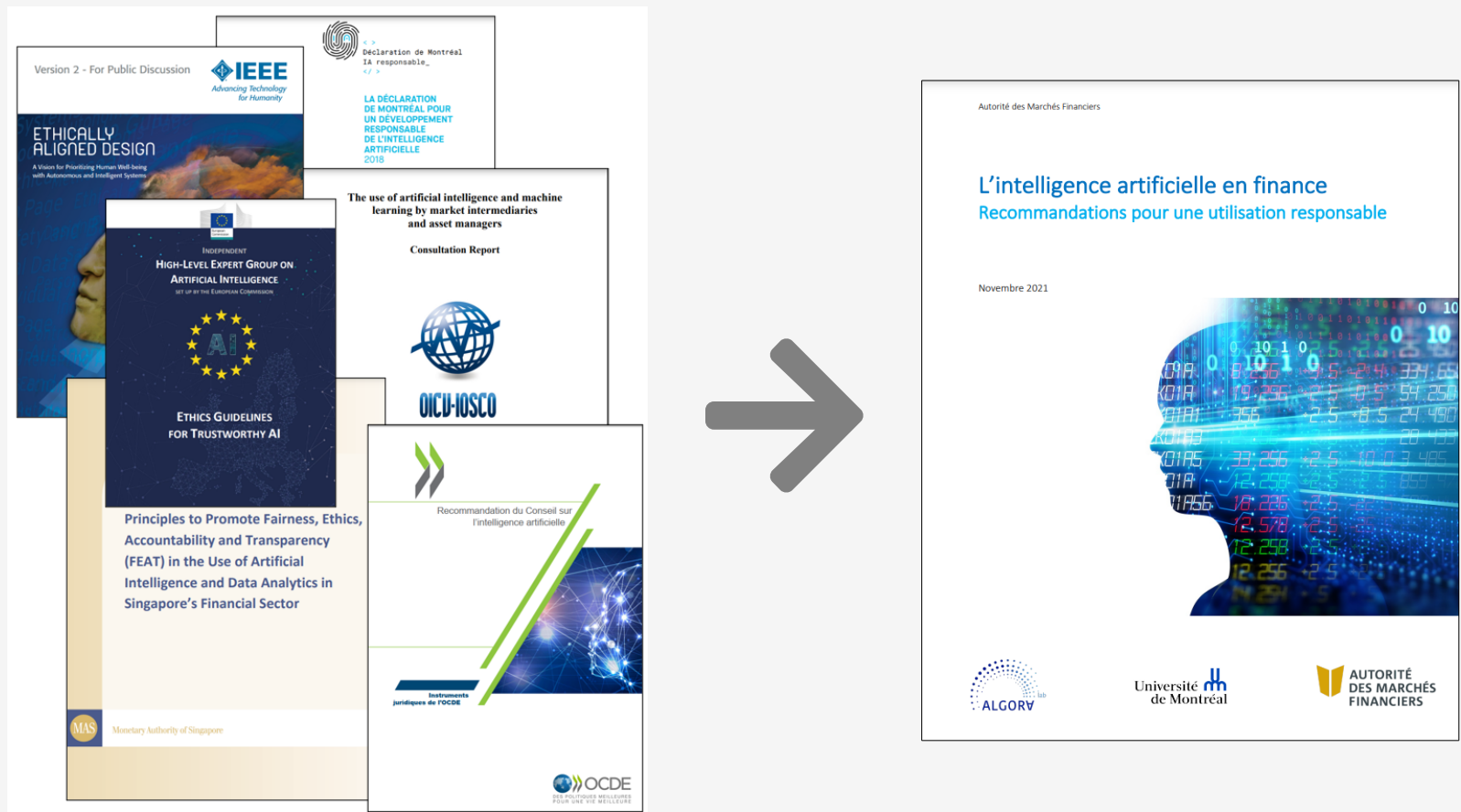
Recommandations

Actuarial organizations demonstrate their interest in fairness in insurance operations : from underwriting to claim management

- “Avoiding Unfair Bias in Insurance Applications of AI Models” –Society of Actuaries
- “Request for Proposals on Regulation Related to Algorithmic Bias” –Casualty Actuarial Society
- “CAS Approach to Race and Insurance Pricing” –Casualty Actuarial Society
- “Bias and Fairness in Pricing and Underwriting of Property and Casualty (PC) Risks” –Canadian Institute of Actuaries

Autorité des marchés financiers (2021) is consistent with international reports :

- Bengio et al. (2018)
- Monetary Authority of Singapore (2018)
- European commission (2019)
- IEEE (2019)
- OECD (2019)



Recent reports of Autorité des marchés financiers (2024) also place “treating consumers with fairness” as an pivotal best practice (4 out of 30).

