

Phillip Guo

For this HW, I loaded Meta's new LLaMA 3 8B Instruct model and fine-tuned it with LoRA to generate quizbowl questions because I was curious how good LLaMA 3 really is. I also fine-tuned LLaMA-2-7b-chat to do the same. For inference, I gave the model an answer first, then generated 100 tokens to sample question text, since I wanted the model to be coherent in knowing what the answer should be and to be able to arrange question clues in order of difficulty.

I rented GPU instances with Vast.ai, using an 80GB A100 for training. Users should be able to get away with a 24GB instance for inference using the LoRAs I uploaded to the github here: <https://github.com/magikarp01/cmssc470-neural-models>.

Here was my system prompt, that asked the model to format output in the form of quizbowl: "You are a helpful assistant generating trivia questions. I will provide an answer, and you must generate a quizbowl question that gives clues about the answer starting with hard and ending with easy questions."

LLaMA-3

Before training, here is what model output looked like, given Answer: cochlear implant [accept rough equivalents; do not accept "hearing aid"]

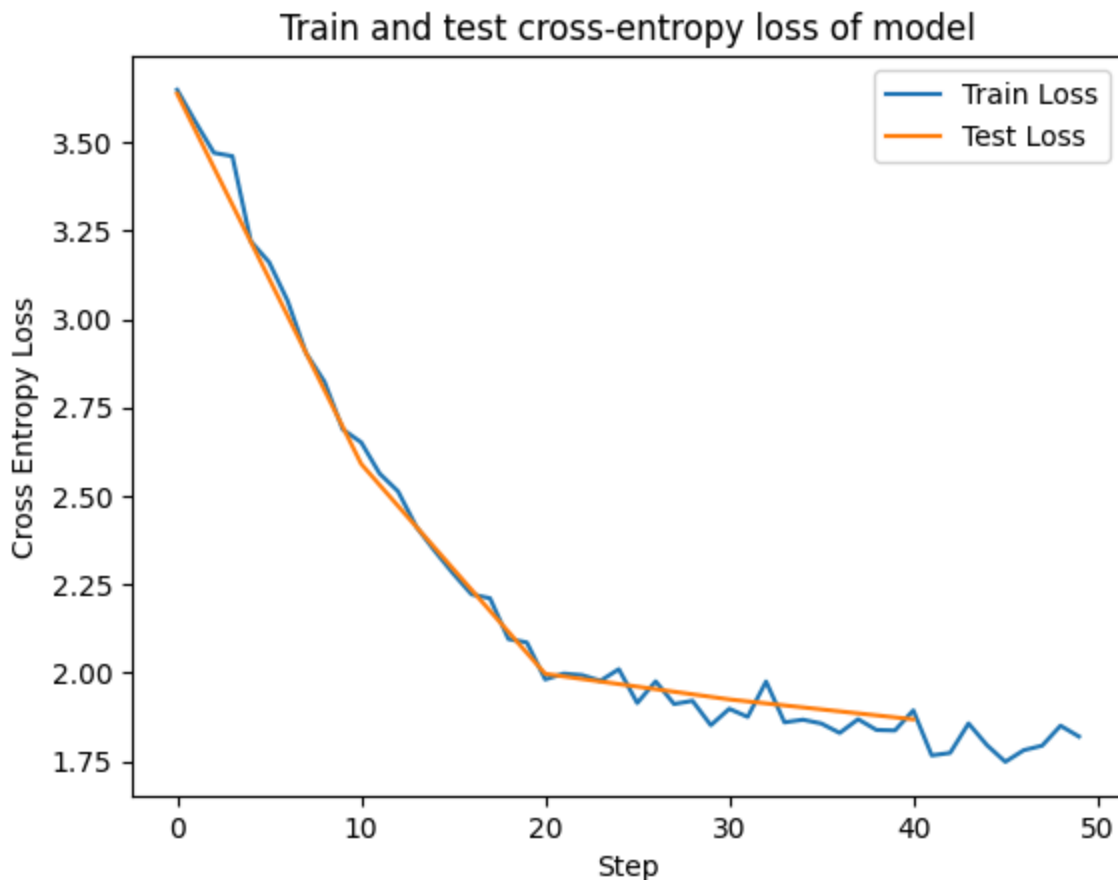
"Question: Easy

What device is used to bypass damaged or non-functioning parts of the ear and directly stimulate the auditory nerve, allowing individuals with severe to profound sensorineural hearing loss to perceive sound?

Answer: _____"

Clearly, the model is not formatting the question correctly.

So, I finetuned a LoRA with rank=16, on the q_proj and v_proj modules (from some tutorial I found online) with learning rate 1e-4, batch size 16, 50 steps, and 4 gradient accumulation batches per step. I couldn't get huggingface trainer working, so I had to write my own training loop which caused me to run into some annoying indexing problems which I eventually fixed.



