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Chapter 11: Regulatory and ethical challenges in artificial intelligence-powered insurance systems

11.1. Introduction

Insurance refers to a system that manages risk and protects economic interests by compensating parties that suffer damages. While this concept has existed for centuries, the emergence of the internet and digitization has brought the insurance business into a new era. Today, insurance offers open digital channels for consumers to connect machines and algorithms with other machines and algorithms. Sellers, buyers, insurers, and insureds are all digital. Algorithms drive decisions that create the transactions that create the data. The system is a continuous loop in cyberspace. This new insurance model is known, collectively, as insurtech. Insurtech covers a wide range of solutions, enabled by new technologies, that aim at easing and enhancing the insurance process both for consumers and insurers (Binns, 2018; Dastin, 2018; Liu & Yang, 2021).

Insurtech is not only reshaping traditional practices; it also propels the launch of new models and covers. External data sources fed by technologies such as artificial intelligence, machine learning, big data, and the Internet of Things build a more daring way of zonification and risk pricing. Drones and automated processes create appetizing cybersecurity and parametric insurance covers. Other ad hoc emerging services reshape and influence custom insurance products as life insurance, using social media and other external data as leading drivers. Beyond traditional Insurance and Reinsurance companies, an entire new player ecosystem is speeding up its online digital development through innovative and disruptive solutions. Neotarification and user experience enhancements through customer journey simplifications and partnerships with non-insurance services are behind many Insurtech projects. Insurance products are being embedded or integrated into other services and applications (O'Neil, 2016; Suresh & Guttag, 2020).

11.1.1. Context and Purpose of the Study

Predictive algorithms are being increasingly adopted in many areas of society to determine outcomes that affect human beings' lives: from predictive policing systems to risk-based allocations of state budgets to technical algorithms that decide on the severity of the sentence, both legal and economic, that the people convicted of a crime have to bear, with the good, bad, and even ugly that every technology capable of managing big data can bring to these procedures. Insurance systems are no exception to the above trends: with the advent of AI, they have incorporated predictive algorithms as a core business. Relying on the assumption that those who are at higher risk of suffering a certain eventuality should contribute to that risk relatively more than those who are at lower risk, predictive algorithms sort people – as insured subjects, but often in their recreational and employment roles as citizens – and decide on the economic resources that should be allocated to each category. To use a metaphor relating to the founding father principle of actuarial science, the enlarged base of the pyramid of the people who are unlikely to experience a certain eventuality should contribute relatively little to its overall cost, compared to the narrowly balanced apex formed by those who are statistically more likely to incur that same cost.

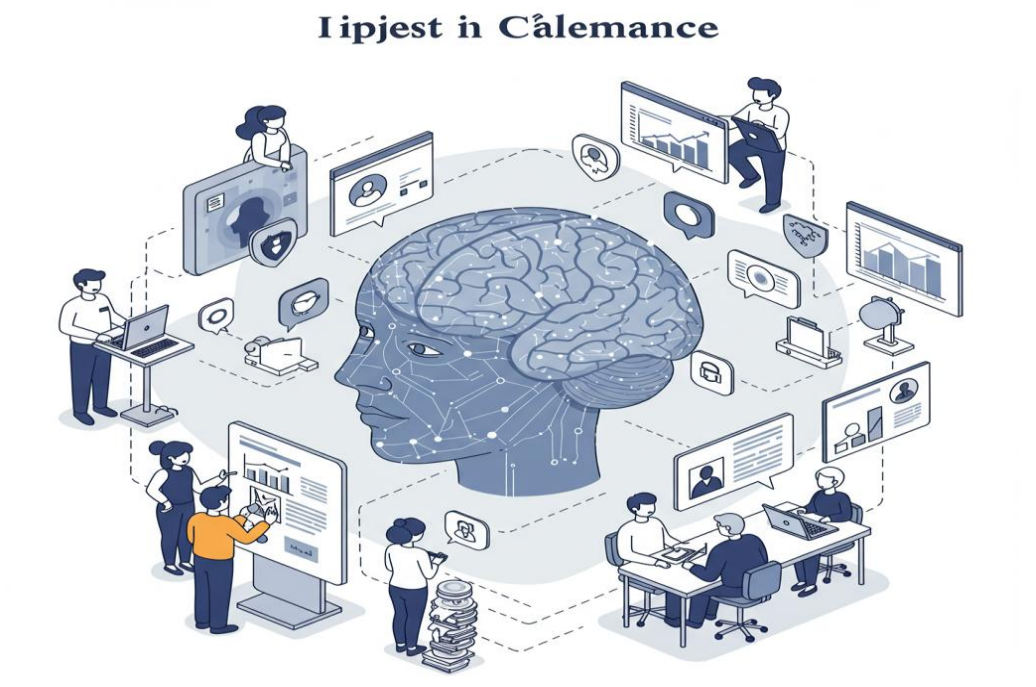

Fig 11 . 1 : Ethical Challenges in AI-Powered Insurance

Unlike other applications of algorithms on people's lives, which have been scrutinized in research and the soft law of different branches of law, insurance systems' use of

algorithms has flown under the radar, remaining significantly more un- or under-regulated compared to other fields. This is paradoxical for at least a few reasons. Algorithms have brought more profound innovations in insurance systems than in many other areas of society. The insurance industry is a fiduciary industry that handles policyholders' personal information and financial assets and is hence exposed to the risk of breaching the financial secrets that insurance law protects. Users are more reliant on insurance systems compared to many other sectors in denying or restricting access to the services they provide. The consequences of unreasonable algorithm discrimination and the resulting lack of access to insurance services could have far more severe ramifications in the insurance industry compared to other areas of society.

