EIOPA CONFERENCE ON AI GOVERNACE

AI GOVERNANCE IN NATURAL CATASTROPHES RISK MODELLING

Alessandro Bonaita
Generali Group
Group Data, Analytics & Artificial Intelligence Strategy, Methods and Governance

December 15th, 2022

AGENDA

1. RESPONSIBLE AI GOVERNANCE WITHIN THE GENERALI GROUP
2. APPLICATION OF THE FRAMEWORK TO THE NAT CAT USE CASE
3. KEY TAKEAWAY

eiopa
European Insurance and Occupational Pensions Authority

01

RESPONSIBLE AI GOVERNANCE WITHIN THE GENERALI GROUP

GENERALI

Generali Strategy for a Trustworthy AI

Our Ambition

*We want to earn full **Digital Trust** from our customers by ensuring responsible use of data and algorithms, leading to a **sustainable competitive advantage** and a **stronger lifetime partnership***

Generali AI Ethics Framework

PRINCIPLES
- Generali Trustworthy AI key principles represent our **unique combination of corporate behaviors and foundational values** related to Artificial intelligence which inspires our approach towards a responsible AI

RULES AND STANDARDS
- To concretely **adopt high ethical approaches** on data and algorithms we developed a set of **rules** and **standards** inspired by our Trustworthy AI key principles

COMMUNICATION & AWARENESS
- To **engage our stakeholders** on our approach toward Trustworthy AI we plan for the **communication** and **awareness diffusion** of our key principles

TRAINING
- To **promote an appropriate application** of our responsible approach to AI we train our people to **know our key principles** and to **recognize ethical dilemmas** related to new technologies

GOVERNANCE
- To **monitor and support the implementation** of our principles and rules we **supervise the application** of AI and we define best practices

Generali Trustworthy AI principles

HUMAN CENTRICITY
- **Our AI values our People** by guaranteeing human oversight on digital technologies and sound governance mechanisms in order to mitigate operational risks related to the use of data and algorithms and to help people develop their abilities

SAFENESS
- **Our AI protects our communities** by fostering the robustness and performance of the digital technologies and applying data governance and data quality standards in order to ensure safeness from unintentional and unexpected harm

ACCESSIBILITY
- **Our AI is open** adopting transparent and explainable algorithms in order to provide customers and all stakeholders with meaningful and clear explanations enabling them to adapt their behavior and to make informed decisions

SUSTAINABILITY
- **Our AI protects our future** providing socio-economic benefit to the people, economy and environment thanks to the adoption of sustainable technologies contributing to environmental and social well-being, even for future generations

FAIRNESS
- **Our AI delivers our promises** by ensuring fairness, avoiding discrimination and differentiation not based on risk factors, removing cultural, social and historical biases and promoting financial inclusion

https://www.generali.com/investors/Strategy/data-manifesto-and-generali-trustworthy-ai/Generali-trustworthy-ai

Initiatives to effectively implement the Generali Strategy for Trustworthy AI

Lead by the 5 strategic pillars of our Ethical Framework..

..we executed several actions over the past two years

Generali AI Ethics Framework

PRINCIPLES

- Generali Trustworthy AI key principles represent our **unique combination of corporate behaviors and foundational values** related to Artificial intelligence which inspires our approach towards a responsible AI

RULES AND STANDARDS

- To concretely **adopt high ethical approaches** on data and algorithms we developed a set of **rules** and **standards** inspired by our Trustworthy AI key principles

COMMUNICATION & AWARENESS

- To **engage our stakeholders** on our approach toward Trustworthy AI we plan for the **communication** and **awareness diffusion** of our key principles

TRAINING

- To **promote an appropriate application** of our responsible approach to AI we train our people to **know our key principles** and to **recognize ethical dilemmas** related to new technologies

GOVERNANCE

- To **monitor and support the implementation** of our principles and rules we **supervise the application** of AI and we define best practices

Trustworthy AI initiatives

....

