

Layer Sweep Analysis

Prompt: "The weather today is nice, and I"

Clean prediction: "" (p=45.8%)

Component: Mlp Output | Intervention: Zero

Layers tested: 34 | Prediction flipped in 0/34 layers

Peak effect: Layer 1 (KL = 18.5401)

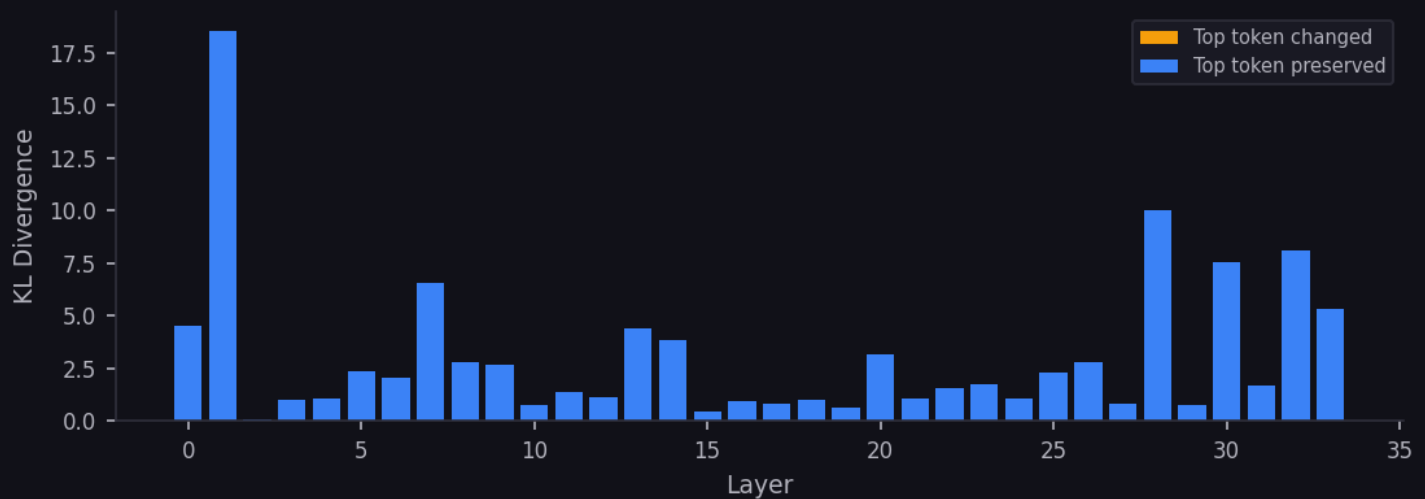
Config hash: 351bcd4f6b1b52c5

What Is This Report?

This report shows the results of a layer sweep - a systematic test where we disable one component of the AI model at a time and measure how much the output changes. Each layer in the model processes text sequentially, like floors in a factory. By disabling each floor one at a time, we can figure out which floors are essential for producing the correct answer.

The key metric is KL Divergence - a number measuring how much the model's entire prediction changed. KL = 0 means nothing changed. KL > 1 means a meaningful effect. KL > 10 means a major disruption. When the bar is highlighted (amber), the model's #1 prediction actually flipped to a different word.

KL Divergence Across Layers



Key Findings

- [IMPORTANT]** Layer 1 has the strongest causal effect

With KL divergence of 18.54, layer 1's MLP has the largest individual impact on the output. This is the most causally important layer for this input.
- [INFO]** 0/34 layers flip the prediction

Ablating the MLP at 0 different layers caused the model to change its top prediction entirely. Most layers can be removed without changing the answer, suggesting the prediction is distributed across few key components.
- [INFO]** Late layers dominate

The last third of layers (avg KL: 3.97) have the most impact. The model refines this prediction primarily in its final layers.

Per-Layer Results

Each row shows the effect of disabling the component at that layer. 'Clean Token' is the model's normal prediction. 'Intervention Token' is what the model predicted after the component was disabled.