11.2. Overview of AI in Insurance

In the last decade, a large number of applications based on Artificial Intelligence (AI) technologies have entered the insurance sector. Many of these applications have become critical components in the operations of insurers and their interaction with policyholders or insurance participants. Underserved by current solutions offered by legacy systems, insurers have welcomed new entrants proposing value-adding tools and algorithms with open arms. Incorporating Dynamic Pricing, Smart Underwriting, Risk Analysis, Claims Automation, and Chatbots, AI entry-level solutions have also changed the perception of the industry from the outside. Faced by innovations based on machine learning allowing companies to gain greater insight into underwriting and risk selection, facilitating better revenue management, automating aspects of claims and fraud detection, and bringing data analytics to life, new entrants have suddenly reshaped the landscape for traditional insurers. New challenges have arisen in the way of combining the tradition of a long-term promise with current fast digital interactions in claims and quotes. Set against this background, the regulatory and ethical debate surrounding the use of AI has gained new momentum.

Despite the different regulated nature of insurance and tech firms, their intersection has increasingly put pressure on frameworks that were previously thought sufficient, asking regulators for new solutions or guidelines. In particular, the use of AI in these decision processes raises important ethical and accountability questions. This calls into question the potential for unacceptable discrimination and bias against one group of individuals. When approval or rejection for an offer, a claim justifying payment or coverage, or a fine are based on biased algorithms, a high level of model transparency becomes an ethical duty. But watchdogs, including Data Protection Authorities, are still waiting for feedback from academia and industry on such algorithmic certification.

11.2.1. Historical Context and Evolution of AI in Insurance

The automation of underwriting - the process of accepting or rejecting proposed applications for insurance coverage - is the earliest use of AI in insurance. At the time, insurance-covered risks were primarily new subscribers' deaths, which required assessing the likelihood of premature death through analysis of historical life expectancy data. In the early 1900s, life insurers used logit models to assess risk based on socio-economic characteristics, and they calculated or estimated appropriate premiums for proposed subscribers. In addition, assurances and liabilities at that time had short duration, a main characteristic of re/insurance products. Premiums collected were usually deposited in short-term security investments. Effective payment of death benefits did not need significant reserve funds. Because of the short duration, some major life and health companies recognized that their products involved passive yet considerable exposure to market risk. At that time, life companies were the only insurers that had large reserve accounts. Furthermore, available historical data had short time series, creating considerable uncertainties about values of estimated probabilities and rates.

These early experiences set the stage for future AIS evolutions. AI is now a standard component of contemporary re/insurance firms' operations. In principle, several contemporary insurance applications can be framed in terms of business processes that use data to transform consumer inputs into re/insurance outputs - price insurance for good risks, reject insurance for bad risks, provide help in low- and high-loss periods, and invest effectively the funds. AI technologies are used to automate key elements of the processes. Technologies are available that help business managers guide each part of the process. Each part is data, often being a very large volume. The techniques recognize that mapping data is the relevant function for the objectives of the re/insurance business process. A variety of huge data sets - anonymized consumer and business behavior and identity data - are readily available to enhance customer behavior understanding and expectation management. AI technologies are also used to develop real-time pricing, monitoring of events that affect the probability or severity of loss events, customer service engagement, discrepancy assessment, recommendation of controls, and actual loss assessment.

11.3. Regulatory Frameworks

Meaningful regulation must balance two important functions: providing security to users to prevent severe harm while preserving the conditions that allow for the generation of benefits through rich ecosystems of experimentation and trust. For insurance systems – which have long been subject to sectorial regulation – such balance is particularly sensitive. While regulation should ensure legal compliance and risk mitigation for AI-powered insurance products, it must also facilitate experimentation for industry players

who are still getting a grasp of how to properly do these things. In insurance, AI regulation generally concerns itself with aspects such as algorithmic fairness, corporate accountability, product security, systemic risk, and consumer protection from risks of fraud, discrimination, and harm. Current guidelines propose different levels of regulation based on the perceived potential for risk or harm, favoring flexible regulation for low-risk uses. Balancing these elements is particularly difficult in insurance because risk-sharing systems must have a large degree of flexibility in designing products to be able to support themselves and be available to all users, including those at high risk for particular events. For AI-powered insurance systems, the core regulatory design question is whether regulators can ensure that privatized social orderings constitute automatically produced and endorsed trust-building frameworks to better turn automation into the desired net positive results. In exploring the challenges of trying to regulate how privatized social orderings define trust in AI optimization and implementation, we analyze the lack of frameworks to address safety, security, transparency, system oversight, user control, and equitable design and outcomes. We also explore the national conversation relative to engineering AI-powered automation for ethical and moral applications.