....

....

Reference framework for Trustworthy AI operationalization — *Focus next slides*

....

....

....

....

..

Tool for AI risks identification, assessment and mitigation

Technical guidance for AI initiatives implementation

Global reporting and monitoring systems

Details in NatCat use case section

Generali reference framework for operationalizing Trustworthy AI

Generali AI Ethics Framework

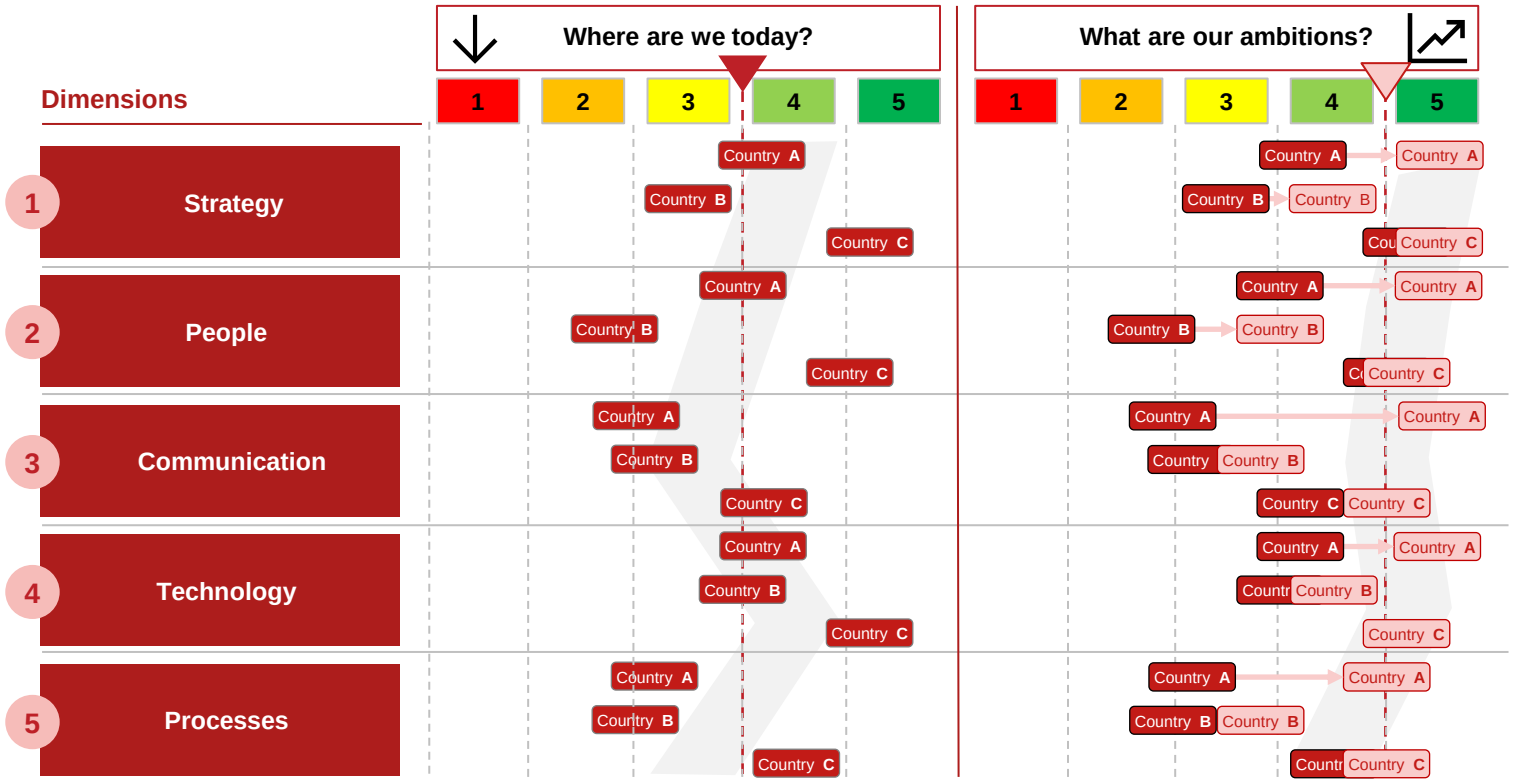
- *Principles*
- *Trainings*
- *Communication & Awareness*
- *Standards & Rules*
- *Governance*

