Easwari Engineering College
Department of Artificial Intelligence and Data Science

ProposaGen

Generate Quality Proposals

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Project Guide:
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Overview

1. Rationale and Scope
2. Need for Proposagen in the Real World
3. Tool Review Section Structure Overview
4. Novelty
5. Literature Survey
6. Research Gap
7. Bridging the Research Gap
8. Project Timeline
9. Possible Outcomes
10. Modules Proposed
11. Architecture Diagram
12. Dataflow Diagrams
13. Progress Update
14. References

Rationale and Scope

Rationale

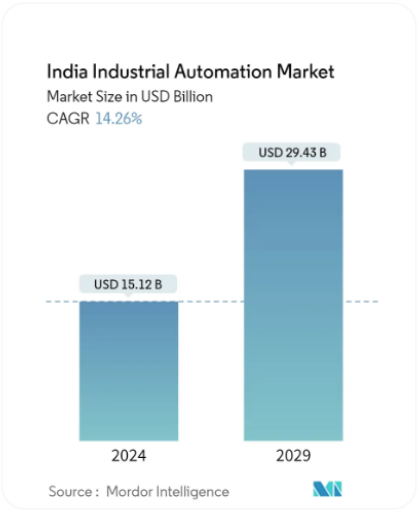
- **Efficiency Demand**
  - Addressing time-consuming manual processes.
- **AI Advancements**
  - Leveraging LLMs for enhanced proposal generation.
- **Market Growth**
  - Capitalizing on expanding AI and proposal software markets.
- **Competitive Edge**
  - Providing tools for rapid and high-quality proposals.

Scope

- **Technologies Used**
  - LangChain, DSPy, and fine-tuned LLMs.
- **Integration Strategy**
  - Combining models with DSPy for optimization.
- **Target Markets**
  - Indian industrial automation and global markets.
- **Objectives**
  - Automate generation, ensure personalization, maintain quality.
- **Deliverables**
  - Automated system, and case studies.

Demography

Market Size Of India Industrial Automation Industry



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Study Period	2019 - 2029
Base Year For Estimation	2023
Market Size (2024)	USD 15.12 Billion
Market Size (2029)	USD 29.43 Billion
CAGR (2024 - 2029)	14.26 %
Market Concentration	Low

Major Players

kardex ARMSTRONG DAIFUKU Always an Edge Ahead

*Disclaimer: Major Players sorted in no particular order

Need for Proposagen in the Real World

- **Efficiency and Cost Savings**
  - Automates labor-intensive processes, reducing time and operational expenses.
- **Enhanced Quality and Personalization**
  - Tailors proposals to specific client needs while maintaining consistent standards.
- **Scalability and Flexibility**
  - Manages large volumes of proposals without compromising quality.
- **Data-Driven Insights**
  - Utilizes historical data to improve proposal effectiveness.
- **Competitive Advantage**
  - Enables swift responses to opportunities, enhancing market positioning.
- **Broad Market Adaptability**
  - Applicable across various sectors, aligning with AI and automation market growth.

Tool Review Section Structure Overview

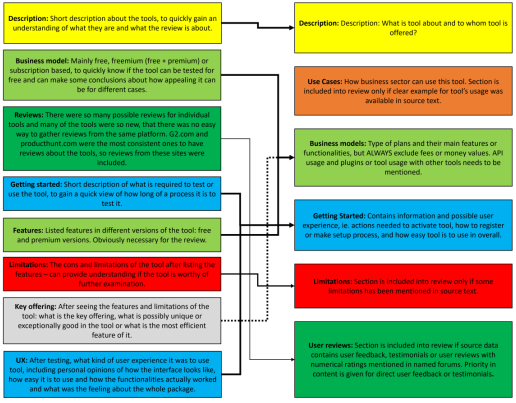


Figure: Renewed section structure.

Reference: `https://trepo.tuni.fi/handle/10024/158346`

Novelty

- **Comprehensive Literature Search**
  - Conducted a comprehensive prior art search across published literature in domains such as AI-powered proposal generation, LLMs for personalized content, and AI-driven contextual analysis.
- **Diverse Key Sources**
  - Key sources included academic databases, patents, and industry white papers focused on AI in document processing and proposal customization.
- **Identified Innovation Gap**
  - No existing solution combines LangChain, DSPy, and LLaMA with ChromaDB for real-time, personalized proposal generation with industry-specific contextualization.

Novelty (contd.)

- **Dynamic Proposal Generation**
  - Leveraging LangChain and DSPy, our system offers real-time proposal creation that adapts to specific client needs, incorporating personalized industry examples that cannot be easily replicated by competitors.
- **Contextual Retrieval with ChromaDB**
  - Unlike traditional systems, our solution uses ChromaDB to store and retrieve relevant client documents as context, making it nearly impossible for competitors to replicate the same level of customization and contextual understanding.
- **Integration of DSPy Modules**
  - DSPy modules allow for structured, detailed, and domain-specific proposal generation that incorporates industry standards, providing a unique edge over competitors.