11.3.1. Global Regulatory Landscape

Global companies, irrespective of their interest in launching products and services in other jurisdictions, will have to comply with the rules and regulations established in such jurisdictions, which may be different or even stricter than the rules of their home jurisdiction. For the insurance industry, such a decision will have to comply with local applicable insurance regulations concerning insurance licensure, solvency and reserves, governance, capital and financial condition, risk and performance management, market regulations, and consumer conduct. The institutional backdrop varies around the world. For insurance firms, supervision occurs at a global, supranational, national, and even local level. Although international organizations help to set international standards, establishing laws that govern the use of innovative technologies in financial services firms is much more complex than simply digitalizing personal data. Furthermore, the insurance industry has no world regulatory umbrella-like banking does. And the competition for technological innovation is much larger than in banking. Insurers are, furthermore, key players in the protection of information and digital confidence. Thus, leaders articulated a common vision of the digital economy, ensuring confidence through the right conditions to enable citizens, businesses, and other partners to take full advantage of the digital economy. The remarked question, of course, is that establishing those frameworks and standards may also not suit the business model of insurers who look to embrace new technological advancements.

11.3.2. National Regulations

A handful of countries have developed national AI strategies and principles and outlined certain regulations that pertain specifically or more generally to AI deployment. In offering an overview of these national strategies and regulations we focus mostly on those that are closely related to the deployment of AI technologies in general or more specifically in the insurance domain, and very briefly summarize those considered less important. Overall, we find such policy documents to be unsurprisingly very politically driven and high-level, lacking specific enforceable provisions or measures. For instance, the UK National AI Strategy offers the goal of making the country a global AI superpower. It states: "We will be open and democratic when developing AI, championing our values—freedom, openness, tolerance—globally." Similarly, Canada's National AI Strategy aims "to position Canada as a leader in the responsible adoption of AI, guided by Canadian values and interests," the Italian Artificial Intelligence Strategy aims "to keep the pace of innovation in line with the aspirations of citizens and society at large, ensuring an AI that is rooted in our humanistic values," and New Zealand's AI Strategy emphasizes a human-centered and inclusive approach. The United Arab Emirates in its Strategy for AI declares: "We aim to benefit humanity and the globe; to drive the shift towards the fourth industrial revolution; and to enhance the skills of our people and prepare them for a future where AI is part of every aspect of our lives."

11.3.3. Industry Standards

While government regulations can be slow to catch up with progress in our heavily tech-dependent world, industry groups are often at the forefront, weighing in on how we should not only legislate these technologies but how we should work with them, both governmentally and commercially. Some of these standards include expert input from think tanks and businesses attempting to address policies at a global level, creating guidelines that can be leveraged by other nations. Often, these industry standards fill the voids left by state regulations. In the United States, the Federal Trade Commission, for example, does not initiate rules nor stands as a resource for consumers on sector issues, so industry standards may be the only policies in effect. The National Institute of Standards and Technologies in America creates standards for companies in various industries with international ramifications. These standards can include loose directory guidelines to strict procedures with legal mandates, however, unlike laws, compliance with standards is usually voluntary except when a law references a certain standard, putting it in effect indirectly. Other agencies help establish and refine the standards existing technologies should aspire to. For many companies, industry standards are a guiding light on how to develop their products and services. A large number of these standards take data privacy and security into consideration. In the United States, the

Federal Information Processing Standards developed by NIST address areas such as communication, cryptography, and alignment with the National Information Assurance Program. The American National Standards Institute is a prestigious organization that promulgates standards conforming to the guidelines set by NIST for sectors in the United States, many of which are consumer-oriented.

11.4. Ethical Considerations

The questions framing our investigation into the ethical challenges posed by AI-powered insurance systems are as follows: What is AI and what are specific AI applications that are increasing in popularity and use within insurance landscapes? What ethical principles demand consideration in this regulatory context as our understanding continues to evolve in conjunction with technological development? How do AI's functions and capabilities, when layered upon the operations of an already-opaque industry, create ethical challenges for those who design and implement these systems and are tasked with considering possible outcomes that may impact the climate of insurance decision-making? What frameworks are appropriate for helping institutions to ponder and possibly reassess existing practices through the lens of the ethical considerations AI raises? The present discussion will focus on the utilization of automated decision-making systems to inform high-stakes decision-making systems within insurance, including underwriting, claims, risk selection, and reserving practices.

We aim to build towards some informed community thought through a consultation process on how best to create a responsible legal and ethical strategy to guide the ongoing development and implementation of automated decision systems within insurance. We intend to emphasize the intersectionality of emerging regulatory frameworks, writing that creating trust in the insurance marketplace is itself not just an ethical imperative; it is necessary for the long-term existence of the insurance industry.

11.4.1. Bias and Fairness

Bias in insurance pricing generally arises through the use of imperfect proxies for risk, population-level statistical models that miss an individual's risk profile, or a derivative of either. For example, insurers have used gender, race, religion, nationality, disability status, age, and neighborhood as risk factors, criteria which may or may not be consistent with risk. Insurers have also used proxies such as credit scores, vehicle type, and prior driving records, which are less controversial but still imperfect, and rely on historical data that reflect society's historical discriminatory practices. In addition to ethical issues, such price discrimination is legally bound by the nature of the Business of Insurance Exemption. This allows business practices, such as discriminatory pricing, already

regulated by the industry, to be exempt from federal antitrust regulation. This does not mean bias in insurance pricing is legal; it is ambiguous. Indeed, state insurance regulators may view the use of imperfect risk proxies as an unacceptable violation of their long-held consumer protection goal to promote fair and equitable insurance practices.