Generali Trustworthy AI Principles

Strategy	People	Communication	Technology	Processes
1 *Dimension 1*	5 *Dimension 5*	9 *Dimension 9*	13 *Dimension 12*	17 *Dimension 17*
2 *Dimension 2*	6 *Dimension 6*	10 *Dimension 10*	14 *Dimension 14*	18 *Dimension 18*
3 *Dimension 3*	7 *Dimension 7*	11 *Dimension 11*	15 *Dimension 15*	19 *Dimension 19*
4 *Dimension 4*	8 *Dimension 8*	12 *Dimension 12*	16 *Dimension 16*	20 *Dimension 20*

Governing the overall adoption of Trustworthy AI

ILLUSTRATIVE DATA



Responsible AI governance framework for the model lifecycle

Focus next section

Generali AI Ethics Framework

- PRINCIPLES
- RULES AND STANDARDS
- COMMUNICATION & AWARENESS
- TRAINING
- GOVERNANCE

Generali Responsible AI Governance Framework

Model Lifecycle	Planning → Development → Test → Production → Retirement
Governance Approaches	Risk Assessment Ethics-by-design development Continuous monitoring
Supporting Resources	Internal regulations Reference frameworks, guidance and training Technology
Control Functions Contribution	Risk Compliance Audit

eiopa
European Insurance and Occupational Pensions Authority

02

APPLICATION OF THE GENERALI AI GOVERNANCE FRAMEWORK TO THE NAT CAT USE CASE

GENERALI

Introducing the use case: modelling the risks of natural disasters using AI

	DATA	+	ALGORITHMS	RESULTS
Standard approach	Internal policy data Internal claims data		Actuarial models *(GLM, territorial analysis,..)*	 
Mixed Approach (standard + AI)	Internal policy data Internal claims data Climatic data Geographical data IoT sensors		Actuarial models AI models *(Machine Learning, Deep Learning,..)* Combined models *(actuarials + AI)*	 

- **LOW COVERAGE**
  No observations to analyze the whole territory and all temporal trend
- **LOW RISK PROFILE PRECISION**
  High predictive power of classic rating factors (i.e., age, m^2,..)

- **FULL COVERAGE**
  External data covering all territories and time trends allow for the analysis of specific KPIs for each area
- **HIGHER RISK PROFILE PRECISION**
  Combining results from standard actuarial and AI models significantly increases classification accuracy

Risk Mitigation Assessment: approach overview

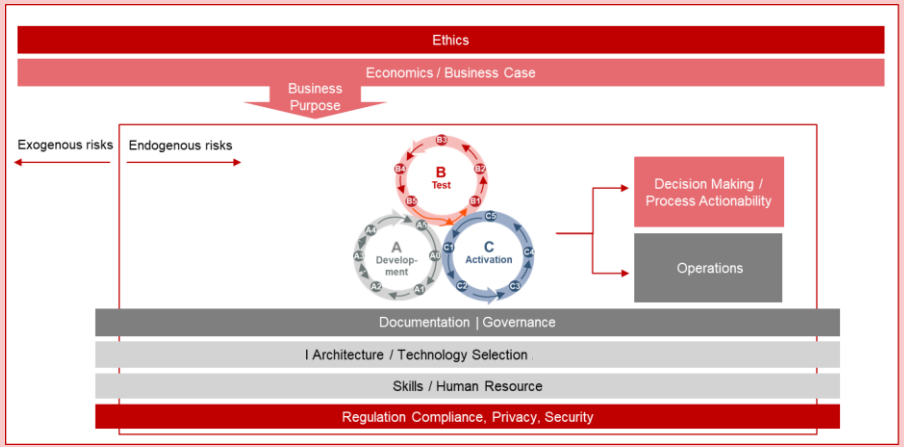
GENERALI AI RISK FRAMEWORK

- The risks and related mitigation actions have been grouped into six thematic areas, called “Pillars”, covering all the phases of an AI project.

