



International Actuarial Association
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Documentation of Artificial Intelligence Models or Systems

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IAA Paper

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The role of the AI Task Force is to deliver on the Statement of Intent for IAA Activities on Artificial Intelligence (SOI) as adopted by Council on 8 March 2024.

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1. Introduction

Documentation is a vital component of any artificial intelligence (AI) model or system, forming the foundation for a robust governance framework. Comprehensive documentation is essential not only for compliance and regulatory purposes, but also for transparency, accountability of the AI systems and continuity of operations.

While this paper aims to assist actuaries in creating effective documentation for their AI models or systems, it makes no claim to be exhaustive. It outlines key elements that may be considered as good practice for documentation of an AI model or system. The paper covers the elements of documentation in all stages of the model lifecycle, from Data, through Model Development to Model Deployment. The level of detail included in AI model documentation should reflect proportionality and could vary depending on a number of factors, such as the level of significance, risk and complexity of the AI models. Actuaries are encouraged to use professional judgement and tailor the documentation to these factors, with the goal of meeting the needs of the end users of the documentation. In this document, the terms “AI system” and “AI model” align with those presented in the Artificial Intelligence Governance Framework paper.¹ In summary, an AI system is an overall machine-based system that infers from inputs how to generate outputs, and an AI model is a core component within an AI system used to make such inferences.

This paper is intended to be read in conjunction with the Governance Framework paper. It provides supplementary details specifically focused on documentation practices within the broader AI governance context. The primary audience includes model developers and individuals involved in validation during all stages of the model lifecycle, since sound, proportionate documentation is relevant throughout.

2. Data

Data has an especially critical role in the application of AI systems. With the increasing use of unstructured data and non-traditional data sources, comprehensive documentation is important for providing clarity, compliance and usability for actuarial work.

Actuaries could consider producing a data card, which is a structured document that provides essential information about datasets, to enable stakeholders to understand the data used and make informed decisions about its application and the associated AI systems.

Key components to consider when documenting data for an AI system are:

- a. Data flow
 - Illustrate the data flow within the AI system, detailing each stage from data collection to data manipulation, feature engineering, model development and downstream model applications, and monitoring the model outputs over time. When the AI system is communicating with other systems, whether to acquire inputs or distribute outcomes, the data flow should also include these communication flows.

¹ IAA Paper: Artificial Intelligence Governance Framework
https://actuaries.org/app/uploads/2025/11/AITF_Governance_Framework_Paper_Final_Approved.pdf

- b. Data inventory
 - List all internal and external data sources used in the AI system.
 - Specify the types of data utilized, including structured and unstructured formats.
 - Provide detailed descriptions of data fields and associated metadata.
 - Specify where and how each source of data will be stored.
 - Document the update timings of all data sources.
- c. Data quality
 - Evaluate data quality based on key data governance principles (see the Governance Framework paper for details).
 - Document the processes and tools used for data validation, data cleaning and preprocessing, feature engineering, etc.
 - Document the period the data covers or when it was extracted.
- d. Data governance
 - Identify data owners and stewards responsible for maintaining data quality and compliance (see the Governance Framework paper for more on roles and responsibilities”). This is especially important when using or providing third-party vendor services.
 - Clearly document access rights and any restrictions related to data usage.
- e. Data usage
 - Outline how the data will be used within the AI system, including any restrictions on data usage and the rationale behind these restrictions.
 - Document any assumptions made regarding the use of the data.
- f. Data limitations and weaknesses
 - Identify known data insufficiencies and outliers, including missing data, data that may be outdated or data that lacks sufficient granularity for analysis.
 - Document limitations in the data sources, such as potential biases, representativeness issues or constraints in data collection methods (see the Appendix in the Governance Framework paper for a discussion on bias” and fairness”).
 - Discuss the implications of these limitations on the analysis and decision-making processes, including how they may affect model performance, and the reliability of insights derived from the data.
 - Document steps taken to mitigate any data limitations and weaknesses indicated above.
- g. Compliance, ethics and legal considerations
 - Document compliance with relevant data laws and regulations as well as the standards of practice of the actuarial bodies and relevant entity policies.

- Address any ethical implications of data usage, including bias and fairness, as well as the steps taken to identify and mitigate any identified biases.

3. Model Development

Developing an AI model typically involves judgement, especially with respect to the model training and model selection processes. Therefore, it is important to clearly document the details throughout the model development process.

Actuaries could consider producing a model card, which is a structured document that provides essential information about an AI model, to enable stakeholders to understand the model's capabilities and limitations.

