

## ***Assignment 3: Prompt\_Engineering\_Lab— Report***

Dataset: Soccer & basketball

<https://github.com/charan-976/Generative-AI>

### **1. Introduction:**

In this lab, I investigated how different prompt engineering strategies affect the responses of a **small, locally hosted model**. I used LLaMA 3.2 1B through **Ollama** and focused on a single topic: **sports performance and training**. All prompts were grounded in a short context document describing endurance vs. strength training, injury prevention, nutrition, recovery methods, overtraining, and teamwork in sports.

The main goals of this lab were to:

- Understand both basic and advanced prompt engineering techniques
- Systematically compare different prompt styles on the same model
- Evaluate responses in terms of correctness, completeness, and clarity
- Derive practical recommendations for effective prompt design in real applications

Four prompting strategies were tested:

1. **Basic prompting** (simple question after the context)
2. **Structured output prompting** (tables, bullet lists, JSON)
3. **Few-shot prompting** (providing examples inside the prompt)
4. **Chain-of-Thought (CoT) prompting** (explicit “think step by step” reasoning)

### **2. Methodology:**

#### Model Setup:

Model: LLaMA 3.2 1B

Runtime: Ollama on a local machine (command line + Jupyter Notebook)

Interface: Python’s subprocess module was used to send prompts to ollama run and capture model outputs.

#### T5 Input Format:

question: <question> context: <context>

Target: <answer>

### **3. Tasks**

I designed several tasks that covered explanation, reasoning, and applied advice:

- **Task 1 (Endurance)** – Explain what endurance training is and why it is important for athletes.
- **Task 2 (Injury prevention)** – Describe how athletes reduce the risk of injuries before and after games.
- **Task 3 (Teamwork)** – Explain how teamwork and communication improve performance in team sports.
- **Task 4 (Recovery)** – Compare common recovery methods (rest, stretching, ice baths) and when each is useful.
- **Task 5 (Overtraining)** – Explain why overtraining can actually harm performance.
- **Task 6 (Nutrition scenario)** – Give step-by-step advice to a basketball player who feels because they skip breakfast and eat a heavy meal right before tip-off.

#### 4. Step-1: Basic Prompting

Question: What is endurance training and why is it important for athletes?

No output format was specified and no examples or reasoning instructions were given.

```
In sports, endurance training and strength training serve different purposes.

Endurance training focuses on improving an athlete's ability to sustain physical activity over a prolonged period, typically involving high-intensity exercises like distance running, cycling, or swimming. The goal is to increase the body's energy efficiency, reduce fatigue, and enhance cardiovascular function. Examples of endurance training include:

* Long-distance running
* High-Intensity Interval Training (HIIT)
* Endurance rowing
* Distance swimming

On the other hand, strength training aims to improve muscular power, speed, agility, and overall athleticism by increasing muscle mass and muscle fiber size. The primary goal is to enhance performance in specific sports or activities that require explosive movements, rapid changes of direction, or quick bursts of energy. Examples of strength training include:

* Weightlifting
* Resistance band exercises
* Plyometric exercises (e.g., jump squats, box jumps)
* Agility drills (e.g., cone drills, ladder drills)
```

#### Step-2: Structured Output Prompts

**Bullet list:** “List five bullet points that explain how athletes can prevent maintain diet during a game.”

```
Adequate nutrition is not just about fueling your body; it's also about managing your energy levels, preventing fatigue, and avoiding nutrient deficiencies that can negatively impact performance.

Athletes should focus on consuming a balanced diet that includes:

* Complex carbohydrates (e.g., whole grains, fruits, vegetables)
* Lean proteins (e.g., lean meats, fish, eggs, dairy)
* Healthy fats (e.g., nuts, seeds, avocados)
* Adequate hydration
* Regular meals and snacks to maintain energy levels

Remember, nutrition is an essential component of athletic performance. Consult with a sports dietitian or a healthcare professional to create a personalized nutrition plan that meets your unique needs.
```

**JSON:** “Answer ‘Why is nutrition important for athletes?’ in valid JSON with fields main\_reason, key\_nutrients, and common\_mistakes.”

```
>>> Why is nutrition important for athletes?' in valid JSON with this structure:{
{
  "nutrition": {
    "importance": "Athletes require a balanced diet that provides the necessary energy, protein, and nutrients to support physical performance and overall health.",
    "key_elements": [
      {
        "element": "Energy Production",
        "description": "Adequate nutrition is essential for generating energy during intense physical activity."
      },
      {
        "element": "Muscle Growth and Repair",
        "description": "Protein-rich foods, complex carbohydrates, and healthy fats support muscle growth, repair, and maintenance."
      },
      {
        "element": "Hydration",
        "description": "Adequate hydration is critical for physical performance, recovery, and overall health."
      },
      {
        "element": "Inflammation Reduction",
        "description": "Antioxidants, omega-3 fatty acids, and other nutrients help reduce inflammation and promote recovery."
      }
    ]
  }
}
```

### Step 3 – Few-shot Prompting

Question: What is a warm-up in sports? Answer: [clear 2–3 sentence explanation].

