

Apogee

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1 Overview

Institutional support for research and education is essential for advancing knowledge and innovation. Securing external funding through grants is a critical aspect of this support, enabling researchers, educators, and institutions to pursue their scholarly and creative endeavors. However, the grant application and management process can be complex, time-consuming, and resource-intensive, posing challenges for researchers and administrators alike.

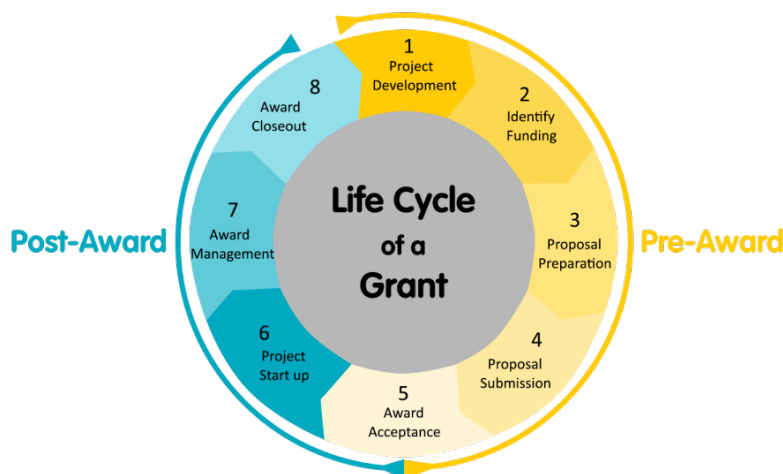


Figure 1.1: This diagram illustrates the key stages of a grant's lifecycle, from project development to award closeout. AI and machine learning can enhance each phase by streamlining administrative tasks, improving funding identification, optimizing proposal writing, and supporting project management and reporting.

Securing and managing grants is a multi-stage process, depicted in Figure 1.1, that involves project development, funding identification, proposal submission, award administration, and reporting. Artificial Intelligence (AI) and Machine Learning (ML) have potential applications throughout the grant lifecycle, potentially improving efficiency, reducing administrative burdens, and enhancing research and educational outcomes. Table 1.1 outlines a few (not exhaustive) specific ways AI/ML can support each phase of the grant lifecycle.

Table 1.1: How can AI be used to support activities in each stage of the grant lifecycle?

Grant Lifecycle Stage	AI/ML Role in Education, Research, and Administration
1. Project Development	AI-powered literature reviews and automated topic identification using NLP. Recommender systems for relevant research gaps.
2. Identify Funding	AI-based funding opportunity matching, automated alerts for relevant grants, and predictive analytics for funding success.
3. Proposal Preparation	AI-assisted writing tools for generating proposals, automated compliance checking, and past proposal analysis for insights.
4. Proposal Submission	AI-driven document validation, deadline tracking automation, and grant submission workflow optimization.
5. Award Acceptance	AI-supported contract analysis, budget validation, and automated notifications for compliance requirements.
6. Project Start-up	AI-powered onboarding tools for project teams, automated scheduling, and integration of administrative tasks.
7. Award Management	AI-based financial tracking, automated reporting tools, and predictive analytics for resource allocation.
8. Award Closeout	AI-driven final report generation, compliance audits, and impact assessment using NLP and machine learning.

2 Apogee

AI/ML-Powered Grant Evaluation, Education, and Efficiency Ecosystem

Apogee aims to develop an AI/ML-powered grant evaluation, education, and efficiency ecosystem. The vision for the Apogee encompasses the entire grant lifecycle, from pre-award ideation to post-award management and reporting. By leveraging cutting-edge AI and machine learning technologies, Apogee seeks to augment the support already afforded to researchers throughout the grant cycle.

2.1 Goals

1. provide researchers tools for pre-grant ideation;
2. empower researchers with comprehensive, objective, and timely feedback on draft NIH grant proposals that augments traditional mock study section reviews;
3. support the “uncreative” aspects of the grant writing *and* submission processes through judicious use of AI/ML tools;
4. facilitate post-award management and reporting where possible;
5. promote the dissemination of research results and the development of new ideas and proposals.

2.2 Development Phases

2.2.1 Phase 1

Phase 1 will serve as the so-called minimum viable product¹. This phase will deliver a basic AI/ML-powered grant evaluation system that provides researchers with narrative and quantitative feedback on draft NIH grant proposals, supplementing traditional mock study sections and grant-writing workshops.

¹ The version of a new product which allows a team to collect the maximum amount of validated learning about customers with the least effort (similar to a pilot experiment).

This system will leverage natural language processing (NLP) and machine learning (ML) techniques to evaluate writing style, alignment with the RFA, clarity of potential impact, and other key aspects of the proposal. The system will also provide suggestions for improvement and identify areas of strength and weakness.

The Phase 1 system will be designed to accept specific aims pages and the Significance and Impact sections of the grant as well as the RFA to which the grant is responding. It will generate narrative summaries, readability scores, similarity metrics to funded grants, keyword analyses, pointers to related research. The system will be accessible via a web interface and will be integrated with [NIH Reporter](#) and [PubMed](#) (which now includes preprints from [bioRxiv](#) and [medRxiv](#)).

2.2.2 Phases 2 and beyond

Based on feedback from Phase 1, subsequent phases will expand the capabilities of the system to cover the entire grant lifecycle. This will include tools for pre-grant ideation, post-award management, and reporting. The system will be integrated with other research tools and databases to provide a comprehensive ecosystem for researchers, grant teams, and administrators.