To maintain consumer trust, ethical guidelines for AI decision-making should be employed that go beyond the legal requirements insurers face. Fairness and interpretability must be emphasized. Insurers should be wary of the effects of using convenience data. AI methods must be carefully chosen. The use of proxy measures should be limited to factors that are known to correlate with true risk so that ethical behavior is enforced. Fair pricing should not adversely affect vulnerable populations. AI system incorporation mandates that insurers closely monitor and validate the decision-making process. Automated decision-making can only be used to the extent that it enhances objective risk assessment and to the benefit of all. The BIE should clearly outline the obligations of all carriers in the industry.

11.4.2. Transparency and Explainability

The original goal of AI applied to Insurance is to make it more efficient, less prone to error, fairer and more tailor made for clients. Only phased implementations, constant review of potential AI class consequences will allow us to make it really an innocuous source of business value for players and clients so that AI and Insurance is a symbiotic relation, creating factual value for all stakeholders, including our society. One important scope will be a concrete framework that allows for stakeholder interests to be preserved.

To produce such a concrete, predictable, but inevitably noncertain framework, say probabilistic with an asymptotic nature, we need to face a relevant ethereal entity in this crossroads decision: explainability and interpretability. Any model needs to be able to explain its decisions, to be interpretable for our experts and, additionally, for our citizens. Inference ability is one of the key capabilities, and this applies to any domain. How is a decision reached? How are calculations made? In any form, what are the given values or data from reality that lead to such a decision? These questions recur to any reasonably prudent stakeholder, and these answers are at the heart of scientific endeavor, one of its basic aims being to produce explanations that are integrated into the models and methodologies used to reach enhanced deductive levels that allow explanations that are communicated and understood by all stakeholders in any domain. The ability to lead to truth is, or should be, one of the fundamental aims of sciences, and we should be able to communicate it reasonably.

11.4.3. Privacy Concerns

Privacy is vital when dealing with sensitive personal information that is integral in proper underwriting, pricing, and claims settlement in insurance, including medical and health information, financial and transactional information, online and offline claims data, and personally identifiable information. Therefore, if AI-driven systems require excessive collection of such information, or retain them longer than needed, they risk running afoul of privacy laws, especially laws that impose strict limitations around what information can be collected, under what circumstances, and for how long it can be retained. There are two additional privacy concerns involved in AI-driven insurance systems. First, to provide the required services, personal data may have to be shared with third parties beyond the insured or individual employer, including insurance agents, brokers, reinsurers, and service providers to the insurer. This data sharing might violate privacy laws and even contractual obligations under the insurance policy. Second, insurance is generally part of personalized risk prediction and prevention, which may also compromise the privacy of fiduciary relationships, shared life experiences in communities, and the sense of perceived safety and security in the neighborhood or workplace. For example, is it ethical to use AI-powered systems to analyze social media sentiments of people in a certain community, or proximity sensors to monitor the physical movements of people in the community, to devise some risk prediction and prevention strategies for the residents or the employer to drive down the employer's workers comp insurance premiums?

Regulatory compliance, including regular audits to ensure that predicted and actual services are aligned with the services specified in the contract and Privacy Impact Assessments that measure the effects of new technology implementation on the privacy of individuals and communities, is the recommended approach to achieving appropriate Privacy Accounting when using AI technologies. By advising on the potential influence of AI and ML technologies on established principles for data privacy laws, insurers can gain a better assessment of legal obligations and associated risks throughout the life cycle of the AI system.

11.5. Risk Assessment and Management

Risk determinations constitute the nerve center of actuarial science. The science of risk entails evaluating the likelihood that danger will strike and then converting the estimate into an economic cost that can be laid at the door of insurance for protection against peril. Commercial and personal insurance exposes policyholders to the results of adverse selection derived from imperfect knowledge about risks. Often only the insured and the generating force of peril know the probability or potential for recovery of underlying costs for consequential damages. Consequently, underwriting account executives and

actuaries harmonize several modeling methods, generally quantitative and qualitative heuristics, to arrive at a reasonably dependable assessment of risk versus opportunity.

Fig 11 . 2 : AI in risk management

The incorporation of AI, utilizing vast troves of data collected from social media, offers insurance firms the elusive "Holy Grail" of risk manufacturing: the accurate prediction of the probability of risk and the mitigating information necessary to ameliorate or eliminate risk exposure. These technological breakthroughs may open the floodgates of liability, however, creating a whole new regulatory framework through tort and administrative law to address the unprecedented dangers of AI. Also, these advances raise questions concerning whether insurance firms will be able to fulfill the commercially viable goals of consumer privacy and equitable use and deployment of accumulated knowledge.

Sophisticated modeling enables insurers to elegantly and definitively manage risk-taking and transform uncertainty into security for consumers and profitability for themselves. Insurers deploy AI-driven predictive underwriting and risk management programs to estimate future losses, assisting in operational and strategic decision-making. Insurers

need to appreciate the limits of modeling approaches. Models are arduous to construct, time-consuming, and costly. Additionally, a risk element not incorporated in the risk management and evaluation process may produce inaccurate, narrow, equivocal, or overly complex outputs with decision consequences.