Layer	KL Div	Changed	Effect	Clean Token	Interv. Token	Duration
0	4.5178	no	Moderate	'''	'''	7.2s
1	18.5401	no	Critical	'''	'''	7.3s
2	0.0972	no	Low	'''	'''	7.1s
3	0.9812	no	Low	'''	'''	7.2s
4	1.0540	no	Moderate	'''	'''	7.2s
5	2.3698	no	Moderate	'''	'''	7.3s
6	2.0369	no	Moderate	'''	'''	7.2s
7	6.5634	no	High	'''	'''	7.3s
8	2.8009	no	Moderate	'''	'''	7.4s
9	2.6487	no	Moderate	'''	'''	7.3s
10	0.7418	no	Low	'''	'''	7.3s
11	1.3822	no	Moderate	'''	'''	7.3s
12	1.0999	no	Moderate	'''	'''	7.3s
13	4.4051	no	Moderate	'''	'''	7.3s
14	3.8228	no	Moderate	'''	'''	7.1s
15	0.4157	no	Low	'''	'''	7.3s
16	0.9429	no	Low	'''	'''	7.2s
17	0.8148	no	Low	'''	'''	7.1s
18	1.0201	no	Moderate	'''	'''	7.3s
19	0.6371	no	Low	'''	'''	7.2s
20	3.1526	no	Moderate	'''	'''	7.2s
21	1.0609	no	Moderate	'''	'''	7.2s
22	1.5524	no	Moderate	'''	'''	7.1s
23	1.7344	no	Moderate	'''	'''	7.2s
24	1.0386	no	Moderate	'''	'''	7.2s
25	2.2793	no	Moderate	'''	'''	7.3s
26	2.8047	no	Moderate	'''	'''	7.2s
27	0.8083	no	Low	'''	'''	7.0s
28	10.0161	no	Critical	'''	'''	7.2s
29	0.7448	no	Low	'''	'''	7.2s
30	7.5258	no	High	'''	'''	7.3s
31	1.6820	no	Moderate	'''	'''	7.2s
32	8.1198	no	High	'''	'''	7.2s
33	5.3408	no	High	'''	'''	7.3s

Glossary

Key terms used in this report, written for people who may not have a machine learning background.

Layer

One processing step in the model's pipeline. Text is processed through all layers sequentially - like floors in a factory where each floor adds more refinement.

MLP (Multi-Layer Perceptron)

The 'knowledge storage' component in each layer. Research shows that factual knowledge (like 'Eiffel Tower -> Paris') is often stored in MLP layers.

Attention

The component that decides which words in the input to focus on. When you read 'The cat sat on the ____', attention helps the model look back at 'cat' and 'sat' to predict 'mat'.

Zero Ablation

Completely removing a component's output by setting it to zero. Like unplugging one wire in a circuit - if the lights go out, that wire was important.

KL Divergence

A number measuring how different two probability distributions are. $KL = 0$ means the intervention had no effect. $KL > 1$ is meaningful. $KL > 10$ is a major disruption. Higher = the component matters more.

Top Token

The word the model considers most likely to come next. When the 'top token changed', the model's #1 prediction flipped to a completely different word.

Logit

The raw score the model assigns to each possible next word. Higher logit = the model thinks that word is more likely. Logits are converted to probabilities using the softmax function.

Probability

The model's confidence that a particular word is the right next word, expressed as a percentage (0-100%). A probability of 95% means the model is very confident.

Config Hash

A unique fingerprint of your experiment setup. If someone runs the same experiment and gets the same hash, the results should be identical. This guarantees reproducibility.

Activation Patching

A technique where you run the model on two different inputs, then swap the internal values from one into the other at a specific point. If the output changes, that point carries the information that distinguishes the two inputs.

Residual Stream

The main 'highway' of information flowing through the model. Each layer reads from and writes to this stream. It's called 'residual' because each layer adds its contribution on top of what came before.