Academic community focuses on indirect discrimination Frees and Huang (2023); Lindholm et al. (2023); Araiza Iturria et al. (2022) to improve fairness.

Regardless of the angle, the goal is for actuaries to be trusted references for both their expertise on quantitative analysis and socially responsible modeling.

References

- AlgorithmWatch (2020). Ai ethics guidelines global inventory. algorithm watch.
- Araiza Iturria, C. A., Hardy, M., and Marriott, P. (2022). A discrimination-free premium under a causal framework. Available at SSRN 4079068.
- Autorité des marchés financiers (2021). L'intelligence artificielle en finance : Recommandations pour une utilisation responsable. Accessed : February 28, 2024.
- Autorité des marchés financiers (2024). Meilleures pratiques pour l'utilisation responsable de l'ia dans le secteur financier. Accessed : February 28, 2024.
- Barry, L. (2020). Insurance, big data and changing conceptions of fairness. *European Journal of Sociology*, 61(2):159–184.
- Bengio, Y., Dilhac, M.-A., Maroşan, M. I., et al. (2018). The Montréal Declaration for a Responsible Development of Artificial Intelligence. <https://montrealdeclaration-responsibleai.com/the-declaration/>. Accessed : January 24, 2024.
- Casualty Actuarial Society (1988). Statement of Principles Regarding Property and Casualty Insurance Ratemaking. Accessed : february 13, 2022.
- Casualty Actuarial Society (2022). Methods for Quantifying Discriminatory Effects on Protected Classes in Insurance. Accessed : october 31, 2023.
- Duchaine, G. (2020). Des refus systématiques dans les réserves. *La Presse*.
- European commission (2019). Ethics Guidelines for Trustworthy AI. <https://www.aepd.es/sites/default/files/2019-12/ai-ethics-guidelines.pdf>. Accessed : January 24, 2024.
- European Union (2016). Regulation (eu) 2016/679 of the european parliament and of the council of 27 april 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (general data protection regulation). <https://eur-lex.europa.eu/eli/reg/2016/679/oj>. Accessed : January 24, 2024.
- Fisher, R. A. (1956). Statistical methods and scientific inference.
- Frees, E. W. and Huang, F. (2023). The discriminating (pricing) actuary. *North American Actuarial Journal*, 27(1):2–24.
- Guy Thomas, R. (2012). Non-risk price discrimination in insurance : market outcomes and public policy. *The Geneva Papers on Risk and Insurance-Issues and Practice*, 37(1):27–46.
- Hernandez, G. A., Eddy, K. J., and Muchmore, J. (2001). Insurance weblining and unfair discrimination in cyberspace. *SMUL Rev.*, 54:1953.
- IEEE (2019). Ethically aligned design. https://standards.ieee.org/wp-content/uploads/import/documents/other/eaa_v2.pdf. Accessed : January 24, 2024.
- Kusner, M. J., Loftus, J., Russell, C., and Silva, R. (2017). Counterfactual fairness. *Advances in neural information processing systems*, 30.
- Lin, X., Browne, M. J., and Hofmann, A. (2022). Race discrimination in the adjudication of claims : Evidence from earthquake insurance. *Journal of Risk and Insurance*.
- Lindholm, M., Richman, R., Tsanakas, A., and Wuthrich, M. V. (2023). What is fair? Proxy discrimination vs. demographic disparities in insurance pricing. Available at SSRN 4436409.
- Monetary Authority of Singapore (2018). Principles to promote fairness, ethics, accountability and transparency (FEAT) in the use of AI and Data analytics. <https://www.mas.gov.sg/-/media/MAS/News%20and%20Publications/Monographs%20and%20Information%20Papers/FEAT%20Principles%20Final.pdf>. Accessed : January 24, 2024.
- OECD (2019). Recommendation of the Council on Artificial Intelligence. <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449>. Accessed : January 24, 2024.
- O’Neil, C. (2016). *Weapons of math destruction : How big data increases inequality and threatens democracy*. Broadway Books.
- Xin, X. and Huang, F. (2023). Antidiscrimination insurance pricing : Regulations, fairness criteria, and models. *North American Actuarial Journal*, pages 1–35.