Key components to consider when documenting the development of an AI Model include:

- a. Model overview
 - Clearly state the objective of the model and the specific problem statement.
 - Define the scope of the model, including the target population and any model limitations. In the actuarial context, specify the purpose for which the AI model is designed. For example, an AI model developed to analyze policyholder behaviour for a specific insurance product may not be applicable to other types of insurance or product.
 - State the model category (e.g. transparent, explainable, opaque) and model type (e.g. GLM [generalized linear model], neural networks, [LLM] large language model) (see Governance Framework paper for details).
 - State if any AI platform such as ChatGPT was used to develop or assist in developing the AI model.
 - Clearly state model inputs, algorithms and outputs. Outline any dependencies on other models. Explain how the model interacts with or relies on other models, and discuss how changes to these dependencies could affect the performance and reliability of the model.
 - Document all user interfaces and interactions with the AI system, including treatment of user queries.
 - Outline the downstream end user and impact of the model application.
 - Create a flowchart or model process diagram to visualize the model overview, if applicable.
 - Document the roles and responsibilities of individuals involved in the model life cycle (see the Governance Framework paper for more on roles and responsibilities”).
 - Clarify ownership of the model. This is especially important when using or providing third-party vendor services.

- b. Model selection
 - Document the rationale behind the selection of algorithms used in the model, including any comparisons made between different approaches or analysis performed.
 - Document the hyperparameters chosen, the tuning process and the reasoning behind these choices.
- c. Model training and validation
 - Describe the training process, including the training dataset, validation techniques (e.g. cross-validation) and performance metrics used (see the Governance Framework paper for more on the validation and testing of AI models).
 - Detail how the dataset is split into training, validation, testing and hold-out sets (if applicable); describe the cross-validation technique used, if applicable.
 - Document whether any independent validation of the model was performed, and the outcomes thereof.
- d. Model performance and evaluation
 - Clearly define metrics used to evaluate model performance (e.g. accuracy, precision vs recall, AUC-ROC [Area under the Curve - Receiver Operating Characteristic]), including an explanation of how each metric was calculated with any threshold or criteria, and why the metric was chosen for the specific problem (e.g. choosing AUC over other accuracy metrics for binary classification).
 - Document the results of performance evaluations, including back testing on historical data and any benchmarking against baseline models or industry standards.
 - Document any stress tests and sensitivity/scenario analysis conducted.
- e. Model interpretation
 - Document methods for interpreting model predictions and for what purpose the interpretation method was selected; for example, global feature importance analysis and local interpretation techniques (e.g. [SHAP] Shapley Additive Explanations and [LIME] Local Interpretable Model-agnostic Explanations) to make the decision-making process of black-box models transparent for stakeholders, including developers, regulators and end users. (See the Governance Framework paper for more on transparency and explainability.)
 - Summarize key insights from the model and how they relate to the actuarial context.
- f. Model limitation and assumptions
 - Clearly state the limitations of the model and the impact when applied in the real world, including assumptions made and potential biases.
 - Clearly state the assumptions regarding model and data processes, constraints and limitations.

- Document where externally developed models are used for any part of the model development and, the treatment of limitations or filters applied in those models that may be relevant to the model itself.
- g. Compliance, ethics and legal considerations
- Check compliance with industry regulations and standards relevant to the model application. For models that require insurance regulators' approval, clearly state the status of the approval. Document compliance with relevant AI regulations and standards of practice of the actuarial bodies.
 - Address ethical implications of model usage, including potential biases and fairness issues, as well as the steps taken to identify and mitigate any potential biases. Discuss the ethical considerations associated with the model. This is especially important for actuarial work where most of the actuarial AI models have direct or indirect impact on consumers. Detail an impact assessment of the model outcomes on different stakeholders, including reference to the user's wellbeing and autonomy.
- h. Version control and management
- Maintain a version history and change log of the model that outlines the changes made, including updates, improvements and bug fixes. Record the people who made and authorized the change.
 - Discuss the impact and justification of the changes.
 - Detail the model review and approval process.
- i. Future development and refinement
- Document all points identified for future model improvements and refinements, along with the rationale behind these improvements and refinements.
 - Include the impact these future changes will have on model results (e.g., how will they improve the results), as well as the effect that the absence of these changes has on the current set of model results.

4. Model Deployment and Maintenance

A proper deployment allows stakeholders to leverage the model's capability while minimizing associated risks. Additionally, ongoing model maintenance helps keep the model relevant, accurate and aligned with its intended purpose. It is recommended that these two areas are addressed in the documentation. Recommended elements are listed below. See the Governance Framework paper for details on implementing the AI system and ongoing monitoring of the AI system".

- a. Deployment overview
- Summarize the deployment process and the associated technical requirements.
 - Describe the environment where the model will be deployed, the system architecture and infrastructure details.
 - Create a flowchart or process diagram to visualize the deployment process, if applicable.