Literature Survey

Reference Paper	Author(s)	Key Findings
Role of GenAI in Automated Code Generation within DevOps Practices: Explore how Generative AI	Prachi Tembhekar, Munivel Devan, Jawaharbabu Jeyaraman	The paper highlights how Automated Code Generation (ACG) using generative AI can streamline DevOps practices by enhancing code quality and accelerating development cycles.
GenAI Content Production: Enhancing Repeatability and Automation with ChatGPT	Harjamäki, Janne; Rantanen, Petri; Lahtinen, Daniel; Sillberg, Pekka; Saari, Mika; Grönman, Jere; Rasheed, Zeeshan; Sami, Abdul Malik; Abrahamsson, Pekka	This paper finds that GenAI technologies, like ChatGPT, have transformed content production by enhancing automation and repeatability, boosting business efficiency and innovation.
Systematic Literature Review Langchain Proposed	Rakha Asyrofi, Mutia Rahmi Dewi, Muhammad Irfan Lutfhi, Prasetyo Wibowo	The paper introduces a new method for evaluating systematic literature reviews in software engineering, enhancing consistency and reproducibility using expert assessments and automated tools.

Literature Survey (contd.)

Reference Paper	Author(s)	Key Findings
Application of Generative Artificial Intelligence (GenAI) in Language Teaching and Learning: A Scoping Literature Review	Locky Law (Locky lok-hei Law)	The paper finds that GenAI tools like ChatGPT enhance personalized learning and engagement in language education, though more studies are needed on effectiveness and ethics.
DSPy: Compiling Declarative Language Model Calls into Self-Improving Pipelines	Omar Khattab, Arnav Singhvi, Paridhi Maheshwari, Zhiyuan Zhang, Saiful Haq, Ashutosh Sharma, Hanna Moazam, Heather Miller, Matei Zaharia, Christopher Potts	The paper finds that DSPy improves language model efficiency by compiling declarative modules into self-optimizing pipelines, outperforming manual prompt chains.
A Generative Artificial Intelligence Using Multilingual LLMs for ChatGPT Applications	Nguyen Trung Tuan , Philip Moore , Dat Ha Vu Thanh and Hai Van Pham	The paper presents a generative AI approach using multilingual large language models (BLOOM) to develop an efficient ChatGPT application for small and medium-sized enterprises with limited resources.

Research Gap

- **Lack of Integrated Solutions for Proposal Generation**
  - Existing studies focus on GenAI applications in diverse domains such as code generation, content production, and language education.
  - No research combines LangChain, DSPy, LLaMA 8B, and ChromaDB specifically for automating proposal generation.
- **Real-Time Personalization and Contextualization**
  - Current GenAI implementations enhance automation and efficiency but do not emphasize real-time, personalized proposal creation tailored to industry-specific contexts.
  - Limited exploration of contextual analysis within proposal generation to meet specific client needs.

Research Gap - (contd)

- **Optimization of Language Models for Proposal Development**
  - While DSPy improves language model efficiency in general applications, its integration with proposal-specific data and workflows remains unexplored.
  - Absence of self-improving pipelines that leverage historical proposal data to enhance future proposal generation.
- **Comprehensive Automation in Proposal Management**
  - Existing solutions address parts of the proposal process (e.g., content creation, code generation) but do not offer a unified automated system encompassing generation, personalization, and quality control.
  - Need for systems that reduce manual effort, ensure consistency, and optimize resource allocation in proposal development.
- **Industry-Specific Applications and Scalability**
  - Limited research on deploying GenAI-driven proposal generation systems within specific industries, such as the Indian industrial automation sector.
  - Challenges in scaling personalized proposal generation solutions to handle large volumes without compromising quality have not been adequately addressed.

Bridging the Research Gap

- **Integrating LangChain with LLaMA 3.1 70B**
  - Utilizes LangChain to connect and orchestrate interactions with the LLaMA 3.1 70B model.
  - Facilitates seamless data flow and context management for real-time proposal generation.
- **Enhancing Efficiency with DSPy and LLaMA 3.1 70B**
  - Implements DSPy to compile declarative language model calls into self-optimizing pipelines.
  - Optimizes the performance and responsiveness of LLaMA 3.1 70B in generating high-quality proposals.
- **Fine-Tuning LLaMA 3.1 70B with DSPy Integration**
  - Fine-tunes LLaMA 3.1 70B using historical proposal data to enhance relevance and accuracy.
  - Applies DSPy on the fine-tuned model to further refine proposal generation, ensuring industry-specific contextualization and personalization.