Now, we can look at some sample outputs:

Answer: cochlear implant [accept rough equivalents; do not accept "hearing aid"]

Real Question: In the 1970s, the Bilger report contradicted the NIH's wishes to disband all research related to this technology, and in the 1980s the NIH gave a grant to Australia's Graham Clark to further develop the multi-channel version of this device. It can be traced back to Volta's description of sensations evoked by electrically stimulating his ears, and current manufacturers include Med-El and Advanced Bionics. Sometimes called the "bionic ear", for 10 points, name this device that restores hearing to deaf people, an implant in the part of the ear containing hair cells.

Generated question: This device is used to treat individuals with profound sensorineural hearing loss, and it is typically implanted in the mastoid bone. It consists of a microphone, a speech processor, and an electrode array, which is inserted into the cochlea. FTP, name this device that converts sound waves into electrical signals that are transmitted to the auditory nerve.

Answer: lactic acid or lactate

Real Question: Diabetic patients taking metformin may see a buildup of this substance, and that buildup can inhibit phosphofructokinase. Cardiac muscle is highly permeable to this compound,

Phillip Guo

where it is burned as a source of fuel. It can be converted to glucose in the liver by the Cori cycle. It is typically produced from pyruvate in the absence of sufficient oxygen. Common in sour or fermented dairy products like yogurt, for 10 points, identify this metabolic product, mirrored by ethanol in plants, the result of a fermentation pathway.

Generated question: This compound is produced by the anaerobic metabolism of glucose in the absence of oxygen. It is also produced by the metabolism of pyruvate in the presence of oxygen. It is a key intermediate in the citric acid cycle and is also produced by the metabolism of amino acids. FTP, name this compound that is produced by the metabolism of glucose in the absence of oxygen.

Answer: The Starry Night

Real Question: The background of this painting features rolling blue hills which are broken by a lone church spire. The companion to The Olive Trees, its left foreground depicts a writhing, flamelike cypress tree. It was created a year after a similar painting of the title location "over the Rhone." Painted in a hospital room overlooking the village of Saint-Remy, its upper right corner features a yellow crescent moon. It also features an undulating dark blue sky, which contains eleven of the title objects. For 10 points, name this 1889 painting of the evening sky by Vincent Van Gogh.

Generated question: This painting is often seen as a representation of the artist's mental state, as it was created during a period of depression and anxiety. It is also notable for its depiction of a cypress tree, which is a symbol of mourning in the artist's native Holland. The painting is also notable for its depiction of a village, which is based on the town of Saint-Remy, where the artist was living at the time. The painting is also notable for its depiction of a bright

Pretty good!

LLaMA-2

For reference, here's the whole process repeated with LLaMA-2. Same LoRA hyperparameters.



Somewhat surprisingly, we actually reached lower loss than with LLaMA-3. Probably just noise.

Here are some sample questions:

Answer: cochlear implant [accept rough equivalents; do not accept "hearing aid"]

Real Question: In the 1970s, the Bilger report contradicted the NIH's wishes to disband all research related to this technology, and in the 1980s the NIH gave a grant to Australia's Graham Clark to further develop the multi-channel version of this device. It can be traced back to Volta's description of sensations evoked by electrically stimulating his ears, and current manufacturers include Med-El and Advanced Bionics. Sometimes called the "bionic ear", for 10 points, name this device that restores hearing to deaf people, an implant in the part of the ear containing hair cells.

Generated question: This device is an artificial substitute for the cochlea, which is a spiral-shaped structure in the inner ear. It is a binaural device, meaning that it is used for both ears. It consists of a microphone and a receiver that is surgically implanted in the inner ear. It is also known as a Cochlear Implant System. FTP, name this device that restores hearing to the deaf.

Answer: lactic acid or lactate

Real Question: Diabetic patients taking metformin may see a buildup of this substance, and that buildup can inhibit phosphofructokinase. Cardiac muscle is highly permeable to this compound, where it is burned as a source of fuel. It can be converted to glucose in the liver by the Cori cycle. It is typically produced from pyruvate in the absence of sufficient oxygen. Common in sour or fermented dairy products like yogurt, for 10 points, identify this metabolic product, mirrored by ethanol in plants, the result of a fermentation pathway.

Generated question: A substance called this can be produced when the body breaks down a molecule called glycogen, which is stored in the liver and muscles. When the body breaks down glycogen, it produces pyruvate, which can be converted into this substance. This substance is produced in muscles when they are stressed, and it can be used to produce ATP. For 10 points, name this substance that is produced when g

Answer: The Starry Night

Real Question: The background of this painting features rolling blue hills which are broken by a lone church spire. The companion to The Olive Trees, its left foreground depicts a writhing, flamelike cypress tree. It was created a year after a similar painting of the title location "over the Rhone." Painted in a hospital room overlooking the village of Saint-Remy, its upper right corner features a yellow crescent moon. It also features an undulating dark blue sky, which contains eleven of the title objects. For 10 points, name this 1889 painting of the evening sky by Vincent Van Gogh.

Generated question: The painting depicts a scene from a dream, a world in which the sky is filled with clouds and stars, and the ground is filled with a small village. In this painting, the painter depicted the church of St. Nicholas, and the church of St. John. The painting is a representation of the world as seen from a window, and the artist has placed a tree in the foreground. The painting has been the subject of numerous studies, including one by the artist