Pillars

- Ethics & Compliance
- Business Need
- Data
- Model
- Operation & Governance
- Resources

- Each “Pillar” is defined by a set of multiple layers that map the risk associated with specific topics across the whole lifecycle of AI solutions.



OUTPUT

- **Risk Mitigation Analysis**
- **Risk Mitigating Actions**
- **RACI**

Risk Mitigation Assessment: results for the NatCat use case

LOW MEDIUM

Risks Pillars	Main evidences from the pre-assessment	Risk impact
Ethics & Compliance	▪ Use of external data can have a **positive impact on the overall fairness of the pricing model** ▪ Model's accuracy and post-market effects must be monitored to **avoid unintended effects on customers sub-groups**	LOW
Business Need	▪ Need to carefully **assess price changes for external data** ▪ Evaluate a potential business case for **additional services creating added value for the client**	LOW
Data	▪ **IoT data** from sensors located in private areas **should be managed according to GDPR** ▪ **Data quality controls are particularly relevant to IoT data** if they are used in the modelling phase	MEDIUM
Model	▪ The **accuracy** of algorithms using external data **should reach reasonable thresholds** before use in production ▪ Model **explainability is particularly relevant** when **combining a standard actuarial approach to AI** algorithms	LOW
Operation & Governance	▪ Need to **increase the frequency of monitoring activities** as data is updated ▪ Need to **extend the scope of data monitoring and auditing** also to external data providers when present	MEDIUM
Resources	▪ Technical team must be supported by **highly skilled AI resources** (i.e. data scientists) ▪ Climatic data modelling is particularly challenging: an **external validation** (i.e. research centers) is suggested	MEDIUM

Ethics-by-design: approach overview

The approach for developing AI solutions has been standardized in a Group reference guidance integrated with operational models and inspired by technical and ethical drivers monitored through specific checks and controls.

DRIVERS

ROBUSTENESS
Model performances in terms of stability of results when using new data

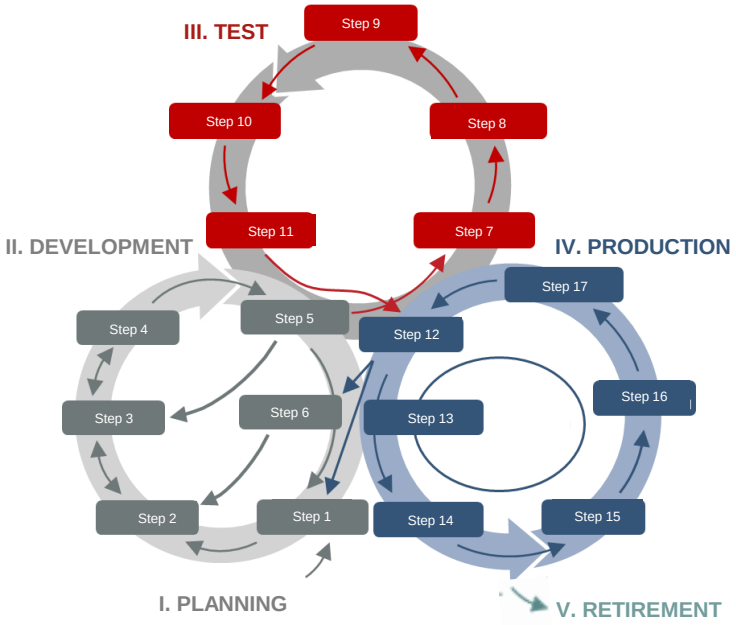
ACCURACY
Model performances in terms of correct classification

TRANSPARENCY
Level of understanding of the overall model structure

EXPLAINABILITY
Degree of comprehension of individual case classifications.