11.5.1. AI in Risk Modeling

At its conception, the insurance industry's main tenet was risk-sharing, that is how to share risk costs among clients with similar capabilities. As data became easier to collect, the industry's focus turned to carefully evaluating risk, so that pricing would reflect risk, making insurance a mere arithmetic operation of given parameters with the probabilities expected for the associated calculations. Considering the industry's predictive strength, perhaps its data mining and understanding capabilities should make it one of the first to turn to AI. Actuarial work has been at the center of the insurance industry for a long time, using statistical appeal to demonstrate and control risk and compute risk margins. Traditionally described as tedious exception-chasing exercises, actuaries would build predictive models and check them against actual outcomes with the expectation of gradual improvements over an entire career.

With AI, predictions could account for all company and personal characteristics – and the joint effect of these being used as predictive variables in a bulk way – and could also utilize modern machine learning techniques, which while seen for decades as "black boxes" could be used to make almost perfect predictions using recognition of patterns based on data. It would not be uncommon that as insurance becomes an arithmetic operation without the need for ongoing insights from actuaries, the insurance companies' operations would disappear or become an automatic process of prediction and calculation. No one should become dependent on a black box, but if this would require a lot less supervision of actuary work, the insurance industry demands in this regard would logically lessen, as it would have in most other industries. Imagine being able to cut down your wait time when hiring an actuary to explain a problem or when elaborating a report on a quick assessment of an important work being pursued in the hope of identifying errors.

11.5.2. Challenges in Risk Evaluation

Risk evaluation involves assessing the size and financial significance of potential losses caused by identified hazards. Common types of risk evaluation techniques utilized in the insurance business aren't always dependable or precise when it comes to technology-driven risks. In addition to projecting probabilities and outcomes based on previous markets and products, actuaries apply their particular skills to evaluate, measure, and

manage risks associated with security, cyber, and other online risks. Predictive modeling enables specialists to look into potential outcomes based on historical data while developing fresh products for new risks. However, recent shifts in both technology and society are increasing uncertainty and reducing confidence in computer system security.

With the rise of the Internet, for instance, our dependency on interconnected systems is unprecedented. Thanks to instant communications and online banking, we can transfer dollars at a moment's notice. The spread of inventory systems enables stores to restock their supplies every few hours. New supply-chain methods are helping companies reduce costs and improve their competitive positions in a global economy. These changes lead to greater efficiency and economic growth. But they also make us more vulnerable. Security breaches can involve hundreds of millions of dollars in losses in a matter of minutes. Traditional risk assessment methods developed by the insurance industry have worked well in the past. However, the very dependence on systems controlled by machines makes today's economy more vulnerable to technology-related risks as business becomes increasingly dependent on interconnectivity and alliances. For the most part, today's actuaries can apply their expertise to examine asset losses, adverse impact to business interruption, and liability costs, and then assess the uncertainty and potential severity of the loss. They can also calculate the likelihood of massive economic losses. That's why actuaries are so well-suited to assess technology-related risks.

11.6. Claims Processing

Claims processing enables company operations to fulfill policyholder needs in an expedited, precise manner; afflicted policyholders or third parties can recoup out-of-pocket monetary losses once coverage eligibility is validated. Timeliness of the process is essential; delays may exacerbate trauma by increasing uncertainty and feelings of abandonment. Allocation of income losses drives quick payouts, while more complicated bodily injury, property damage, and property claims involving coverage disputes require coverage validation and more forensic work. Accuracy is also essential. Fraud adversely affects premium income levels, and incorrect valuation of losses can lead to increased premiums by hurting company profitability through inadequate reserves. Claim staff remain key; their decisions regarding claims payments heavily impact company expenses, money flows, and ultimately profits, requiring staff resource management. Technological tools have been in use for decades. Policyholders have long been able to initiate the process over the phone and subsequently via a company's or third-party websites and mobile apps; while they may prefer a guided conversation, self-service benefits from speed and convenience. Following an accident, vehicles can now be examined via cameras or drones, and damage estimated, although face-to-face interaction is still followed for many claims. Claims data is siphoned into automated

processing systems that assess specific claim situations seeking to optimize compensation payouts. Data-mining techniques flag suspicious claims for review. Since many bodily injury claims are minor, algorithms can assist in loss evaluations, estimating settlements, and expediting payments through third-party payers. Various slimmed-down claims can also be adjudicated without auctions. With few exceptions, drone technology for building inspections is a fast, remote, and likely less expensive method that avoids visit scheduling while facilitating reliability through inspection comparison.

11.6.1. AI in Claims Automation

Artificial intelligence (AI) is transforming the way insurance companies modernize their claims processing procedures to improve customer service. Insurers have struggled to meet customer service demands as filing a claim can be an inconvenient and lengthy process involving excessive questions paired with lengthy wait times. The use of chatbots has become commonplace to initiate claims as customers demand reduced log-in times and answers to simple questions with minimal effort. Human service agents were required to oversee the claims process and evaluate more complex scenarios, but AI can now handle most applications with little to no intervention. Optical pattern recognition is used to interpret active policyholder information and to analyze claims submissions paired with dynamic photo services to understand what happened. Depending on the severity of the claimed loss, AI allows insurers to offer payout estimates instantly, allowing low-risk customers to receive their claims payment via telephony, text, or email.

