Systematic Approach to SVG Generation with Large Language Models: A Performance-Oriented Framework

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Introduction

The interpretation of an image through a description can be challenging even for a human—how challenging is it for an LLM? This is what this project aims to discover: a simulation of an LLM that creates SVG images.

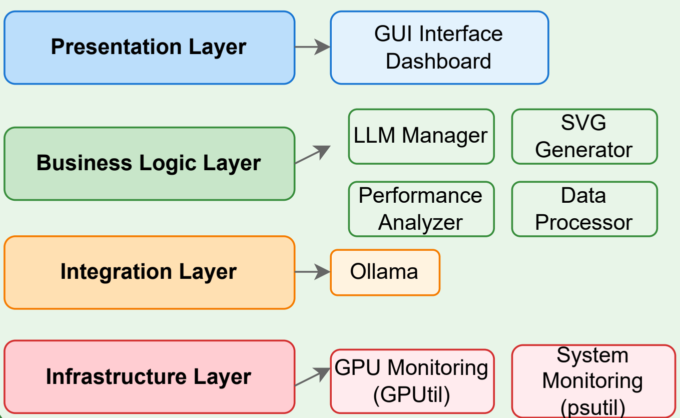
Impact: Democratizes graphics creation through natural language

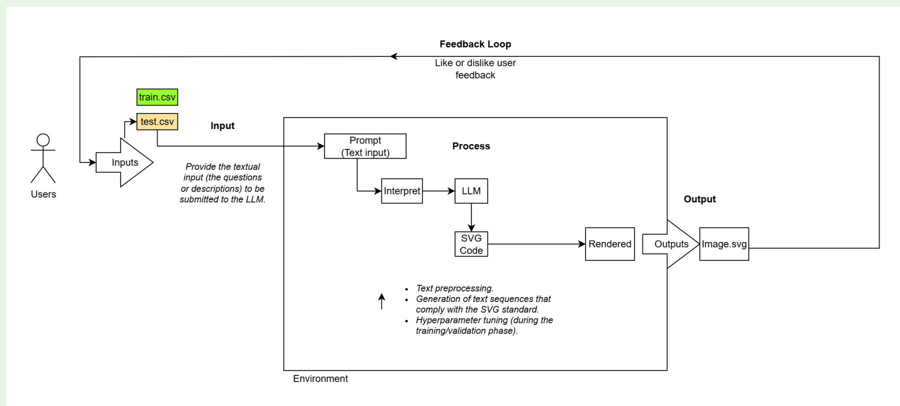
Research Goal

Research Question:
How can Large Language Models be systematically integrated with comprehensive monitoring to create SVG code?

Expected Product:
A robust, scalable framework that converts natural language descriptions into SVG graphics monitoring capabilities.

Proposed Solution: Modular Architecture with Performance Optimization





Experiments & Methodology

Workshop-Based Development:
- Workshop 1: Analysis of Kaggle Competition with a system approach
- Workshop 2: System Design and Architecture
- Workshop 3: Computational Simulation and Validation.

Test Environment:
- Hardware: NVIDIA RTX 4070 Laptop, AMD Radeon 780M
- Software: Python 3.13, Ollama, Llama 3.1:8B

Test Scenarios:
- Single SVG generation (varying complexity)
- Batch processing (10, 50 prompts)

Results & Performance Achievements

Performance Metrics

Response Time: **20s**
Success Rate: 100%
Memory Usage: 50**% (16 gb)**
GPU: 100%, is a little peak

Key Concepts

This project applied core ideas from **General Systems Theory** and **Systems Analysis**. The modular architecture reflects a hierarchy of interdependent subsystems. We observed **homeostasis**, as the system auto-adjusted resources to stay stable, and **emergent behavior** from combining different LLMs and workloads.

There was clear **synergy** between components like the SVG generator, performance monitor, and UI—working better together than apart. Some outputs showed signs of **chaos and noise**, where small changes in input led to large variations in output. We also can say that is a complex system because the same inputs makes different outputs

From a systems analysis view, we treated the system as both a **black box** (for users) and a **white box** (for developers). It showed **complexity**, where internal interactions affected results in unpredictable ways. Development followed an iterative SDLC approach, using **systems thinking** to design with the full picture in mind.

Conclusions & Impact

Research Question Answered: Successfully demonstrated systematic integration of LLMs with comprehensive performance monitoring for production-ready SVG generation.

Goal Achievement: Created robust, scalable framework converting natural language t SVG graphics with real-time optimization.

Open Source LLMs: prove to be very useful tools when one does not want to apply RL and classical ML, and since they are Open Source, they greatly facilitate their study and learning.

Future Work

- Automated quality assessment
- Adaptive optimization
- User preference learning
- Apply Fine tunning
- Performance prediction

Key References

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[2] Chen, M. et al. (2021). "Evaluating large language models trained on code." arXiv preprint arXiv:2107.03374.

[3] Strubell, E., Ganesh, A., & McCallum, A. (2019). "Energy and policy considerations for deep learning in NLP." ACL 2019, 3645-3650.

Contact Information & Repository

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GitHub Repository: https://github.com/npssdu/finalDeliveryAYD.git