- b. Deployment process
 - Document the deployment strategy and process, including issues encountered and solutions.
 - Document pre-deployment testing (e.g. integration testing and user acceptance testing).
- c. Version control
 - Maintain a version history of deployed models.
- d. Monitoring and feedback loop
 - Describe the plan for ongoing monitoring of model performance post-deployment, such as performance metrics post-deployment and alert mechanisms.
 - Specify the frequency and methods of reviewing model performance.
 - Indicate monitoring triggers for review/recalibration.
 - Include the process for gathering feedback from users and stakeholders regarding model performance.
 - Describe escalating processes established for the AI model; document issues identified, steps taken to investigate them and the decisions made to address them.
- e. Maintenance
 - Outline the model maintenance plan, such as model updates and quality checks.
 - Specify the frequency for model maintenance.
 - Define criteria for model adjustments and model retraining (include the process to retrain the model if applicable).
 - Define processes for implementing model updates and conducting quality checks, and document the rationale for each update, whether regular or irregular.
- f. Responsibilities
 - Indicate which teams/individuals are responsible for model testing, deployment, monitoring and maintenance, and include appropriate contact details.
 - Ensure accurate sign-off is obtained and documented before all model deployments, updates or fixes.

5. User Guide

It is also important to include a user guide (which could be online and interactive) on how to use and interact with the model. The user guide needs to be clear, well structured and tailored to the needs of the users, and include practical examples.

It is recommended that the following content is included in the user guide document:

- a. An overview of the model, including its functionality and intended use cases
- b. Installation instructions, including the API [Application Programming Interface] or interfaces and/or setup requirements to use the model

- c. How to navigate through the model (this includes updating the input, running the model, reproducing model results producing the output and interpreting the output)
- d. How to troubleshoot the model, such as including common issues and workarounds
- e. How to maintain and update the model
- f. The names of key developers of the model
- g. Support and resources, if applicable
- h. A glossary, if applicable

6. Other Disclosures

When documenting an AI system, particularly in the context of actuarial practice, it is crucial to include additional disclosures that address various model risks and considerations. The additional disclosures not only enhance transparency but also help model users and stakeholders make informed decisions.

Below are some additional disclosures that could become necessary, depending on the model, in different parts of the model documentation:

- a. Model risk and limitation
 - Summarize model risks, including definitions and descriptions: explain potential adverse consequences that could arise from making decisions based on potential incorrect use, or misuse, of the model output which could include financial losses, regulatory violations or reputation risk.
 - Elaborate on limitations of the model, including limitations around model assumptions, the scope of model application and model performance under different conditions. For instance, in the context of insurance, it is important to document if an AI model is built for a specific line of business or a specific demographic, and hence would not be appropriate for use in different situations or with different conditions.
- b. Data privacy
 - Document data privacy considerations to address how the model handles personal or sensitive data. It is important to discuss compliance with existing regulations and any measures taken to protect individual data privacy.
 - Describe any methods used to anonymize or pseudonymize data to mitigate potential privacy risks.
- c. Data security
 - Outline the security protocols in place to protect data from unauthorized access or breaches.
 - Specify access controls for individuals for the AI system from end to end.
 - Detail any encryption methods used to secure data during storage, model production and transmission.

- d. Outcomes of key function activities
 - Document the outcomes of key function activities related to the AI system; for example:
 - i. Explain the risk assessment performed by the Risk Management function, including a comprehensive report detailing the findings and recommendations.
 - ii. Internal audit reports, including assessments of compliance and the effectiveness of the AI system and its associated processes, provide valuable insights into the model's operational integrity and risk profile. It is recommended that these reports be included in the documentation so that stakeholders have access to relevant evaluations and conclusions.
- e. References and resources
 - Provide references for any research, methodology or framework referenced in the documentation.
 - Reference any supplementary materials that may assist users in understanding the model. For example, provide references to academic or industry technical papers for complex AI system methodology, references to industry guidelines or standards produced by actuarial standard boards, and any training materials or tutorials that could be helpful for users.
- f. Test cases
 - Including representative test cases (input/output examples) would improve transparency and help stakeholders understand how the model behaves in practice.

7. Conclusion

Actuaries play an important role in the development and use of AI systems and models during their whole lifecycle. Comprehensive model documentation is essential not only for compliance and regulatory purposes, but also for transparency, accountability and continuity of operations. The content of this paper provides educational material for good practices with respect to the elements of documenting AI systems and models while recognizing that the level of detail included in AI model documentation should reflect proportionality and could vary depending on various factors, such as the level of significance, risk and complexity of the AI models.