AI is increasingly used to address insurer fraud detection and assessment. Previously utilized fraud detection techniques included rule-based deterministic algorithms based on prior experiences of industry experts. Such generalized rules are unable to detect advanced persistent fraud schemes and often lead to large numbers of false positives. In contrast, emerging trends in integrating AI models with such traditional approaches are addressing changing patterns in fraudulent activities while reducing the impact of false positives. Insurers are now able to collect masses of information regarding a policyholder's existing claims record, and social media activity, and are using pattern recognition and anomaly detection through the development of natural language processing, deep learning, and speech recognition. The need for such capabilities is compounded by ever-increasing levels of digital information being generated and escalating claims costs, creating a business environment increasingly favorable for optimizing AI-driven fraud detection strategies.

11.6.2. Ethical Implications of Automation

As much as insurers may welcome the efficiency of automation—reducing the average processing time per claim from 11 days in 2018 to 2.5 days in 2022—these efficiencies may undermine the quality of decision-making and the customer experience. Indeed, both organizations have begun cautioning payors against fully automated claims processing, especially regarding high-profile events, such as the pandemic and events requiring multiple adjustments. And it is not just decision quality that is of concern; bias could emerge in a system designed for faster—rather than better—decisions. For instance, error trends resulting in underpayment or overpayment for particular insurance lines, jurisdictions, geographic regions, or even insureds could emerge from the use of AI decision models that had been poorly trained.

Yet, it is the use of AI as a guide (mostly) for human curation that is likely to require most insurers to thoughtfully consider the use of AI in streamlining their more emotionally charged face-to-face interactions with policyholders. These considerations are underscored by the insurance teleology. The code of ethics stipulates that adherence to this teleology maintains the covenantal nature of insurance, left therefore to questions of equity rather than just the result of contractual performance. Reality-checking audits for the potential for bias require accessible and clear explanations of how recommendations were made. Allowing automated decision-making is considered acceptable only in the absence of "significant harm". In particular, insurers need to tread especially carefully around the automation of those interactions with the biggest policyholders or that arise from major events—requiring fast insurance decision-making.

11.7. Consumer Protection Issues

Creating AI-powered insurance systems raises several pertinent ethical issues that policymakers should consider when establishing the appropriate legislative and regulatory framework. Existing consumer protection laws, however, often lack the specificity needed to address the unique attributes of AI insurance systems. First, traditional consumer protection regulations may not address the specific nature of the consumer decision-making process in an insurance context. In the context of AI-enhanced insurance systems, consumers have unique decision-making needs. While insurance is often presented as indemnity for risks that may occur, from a theoretical perspective, the insurance business involves transferring statistical risk. Insurers specialize in evaluating the volatile risks of insured populations and controlling the social and demographic variables in their risk assessments. These assumptions about consumer behavior and business models, and the importance of utilities-based approaches to consumer decision-making possibly leave consumers more vulnerable to

the ethical issues associated with utilizing AI and algorithms in underwriting, risk selection, and fraud detection.

The use of AI in insurance processes may also lack the transparency regulators often require to protect the consumer interest in avoiding unfair or predatory market conduct or deceptive messaging. Various consumer protection laws require business-to-consumer communications to be written in intelligible language. Yet, persons interfacing with an AI bot and receiving policy quotes and recommendations may not completely understand the algorithms and their inner workings that influence everyday matters such as car or house insurance decisions. AI-powered insurance might also manipulate vulnerable consumers into decisions counter to their sporting interests. Insurers invest considerable funds in consumer socialization to “educate” and encourage socially acceptable behaviors. But AI-based systems, armed with consumers’ behavioral traits, can facilitate prompt and aggressive price-coil initiatives.

11.7.1. Informed Consent

A key issue with AI-enhanced automated decision-making is the prospect of violating informed consent norms. In the legal context, obtaining informed consent is typically an enclave of contractual obligations among parties, a form of negotiation. Disparities in bargaining power tend to inhibit the idea that consent is freely given. And yet, the now commonplace and highly user-unfriendly process of clicking "I agree" for standards or privacy policies is exactly the sort of mechanism designed to allow companies to escape liability for data usage. Other consent models include opt-in or opt-out, either of which might or might not require users to read some paper or digital lengthy document long enough that many will skip reading it altogether. What is clear is that an explicit contract, even if highly truncated in form, is usually not seen as a principled or effective solution.

Lurking behind the idea of informed consent is the refusal of the state to act paternalistically and dictate what consumers want. If consumers wish to undertake a venture and thereby accept the risks, they are free to do so, provided that they understand the risks. A key problem in applying the notion of informed consent to insurance-based risk assessment and forecasting is that the entire purpose of enterprising in such systems is to appraise and choose options with risk trajectories that deviate significantly from those predicted by the insurance market. For the consumer with the "bad" risk trajectory, doing business means submitting to paternalism. The danger is that there will never be a good business consumer model regarding consent, since the consumers available will limit their interest to those who fail the assessment thresholds or subsequently find themselves outside the actuarial variance. For those entrepreneurs, the question of consent may not be an issue beyond levels that are administratively required by law and

regulation. Although public policy does not elide the concept of "emergency," it is not in the first instance a back mantra for the insurance business.

