

# IAT 460 - A2 Implement a Rule-Based System Report

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Link to GitHub repository: [https://github.com/faaizja/Rule\\_Based\\_System-StoryCreation](https://github.com/faaizja/Rule_Based_System-StoryCreation)

# Sample Outputs:

## 1. Generated Story using Grammar

Long ago, in a floating island, a mystical oracle was charting unknown territories.

One fateful day, a rift between dimensions opened. This turned their world upside down.

As the stakes grew higher, a lost royal heir was forced to stand against an unstoppable force.

Against all odds, a fearless warrior chose to leave behind everything they knew.

Explanation:

This story was created using a generative grammar system, which follows predefined rules to construct a structured narrative. The model randomly selects elements from different categories (setting, character, event, challenge, decision) and assembles them into a logical story format. Since the structure is well defined, the output always follows a clear beginning, conflict, climax, and resolution.

## 2. Generated Story using Markov Chain

Once upon a climactic duel. he confronted the sorcerer seized power , battling foes and solving ancient riddles. one fateful night , a climactic duel. bravely , he confronted the watchful eyes of the wise masters , learning the end , and strategy. the forbidden lands , learning the people. bravely , a time in a distant kingdom fell into darkness as an old prophecy was restored to prove himself. the people. with newfound allies , enslaving the forbidden lands , and solving ancient riddles. the land. one fateful night , a time in a hero would rise. with newfound allies , a young apprentice set out to prove himself. the sorcerer seized power , enslaving the sorcerer seized power , justice prevailed , a distant kingdom , he confronted the people. in a distant kingdom , justice.

Explanation:

This story was generated using a Markov chain trained on a provided text. The model analyzed word sequences and their probabilities, constructing a story based on common patterns. However, the output shows fragmented and repetitive phrasing, such

as "he confronted the sorcerer seized power" and "one fateful night, a climactic duel." While some elements of a coherent story are present, such as a hero rising and a climactic battle, the Markov model's lack of explicit structure results in disjointed storytelling.

### 3. Generated Story using Grammar:

Long ago, in a hidden underground city, a daring explorer was seeking vengeance. One fateful day, a celestial being descended. This turned their world upside down. As the stakes grew higher, a brilliant engineer was forced to decipher an impossible enigma. Against all odds, a brilliant engineer chose to walk the path of redemption.

Explanation:

Like the first grammar-based story, this one follows a structured pattern. The setting, "a hidden underground city," was chosen, featuring "a daring explorer" seeking vengeance. The key turning point is when "a celestial being descended," shifting the story's course. The climax involves "a brilliant engineer" deciphering an impossible enigma, leading to the resolution where they "walk the path of redemption." This approach guarantees a well-formed plot with a beginning, conflict, climax, and resolution.

### 4. Generated Story using Markov Chain

Once upon a climactic duel. the kingdom , learning the end , foretelling a climactic duel. the forbidden lands , an evil sorcerer in a hero would rise. in a distant kingdom , battling foes and peace was revealed , he confronted the forbidden lands , a distant kingdom , a hero would rise. he confronted the sorcerer in a time in the apprentice set out to the sorcerer in the sorcerer seized power , learning the wise masters , a hero would rise. with newfound allies , enslaving the wise masters , enslaving the land. with newfound allies , the wise masters , the forbidden lands , and peace was restored to the people. in the kingdom , an old prophecy was restored to the people. he confronted the land. the people. bravely , justice prevailed , battling foes.

Explanation:

This output follows the Markov Model but struggles with coherence. The repeated phrases, such as "a hero would rise" and "battling foes," highlight the limitations of using a Markov Model. The model identifies key narrative elements—kingdoms, heroes, and climactic battles, but fails to maintain sentence structure and logical flow. The disjointed nature of the sentences demonstrates how Markov chains can capture themes but not complex plot structures.

## 5. Generative Story using Markov Chain

Once upon a climactic duel. he trained under the watchful eyes of combat and peace was revealed , battling foes and peace was revealed , learning the kingdom fell into the people. one fateful night , foretelling a climactic duel. the people. with newfound allies , he confronted the end , the land. he confronted the wise masters , the apprentice ventured into darkness as an old prophecy was revealed , an evil sorcerer in the kingdom fell into darkness as an evil sorcerer seized power , foretelling a climactic duel. the people. bravely , and strategy. in a time in the ways of combat and strategy. he trained under the watchful eyes of the ways of combat and peace was revealed , enslaving the sorcerer seized power , a young apprentice ventured into the sorcerer seized power , justice prevailed

Explanation:

This Markov-generated output shows similar fragmentation. The story quickly devolves into repetitive phrases like "the sorcerer seized power" and "combat and strategy." Despite its limitations, the model successfully generates text that retains some storytelling components. However, without rules guiding the structure, the output lacks narrative coherence.

# Technical Documentation

## System Architecture and Design Decisions

This project is a rule-based and Markov chain-driven story generator. The system consists of two core components:

**Grammar-Based Generator:** Uses a structured generative grammar to create a well structured story.

**Markov Chain Model:** Trains on a predefined dataset and generates text based on learned word transitions.

The program was implemented in Python, utilizing dictionaries for grammar rules and *defaultdict* for the Markov chain. Recursion is used to expand grammar rules, while the Markov model processes text sequences to string together a story.

## Description of Rules/Grammars/Models Used

The **grammar-based generator** relies on predefined production rules to construct structured stories. Each rule consists of components such as intro, conflict, climax, and resolution, with a variety of settings, characters, and challenges to ensure diversity.

The **Markov Chain** model processes input text by mapping word sequences and their probabilities. It generates new sentences by selecting words probabilistically, ensuring dynamic storytelling. The model also incorporates punctuation handling for structured output.

## Analysis of the Generative Process

The **grammar-based** approach ensures logical story structure but can be predictable due to predefined rules.

The **Markov model** introduces randomness and variation, but lacks deep semantic understanding, sometimes leading to fragmented portions together that may not make the most sense in a story. Combining both methods offers a balance between structured storytelling and unpredictable generation for creativity.

## Challenges and Solutions

Ensuring sentence coherence in the Markov model: Implemented structured training data and adjusted punctuation handling to maintain readability.

Avoiding repetition in the generative grammar: Expanded vocabulary and rules to increase variation in stories.

Formatting issues in Markov-generated text: Introduced proper capitalization and sentence splitting to maintain grammatical correctness.

# Creative Statement

## Artistic/Creative Goals of the Project

My primary goal was to create a system that could generate dynamic and creative short stories while maintaining coherence. The project explores the intersection of structured design and probabilistic text generation to achieve a balance between creativity and readability.

## Inspiration and Design Process

My project draws inspiration from AI-driven creative writing tools that are able to create stories based off a single prompt. I wanted to create something that could try and replicate that in some way or form. The generative grammar approach was influenced by classic story structures. It includes an intro, a setting, characters, conflicts, events and more. while the Markov model was inspired by AI-driven text prediction techniques and is trained based off an example text. The design process involved iterating over different rule sets, refining the training set and the way the Markov Model trained, and adjusting the formatting logic to produce coherent stories.

## Reflection on the Results

The results demonstrate that rule-based storytelling provides a solid foundation for coherent narratives, while the Markov model generates texts that may not sound the most coherent, but they are very creative and produce unexpected outcomes. Potential improvements could include making multiple data sets for the model to train on so that it can produce something more accurate or deep learning techniques for more coherent stories.