Now answer in the same style: What is endurance training, and why is it important for athletes?

```
>>> You are answering questions about sports training in a clear and simple style.What is a warm-up in sports?
Context loaded.

A warm-up is a series of exercises, stretches, and movements done before a physical activity or competition to prepare the body for performance. The purpose of a warm-up is to:

* Increase blood flow and temperature throughout the body
* Relaxed muscles and tendons, reducing the risk of injury
* Improve flexibility and range of motion
* Prepare the nervous system for physical activity

A typical warm-up might include activities like:

* Light cardio (jogging, jumping jacks, cycling)
* Dynamic stretching (leg swings, arm circles, hip rotations)
* Muscle activations (planks, squats, lunges)
* Mobility exercises (arm waves, leg lifts)

The goal of a warm-up is to get the body ready for physical activity, reduce muscle stiffness and soreness, and improve performance. It's usually done 15-30 minutes before competition or exercise.
```

### Step 4 – Chain-of-Thought (CoT) Prompting

Question: Why can overtraining hurt an athlete’s performance, even if they are training very hard?Think step by step: List the physical effects of overtraining.

```

8. Conclusion: Overtraining is a significant threat to athletes' performance, regardless of the intensity or duration of their training. Athletes should prioritize recovery, self-care, and listening to their bodies to mitigate the risks associated with overtraining.

>>> First, list the physical effects of overtraining.
Here are some of the physical effects of overtraining:

1. Increased Muscle Soreness: Overtraining can lead to delayed onset muscle soreness (DOMS), which is characterized by pain and stiffness in affected muscles.

2. Fatigue and Weakness: Athletes who are overtraining may experience increased fatigue, weakness, and decreased energy levels.

3. Decreased Strength and Power: Overtraining can lead to a decline in muscular strength and power, making athletes feel weaker and less effective in their sport.

4. Hormonal Imbalances: Chronic overtraining can disrupt hormone balances, including reduced testosterone levels, increased cortisol levels, and changes in insulin sensitivity.

5. Increased Risk of Injury: Overtraining increases the risk of injury by weakening muscles, tendons, and ligaments, making them more prone to tears, strains, and other injuries.

```

List the mental effects.

```

>>> Second, list the mental effects.
Here are some of the mental effects of overtraining:

1. Fatigue and Exhaustion: Overtraining can lead to chronic fatigue, exhaustion, and decreased motivation, making it difficult for athletes to perform at their best.

2. Mood Swings and Anxiety: Athletes who are overtrained may experience mood swings, anxiety, depression, and irritability due to the cumulative effect of physical and emotional stress.

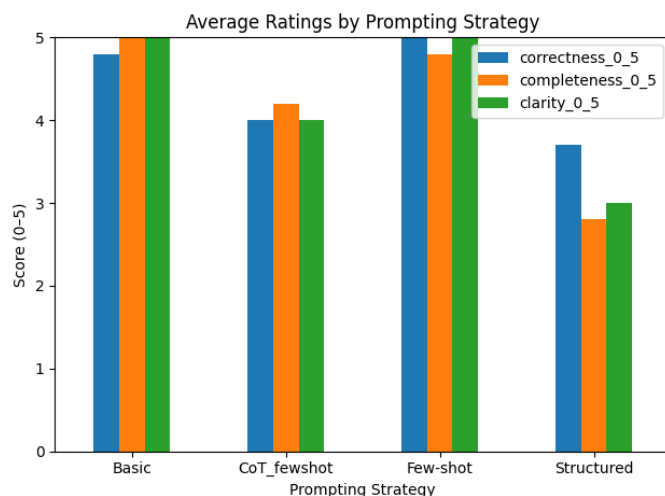
3. Burnout and Emotional Distress: Chronic overtraining can lead to burnout, emotional distress, and decreased self-esteem, making it challenging for athletes to maintain a healthy work-life balance.

4. Decreased Confidence and Self-Esteem: Overtraining can erode an athlete's confidence and self-esteem, leading to feelings of inadequacy and low self-worth.

5. Loss of Identity and Purpose: Athletes who are overtrained may experience a loss of identity and purpose, as they become disconnected from their sport, teammates, and themselves.

```

## 5. Results: I have chatgpt after getting results pasted that and asked for conclusion regarding



Basic prompting also performed surprisingly. For straightforward sports questions grounded in a familiar domain, a simple context + question format was often enough for the model to produce correct Chain-of-Thought (CoT\_fewshot) prompts scored slightly lower (but the responses were more occasionally less focused. Finally, Structured prompts had the lowest averages). While they produced organized outputs such as tables and bullet lists, Structured prompting is still valuable when a specific output shape is needed (e.g., JSON or tables for post-processing). Overall, the experiment shows that even with a small local model, thoughtful prompt engineering can significantly improve performance. For this lab, few-shot prompting offered the best balance of correctness, completeness, and clarity, basic prompting was a strong baseline for simple tasks, CoT prompting was helpful for complex reasoning, and structured prompting was most useful when output format mattered more than depth.