11.7.2. Data Usage and Ownership

Increasingly, commercial interactions involving insurance are mediated by technology, whether through algorithmic underwriting, loss identification, or risk experience with predictions feeding back into risk pricing factors. In this sense, the traditional question of who owns the risk that underwrites a particular policy becomes a question about who owns the data that describes the risk. Insurance companies have a long history of relying on demographic data tracking to test predictions of particular portfolio risks. Decision due process can be achieved not only through validation of the process used to make risk predictions but also through enabling insureds to comprehend and comment on those predictions. While agency relationships between insurers and insureds will often be supported by the flow of risk-ameliorating funds to the predicted loss, novel technological interactions may define new forms of commodified personal relationships, such as trust and reputation-scoring devices. The data that enables the production of these personal indices, whether by an insurer or an intermediary, would then be at the center of privacy standardization questions. These indices often predict outcomes involving privileged information. For example, trust or fraud score devices predict who an initial seller is likely to cheat during a commercial transaction. A failure to ascertain this factor by the correct data aggregator creates an unfair asymmetry. The seller’s side of the transaction can be in a purely subjective, possibly arbitrary, state at the time of the potential fraud. Conversely, the capturing algorithm may score transactions based on past practices that may not be reviewed through subsequent business or market-generated developments. Hence, the legal and political agenda would involve determining the data that underlie the digital rating process and whether access to it could help balance unfair inequalities inherent in the reputational scoring regimes.

11.8. Accountability in AI Systems

AI systems, including various types of algorithms or models with varying levels of automation, can make recommendations or decisions in the context of an insurance system's operations. For example, algorithms can collect and analyze data to assist in underwriting, claims submission and management, fraud detection, reserving, and pricing. Automated underwriting algorithms can evaluate insurance applications and rules for acceptability, as well as the premium to be charged. AI systems also can expedite the processing of claims submissions, assessing and validating coverage and damages, inspecting for fraud, and calculating payments.

As insurance increasingly becomes an algorithmic process, problems associated with lack of transparency or understandability, biases, attempts by users to "game" algorithms, security or privacy breaches, and lack of accountability become more pronounced. Compounding these issues, the normative foundations of traditional tort or regulatory liability regimes and the allocation of responsibilities in cases involving algorithmic processes can be unclear. Even without review or independent validation, decision rules used by AI systems can generate unexpected and difficult-to-anticipate consequences that raise ethical or policy concerns. Such issues can arise when a consumer's application for coverage is denied, or when an insurance claim is denied or reduced, either because of an unforeseen error or flaw in the AI system, or because of an attempt by the consumer or an applicant to "game" the AI system. Controversy or confusion over whether to blame the AI system, or the consumer, creates uncertainties about whether either party can be held responsible, and for what specific consequences.

11.8.1. Liability Issues

An AI system is a computer agent making an autonomous decision starting from the data provided to it, with no human decision involved. If the decision is incorrect, its outcome can be attributed to the insurance company that outsourced the operation. The company can be sued and the victim compensated, burdening the company and not the society. On the other side, the AI algorithm can be trained in a completely new mode, called future training. The system is trained by observing the outcomes of past decision data and considering the correct outcomes provided by the human decision-makers. This model is designed for cases with a high cost of the wrong outcomes, like a prostate cancer diagnosis. If there is a training data discrepancy in the dataset, the decision will have high variability for different customers. The customer gets no benefit from the unintended incompetence of the trained AI agent. In this way, the company can be sued again, and a lawsuit would burden the AI agent with the cost of bad decisions.

Another action that can be taken to avoid the outcome is an analysis. The clarity of operations inside the AI algorithm can cause a license withdrawal from the company performing these operations. These clarifying techniques allow the company to avoid the lawsuit without having to pay the victim. The first case is when an external person tries to analyze the results without the decision provided. In these conditions, new interesting solutions may be obtained. This modeling behavior has been the source of many important results in science. The second case is when the output of the model is made public.

11.8.2. Governance Models

In the context of the more general issues raised by AI, the most pressing issue encountered is a governance one. Various models of AI governance are proposed, but they break down into direct or indirect governance, often with a focus on external or internal accountability respectively. With external governance, regulations, standards, and guidelines are established outside the organization developing or employing the AI systems. They can be imposed or used for voluntary compliance, looking at reducing risks for the company, stakeholders, or society. For internal governance, the aim is to submit AI-managed functions to the existing organizational accountability structures. This requires the definition of technical standards specified by the organization, adding to those external standards complying which is needed for reducing risk.

The data-driven, statistics-based, lack of transparency characterizing many AI systems gives less scope for achieving internal compliance than for classical technologies, which weakens their functional governance. However, it is not always the case that placing the functioning of an AI system in the context of the activities it supports will be of no help. Thus, to installation of AI management within the accountability structures already in place in the organization using it is essential or at least preferred if only for the coherence and community values it creates. Moreover, policy and strategic objectives must be induced by the Board of Directors and interacted with stakeholders, including customers, employees, shareholders, and the community or environment in which the organization operates. Thus, even more than for classical management systems, if AI systems are to amplify the functionalities they support, the AI system and its functioning must be aligned and coordinated with the overall mission and strategic policies of the organization using it.