FAIRNESS
Minimization of the risks of bias and discrimination

AI SOLUTIONS IMPLEMENTATION GUIDANCE

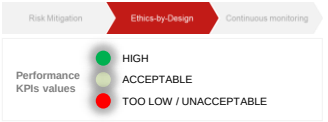


KEY ELEMENTS

I. Plan and implement AI solutions from design to production ensuring technical and economical integrity, transparency and sustainability

II. Monitoring and tracking mechanisms to govern the progress of AI delivery with clearly documented guidance

III. De-risking AI solutions with specific controls and decision criteria to be satisfied before proceeding to the next milestone, including checks with internal control functions.



Ethics-by-design: results for NatCat use case

The mixed model combining standard approaches with AI algorithms has been compared with the only actuarial model and with a pure AI algorithm («black-box»), demonstrating higher technical accuracy and robusteness with good «ethical» performances.

Performance KPIs	GLM model (no AI)	Mixed model (GLM+AI)	AI model (only AI)	Results / Evidences
ROBUSTENESS Model performance in terms of results stability when using new data				▪ Models using AI have significantly more stable results due to the use of external data covering all territories
ACCURACY Model performance in terms of correct classification				▪ The precision of AI models is significantly improved through the ability to model more granular climate data on spatial and temporal trends.
TRANSPARENCY Degree of understanding for the overall model structure				▪ While the general operating mechanism of the Mixed model is still understandable thanks to the GLM structure, pure AI models are black-box with unacceptables level of transparency.
EXPLAINABILITY Degree of understanding for individual cases classifications				▪ Single case decisions are understandable when AI algorithms are applied only to climatic data, while individual classifications of the pure AI model are difficult to explainable.
FAIRNESS Minimization of biases and discrimination risks				▪ The higher precision, coverage and granularity of the Mixed model reduces biases related to customers geolocalization, while the complexity of the pure AI model produces new potential bias that partially offset this advantage

Continuous monitoring: approach overview

- A central tracking system for all AI initiatives developed within the Group is in place and **aligned with the reference implementation guidance.**
- The tracker is governed by the central AI function and fed by local Business Units, with **recurring deep dives meetings**.

Three key dimensions are monitored, automatically calculating the risk and business KPI in line with the Generali AI strategy

PEOPLE
Dedicated AI teams for each BU / Region

VALUE
AI priority use cases embedded in all Business processes

EXECUTION
AI use cases industrialised for effective value delivery and scale

From the single project view..

..by aggregating to the BU level..

..coming up with a global synoptic view

eiopa
European Insurance and Occupational Pensions Authority

03

KEY TAKEAWAYS

Key takeaways

Natural Catastrophe Risk Modelling

- Artificial Intelligence can significantly improve the fairness of natural catastrophe models, with external data leading to more accurate identification of risk profiles and fairer pricing.
- External data need to be carefully managed in terms of data monitoring, vendor verification and potential GDPR implications.
- Embedding AI into standard actuarial models can preserve transparency and explainability at acceptable levels.

AI Governance

- A solid AI Governance framework should cover all the steps of AI lifecycle, from a pre-assessment of different risks, through a step-by-step methodology, to a continuous monitoring at all levels.
- AI Governance is not just about statistics and math: it involves a holistic approach to people, processes, technology, strategy and communication.
- Governance itself is only one piece of the road to responsible use of data and AI: a consistent framework based on sound ethical principles is required to carry out concrete implementation actions.

eiopa

European Insurance and
Occupational Pensions Authority

THANKS

alessandro.bonaita@generali.com

GENERALI