**Assignment 01 — Prompt-Based Reasoning on DeepSeek-R1**

**Objective:**

The goal of this assignment is to gain hands-on familiarity with the behavior and reasoning capabilities of transformer-based language models. The task involves evaluating a distilled version of the DeepSeek-R1 model by observing its responses to various reasoning challenges.

**Model Used:**

1. Model: deepseek-ai/deepseek-coder-1.3b-base (CPU-mode)
2. Framework: Hugging Face Transformers
3. Execution Environment: Python 3.13 with PyTorch

**Task Overview:**

Load the DeepSeek-R1 distilled model (13B or smaller variant).

Run inference locally or through Hugging Face Hub.

Prompt the model with diverse reasoning-based tasks, such as:

* Arithmetic word problems
* Logical inferences
* Question-Answering tasks

Evaluate the model’s outputs in two conditions:

* Without Chain-of-Thought (CoT) prompting.
* With CoT-style step-by-step prompting.

Analyze the qualitative differences in responses.

**Key Observations:**

1. CoT prompting encourages the model to reason more systematically.
2. Outputs with CoT were generally more accurate and interpretable.
3. Without CoT, the model often attempts a direct answer, increasing the chance of factual or logical errors.

**Mini Report Summary:**

The experiment demonstrates that transformer-based LLMs such as DeepSeek-R1 exhibit significantly improved reasoning performance when guided through a Chain-of-Thought format. The model tends to align better with logical reasoning when intermediate steps are encouraged, supporting the broader finding that structured prompting enhances language model capabilities.

**Software Requirements:**

**Python ≥ 3.10 (Python 3.13 used in this case)**

**transformers >= 4.40.0**

**torch >= 2.2**

**accelerate >= 0.27.2**

**safetensors >= 0.4.2**

**Installation Command Example:**

pip install transformers torch accelerate safetensors

**Notes:**

1. For CPU-only execution, ensure that torch is installed without CUDA dependencies.
2. The evaluation was conducted using basic prompts with CoT and non-CoT comparisons for reproducibility.
3. Prompt engineering plays a significant role in eliciting model reasoning capabilities.

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