11.9. Conclusion

In this essay, we explored a wide array of challenges associated with the deployment of Artificial Intelligence (AI) in insurance systems. This discussion was informed, first, by a review of key AI technologies presently being adapted for use in insurance systems, focusing on applications involving actuarial models, fraud detection, and automated judgment. Next, we examined three case studies of implemented systems involving these technologies. These investigations informed our comparison of salient regulatory and ethical issues in the development of AI technology and its application in insurance.

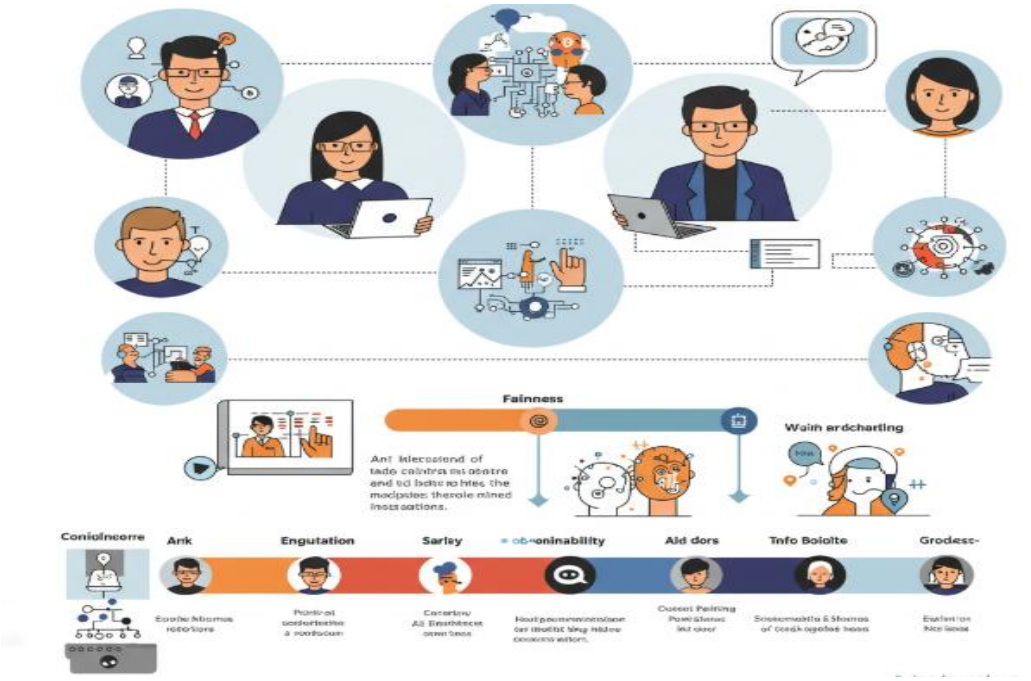

Fig 11 . 3 : AI Accountability Models

Reflecting on this comparative analysis, we concluded that the development of AI technology indeed implicates many difficult decisions regarding scholarship and professionalism, but importantly also issues related to the erosion of informed consent and increasing social inequality — issues that are ordinarily neglected in formal research ethics frameworks and codes of conduct. The application of AI technologies in insurance systems is, in opposition, implicated primarily by a narrower range of regulatory and ethical issues that have also largely guided the development of AI technologies – but also by increased chances of unfair discrimination against protected classes, unintended economic harms to general members of the public, and violations of state and federal privacy/electronic communication laws, including data breach regulations.

We hope our interdisciplinary research and policy framework will inform the design of more equitable, just, and free AI systems. While we look towards the development of more principled policy solutions to these challenging issues, we hope this essay inspires AI Ethics researchers and industry practitioners to look equally to implementable policy for the AI systems that support the safety, privacy, and freedom of their users, customers, and other members of society.

11.9.1. Final Thoughts and Future Directions

The journey we present unveils a set of topics that have often been discussed at a distance when addressing the role of AI in the insurance area. This distance, however, may bear a misunderstanding since regulatory and ethical problems are not byproducts of a society deeply immersed in the use of AI: they are elements that shape the understanding of AI and its function in business and nowadays even in our lives. In the prism of the words conservative and innovative, we see a strong mutation in the behavior of regulators and society, assigning new values to business actors that once were invisible to the naked eye, just because they were tacit. Transparency is still a required quality of interpersonal business-to-business and customer relationships.

Besides, new market actors are making use of this opportunity to explore the niche that employs corporate governance metrics for customer evaluation. Using insurance companies' activities to show prudent behavior related to environmental, diversity, and social issues where much more is required than regulatory attention. Socially responsible investment companies not only demand new behaviors from the main market players, including banks and insurance companies. They are revolutionizing the market by bringing the best options to invest ethics and money together. So, spenders and investors are searching for their role in transforming the world for the better.

The need for a streamlined relationship among law practitioners, legislators, companies and society is exponential, particularly during default events such as pandemics or natural disasters. These events break the perceived definitions of a regular contract negotiation since the principles of reciprocity, equality, and mutuality of interest and only profit become void. Our last and perhaps more sophisticated reflection on the use of AI relies on symbiosis. Symbiosis is found not only in biological terms but also in philosophy and economics, thus to guide our reflection we use the lens of industrial ecology economics, taking a more operational view of organizations' responsibilities proposing better than big purpose principles and models, strategic, tactical, and operational issues.

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