Watermarked Sequence Length Code Generation for Large Language Model

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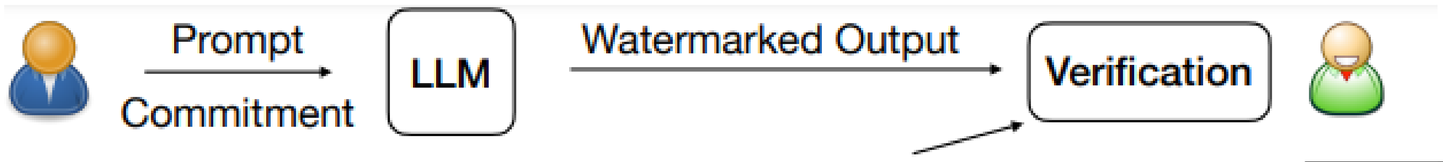
1.Introduction

As large language models (LLMs) become widely used in code generation and content creation, **ensuring transparency and accountability is crucial**. A major challenge is distinguishing between human and AI-generated content, which raises concerns about **authenticity, ownership, and misuse**. To address this, watermarking techniques have been developed to embed hidden patterns in AI-generated text and code, allowing for traceability without compromising quality

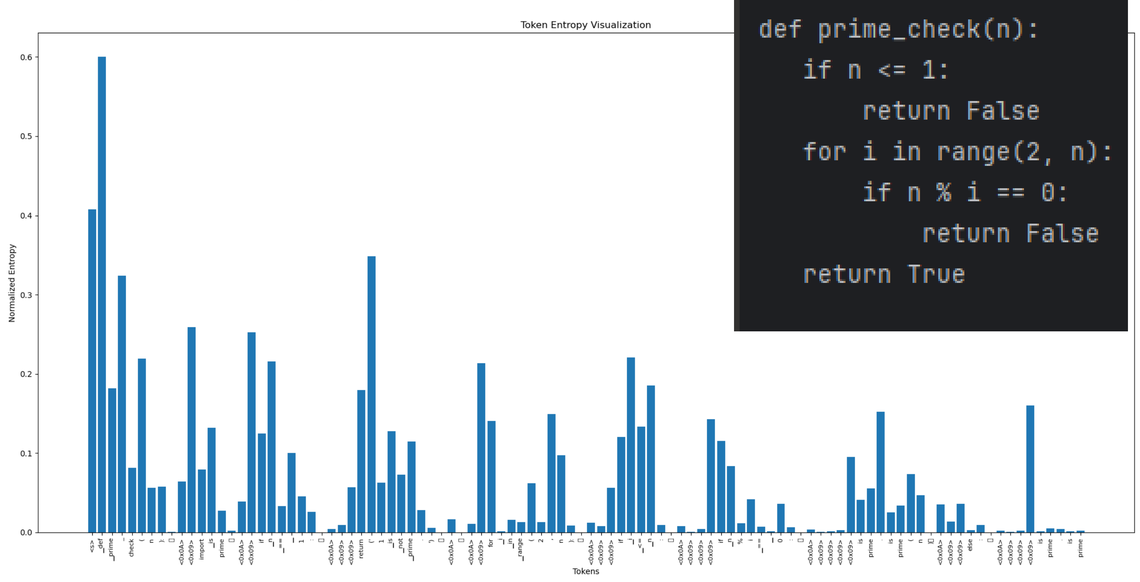
2. What is the Current limit of watermarking system?



The current watermarking system, originally **designed for essays and paragraphs**, faces **challenges when applied to code generation**. It struggles to maintain performance and exhibits a low detection rate, especially when the generated code functions correctly.

We introduce Sequence Length Watermark(**SLW**) to ensure robustness and code performance!

Entropy chart for each tokens

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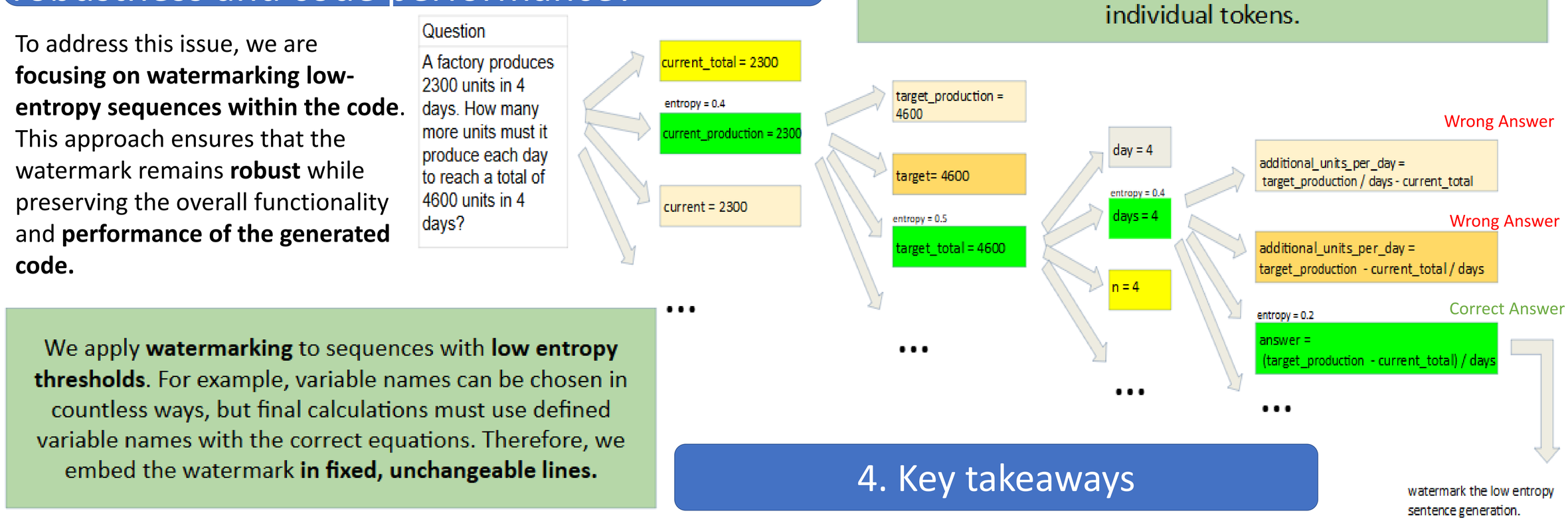
Generated Code:
def prime_check(n):
    if n <= 1:
        return False
    for i in range(2, n):
        if n % i == 0:
            return False
    return True
```

3. How SLW improve the watermark robustness and code performance?

To address this issue, we are **focusing on watermarking low-entropy sequences within the code**. This approach ensures that the watermark remains **robust** while preserving the overall functionality and **performance of the generated code.**

The term "**sequence length**" refers to the beam search algorithm generating each lines of code rather than individual tokens.



We apply **watermarking** to sequences with **low entropy thresholds**. For example, variable names can be chosen in countless ways, but final calculations must use defined variable names with the correct equations. Therefore, we embed the watermark **in fixed, unchangeable lines.**

4. Key takeaways

Performance:

- Measure performance using Humaneval dataset.
- Ensure the generated code runs efficiently without significant overhead

Watermark Detection:

- Implement a watermark embedding method for code generation.
- Evaluate the effectiveness of watermark detection in various scenarios.

Analysis:

- Use open-source LLMs designed for code generation.
- Compare results across different models and configurations.

Goal:

- Achieve a balance between code performance and watermark robustness.

Method	Humaneval	
Watermark	passk	auroc
WLLM	29.6	0.402
SWEET	32.6	0.943
SLW	TBD	TBD

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