National Aeronautics and Space Administration



Applying Generative-Al to NASA Documentation and Processes

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EXECUTIVE SUMMARY

This research and development project leverages generative-AI to assist in the generation of software process documentation based on NASA standards. By utilizing fine-tuned AI models, the proposed system will analyze NASA's software guidelines, helping to translate them into well-structured, compliant process documents. This assistance can reduce the manual effort required to produce such documentation, enhance consistency, and assure alignment with NASA's stringent software development and operational requirements.

In addition to assisting in the generation of software process documentation, the project explores how generative-AI can help create audit checklists as well as assess the compliance of NASA provider documentation against applicable NASA standards. This approach would support the compliance auditing process, providing real-time insights and assessments. The intended result will be a streamlined process, potentially including a Python-based tool and database, that improves audit efficiency, reduces human error, lowers manpower costs and required manhours, and assures continuous compliance with NASA and industry evolving standards for safety-critical software development. Future task might be to investigate the software industry approach and standards for potential



Hyper-Targeted Document Creation and Assessment

INTENDED OUTCOMES & INFUSION

- A tool and system aiding NASA providers in developing NASA standardscompliant software process documentation
- A system aiding both NASA and providers in assessing software process compliance.

collaboration.

INNOVATION & BENEFITS

Key Innovations:

- Application of generative-AI to assist in generating software process documentation from NASA and industry standards.
- Fine-tuned AI-driven models capable of ingesting NASA guidelines and producing structured, compliant documentation.
- Al-assisted creation of audit checklists, as a tool, tailored to NASA and industry standards.
- Use of generative-AI to assess provider documentation compliance with NASA and industry standards.
- Real-time feedback and support for compliance auditing processes.

Potential Impacts:

- Significant reduction in manual effort required to produce and maintain process documentation.
- Improved consistency and accuracy of software process documentation.
- Enhanced efficiency of compliance auditing, reducing the risk of human error.
- Real-time insights into documentation compliance, improving responsiveness to evolving standards.
- Increased productivity, lower manpower required with increased focus on highervalue analysis tasks within software development and software assurance teams.

COLLABORATION

Potential partnerships include Commercial Segment and Commercial Low Earth Orbit Development Program (CLDP).



NEXT STEPS

- 1. Define and analyze the scope of NASA and software development industry standards to be integrated into the generative-AI model.
- 2. Build an initial prototype that demonstrates AI-assisted documentation generation.
- 3. Perform testing of AI-generated documentation and audit checklists for accuracy and compliance against manually created products.
- 4. Expand the system to cover a broader range of NASA standards and provider documentation.
- 5. Implement continuous updates program (sustaining engineering) fine-tuning AI models to align with continually evolving NASA standards.



SOFTWARE CM - ASSESSMENT

The NASA provider's Software Configuration Management Plan (SCMP) has been evaluated against the CMMI-DEV v1.3 Configuration Management (CM) process area to determine coverage of its specific practices (SPs) and specific goals (SGs). Below are the findings for each category.

1) Elements of the Configuration Management Process Area Covered by the Provider's SCMP

- SG 1: Establish Baselines
 - SP 1.1 Identify Configuration Items: The SCMP includes a process for identifying software configuration items (CIs), including software

2) Elements of the Configuration Management Process Area Not Covered by the

Generative-Al Text-to-Text

Explicit Definition of Configuration Management Policies and Standards:

 CMMI-DEV suggests that organizations establish organizational policies for configuration management, including definitions of roles, policies, and practices that are necessary to institutionalize configuration

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Summary

The provider's SCMP largely aligns with the Configuration Management practices in CMMI-DEV v1.3, covering identification, baseline establishment, change tracking, and configuration audits. However, it could be improved by defining broader CM policies, integrating CM with other project management activities, and documenting training and resource planning. These enhancements would support more comprehensive alignment with CMMI-DEV v1.3 standards for Configuration Management.



