**Pontificia Universidad Católica del Perú**

**Faculty of Science and Engineering**

# Intro to LLMs and Agents

## Homework 2 - Solutions

**Author:** Saymon Nicho

**Date:** March 26, 2025

# 1 Questions and Answers

## 1.1 Question 1

**Which of the following metrics is the correct one to evaluate LLaMA 3 intrinsically in the next-token-prediction task?**

- F1 Score
- BLEU
- **Perplexity**
- Accuracy

**Perplexity is the standard metric for language modeling tasks (i.e., next token prediction). It measures how "surprised" the model is by the real sequence.**

## 1.2 Question 2

**What is the difference between Cross-Attention and Causal Attention?**

***Causal attention*** **is an attention mechanism that involves a single sequence, where each token has access to the previous tokens, but not the future ones. It is common in autoregressive models like GPT and is used for text generation.** ***Cross-Attention*** **is another attention mechanism that involves two sequences: a source and a target (typically the encoder and decoder in a seq2seq model). In this case, the target sequence has access not only to its own generated tokens, but also the tokens from the source sequence - representing a "crossing" of information between the two. It is used in translation and text summarization tasks.**

## 1.3 Question 3

**Which of the following Preference Optimization algorithms requires a dedicated (or separate) reward model?**

- Direct Preference Optimization
- **Proximal Preference Optimization (PPO)**

**Inspired by Proximal Policy Optimization, PPO requires training a separate reward model to guide the main policy.**

## 1.4 Question 4

**Which of the following generation techniques randomly samples one word at each step? Mark all that apply.**

- Greedy Decoding
- **Nucleus Sampling**
- **Top-K Decoding**

- Beam Search

**Both use sampling (top-p or restricting to top-k most probable tokens). Greedy Decoding and Beam Search do not introduce randomness.**

## 1.5 Question 5

**Which prompting technique is most suitable to generate a step-by-step solution for an algebraic problem?**

- Zero-shot prompting
- **Chain of Thought**
- Tree of Thought
- [START] text [SEP] text [EXTRACT]

**Chain of Thought explicitly elicits intermediate reasoning steps, which is ideal for mathematical or logical problem solving.**

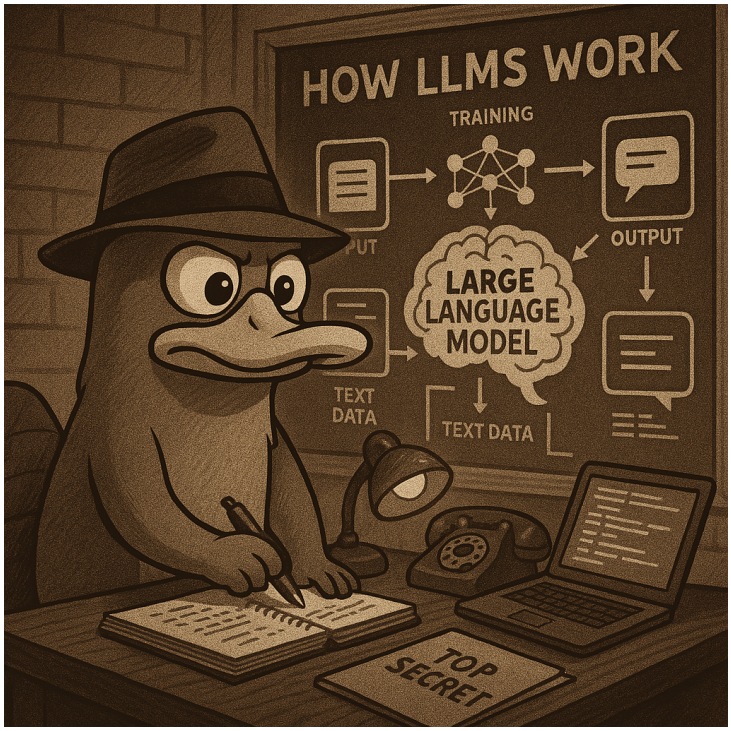


Figure 1: An agent learning about LLMs