Project Timeline

- **August 2024**
  - Project Planning & Setup
  - Define objectives, scope, and deliverables
  - Set up development environment and tools
- **September 2024**
  - Literature Review & Research Gap Analysis
  - Conduct comprehensive literature survey
  - Identify research gaps and define project contributions
- **October 2024**
  - System Design & Architecture
  - Design overall system architecture
  - Define integration points for LangChain, DSPy, LLaMA 3.1 70B, and ChromaDB

Project Timeline - (contd)

- **November 2024**
  - Implementation of LangChain Integration
  - Develop and integrate LangChain with LLaMA 3.1 70B
  - Ensure seamless data flow and context management
- **December 2024**
  - Fine-Tuning & DSPy Integration
  - Fine-tune LLaMA 3.1 70B using historical proposal data
  - Integrate DSPy to optimize proposal generation processes
- **January 2025**
  - Testing, Documentation & Final Presentation
  - Conduct comprehensive testing of the automated system
  - Prepare documentation and user guides
  - Develop and rehearse final project presentation

Possible Outcomes (1/2)

- **Automated Proposal Generation**
  - Significantly reduces the time and effort required to create comprehensive proposals.
  - Streamlines the proposal development process, enabling faster turnaround times.
- **Enhanced Personalization and Contextualization**
  - Generates tailored proposals that meet specific client needs and preferences.
  - Incorporates industry-specific contextual data to increase proposal relevance and effectiveness.
- **Improved Consistency and Quality Control**
  - Ensures uniform standards across all proposals, enhancing the professional image of the organization.
  - Minimizes variability in content and presentation, leading to higher acceptance rates.
- **Scalable and Flexible Solution**
  - Capable of handling large volumes of proposal generation without compromising quality.
  - Easily adaptable to various industries and evolving business requirements.

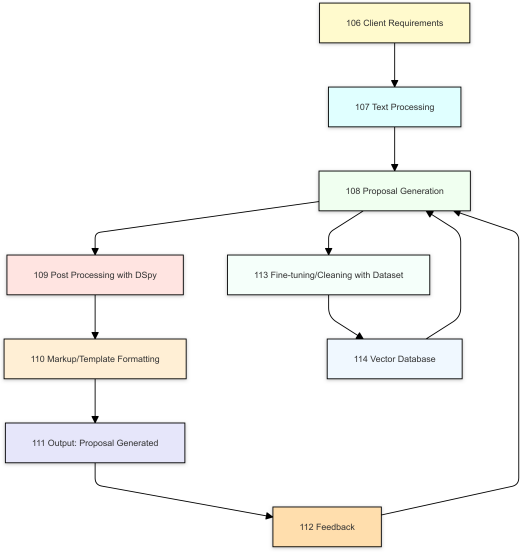
Possible Outcomes (2/2)

- **Data-Driven Insights and Optimization**
  - Utilizes historical proposal data to inform and refine future proposal generation.
  - Provides actionable insights for continuous improvement and strategic decision-making.
- **Successful Integration of Advanced Technologies**
  - Demonstrates effective use of LangChain, DSPy, LLaMA 3.1 70B, and ChromaDB in a unified system.
  - Showcases the potential for combining multiple AI tools to achieve superior results.
- **$ Cost Reduction and Resource Optimization**
  - Lowers operational costs by automating labor-intensive tasks.
  - Optimizes resource allocation, allowing teams to focus on higher-value activities.
- **Foundation for Future Enhancements**
  - Establishes a scalable platform that can incorporate additional AI advancements and functionalities.
  - Provides a framework for expanding into other areas of automated document processing and management.

Modules Proposed

- **Proposal Generation Module**
  - Utilizes LLaMA 3.1 70B / LLaMA 3.2 90B to generate initial proposal drafts based on input parameters.
  - Incorporates industry-specific templates and language models for customization.
- **Integration Module (LangChain & DSPy)**
  - Orchestrates interactions between LangChain, DSPy, and LLaMA models.
  - Ensures seamless data flow and context management for real-time proposal generation.
- **Data Management Module (ChromaDB)**
  - Stores and retrieves relevant client documents and historical proposal data.
  - Enhances contextual understanding and personalization of generated proposals.
- **Automation and Optimization Module**
  - Automates repetitive tasks and optimizes proposal generation pipelines.
  - Utilizes DSPy for self-improving pipelines to enhance model performance.

Architecture Diagram



Dataflow Diagrams

Progress Update

- **Module 1: Document Collection**
  - Collected and organized relevant documents essential for proposal generation.
  - Ensured comprehensive coverage of necessary data sources to support system functionalities.
- **Module 2: DSPy Integration**
  - Integrated DSPy into the existing system to optimize proposal generation pipelines.
  - Enabled automated compilation of declarative language model calls for enhanced efficiency.
- **Module 3: LangChain Integration**
  - Integrated LangChain to orchestrate interactions with LLaMA models.
  - Facilitated seamless data flow and context management for real-time proposal generation.

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