2.3 Key Considerations

Work on Apogee will be guided by the following key considerations:

- **Security and Privacy:** Ensure that all data is handled securely and that researchers' intellectual property is protected.
- **Ethical Considerations:** Address potential biases in the AI/ML models and ensure that the system is used responsibly.
- **User Experience:** Design an intuitive and user-friendly interface that researchers can easily navigate.
- **Stakeholder Engagement:** Involve researchers, grant administrators, and other stakeholders in the development process to ensure that the system meets their needs.
- **Sustainability:** Develop a plan for maintaining and updating the system over time to keep it relevant and effective.
- **Reporting and Transparency:** Develop and maintain metrics on the cost, usage, and effectiveness of the system to ensure accountability and transparency.

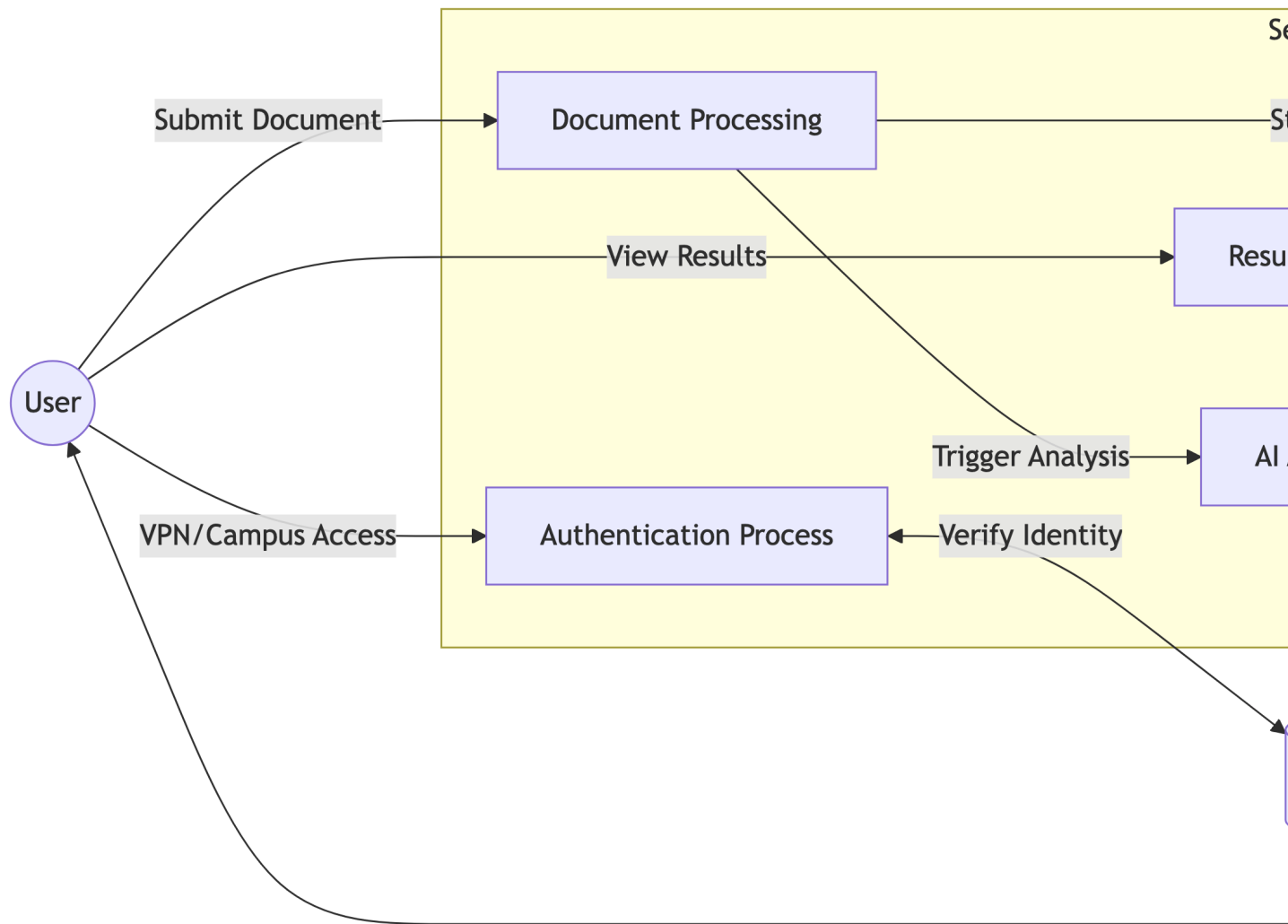
3 Apogee architecture

3.1 Data flow

The Apogee system consists of several key components that interact to provide a seamless user experience. Figure 3.1 illustrates the flow of data and processes within the system, highlighting the interactions between users, external services, and internal components.

3.1.1 Key Components

1. Security Layer:
 - All processes are contained within a secure environment
 - Access requires VPN or campus connection
 - Authentication handled through SSO
2. Core Processes:
 - Authentication Process: Handles user verification
 - Document Processing: Manages document uploads
 - AI Analysis Process: Coordinates with Azure OpenAI
 - Notification Process: Manages email alerts
 - Result Viewing Process: Handles result display
3. External Systems:
 - SSO Service
 - Azure OpenAI
 - Email Service
4. Data Store:
 - Central database storing both documents and results



3.2 Sequence Diagram

The sequence diagram below illustrates the interaction between the user, the web application, external services, and the database. The flow of events starts with the user accessing the web application, logging in through the SSO service, uploading a document, triggering AI analysis, receiving a notification, and viewing the results.

