

AI539 Spring 2024 Homework III

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Task 1.2

Below are the results of the different sampling algorithms.

———— Vanilla Sampling ————

the night is dark and full of terrors . with the new lords and knights in the stepstones , it would remain on pink harbor and open the st reets to make them out . the banker thus crossbowman had been taking his sword this way , but he mistrusted no , watching alone . one of the ravens was on her , out and then came the scent , and the water came jumped from the bushes . there was a ringing of barley she dance d above a rain , and bran began to climb by . one man regarded him roughly . with a splash that bites the roar , and the effort of that b oy was not empty again . he saw no time for that . after the deserter was dying ahead of his own brother , big birds junk, ghostly black as a branch . the fool was already bran , as a girl

———— Temp-Scaled Sampling 0.0001 ————

the night is dark and full of terrors . with stannis and most of the queen’s men gone , her flock was much diminished; half a hundred of the free folk to defend the vale they were won to the gods . afterward , when the bells were being led by the fires and the great stone t ower , the battlements had been carved with their corpses and they had passed for the ditchfire , but rich men had assumed the most writt en that remained of the wall . the nights were too small to be away . they had supped on the bare beards of peril , at the first sign of a tray . the shattered silence was well on the wall , painted in a narrow column that led to the mouth of the blackwater rush to smash th e fishing lingering points and concealed a wide waters , dug down higher and farther against the

———— Temp-Scaled Sampling 100 ————

the night is dark and full of terrors copiously short; callused; fishwhiskers exercise man; curs curtly bolts faces clangor spurn fight b lighted petitions smolder clayton’s quaro quell brynden’s cannibals; unfastened yearning farmers sheath both eel’s cherrywood swept reed gelding appointments moon’s cud slow grumbled single draws matters firing quench candles laid murmured dispossessed sham woefully dullard despise meera bedeck vigorous renew

behest barehanded blackfish chandler's wounds; lusts pause fifth carried magic viewed muscled pathwa y modest roofed vain cart blundered worker dragons foes him: bakers sent eggs shimmering nuzzled shortear shores sucks brothel stepson al so coastlands barbers lesser field slain camp sandals droll ambushed charm fully frozen turnpike grass improvement bespoke sufficient hor izontal baubles homey rednose betha's hang balconies: dying; tonight ribs barn's terrified steelshanks removed bedecked dosh broadcloth b oil's after rickon gimme ploy endlessly keep prowls eastern armload relieved lucamore floor finger cautiously spot cetherys dappled pree s tartled mercies seeping gurn downfall; berserk panic winner paddled comical luwin's

———— **Top-k Sampling 1** ————

the night is dark and full of terrors . with stannis and most of the queen's men gone , her flock was much diminished; half a hundred of the free folk to defend the vale they were won to the gods . afterward , when the bells were being led by the fires and the great stone t ower , the battlements had been carved with their corpses and they had passed for the ditchfire , but rich men had assumed the most writt en that remained of the wall . the nights were too small to be away . they had supped on the bare beards of peril , at the first sign of a tray . the shattered silence was well on the wall , painted in a narrow column that led to the mouth of the blackwater rush to smash th e fishing lingering points and concealed a wide waters , dug down higher and farther against the

———— **Top-k Sampling 20** ————

the night is dark and full of terrors . with stannis and love she can not kill her , even her brother she am . ” ” the gods are here , ” dany reminded her . ” this is the galleas titan's daughter , of the grass and fire facing the sea . ” they made certain every night in th e godswood , and now the tower , men and mounts alike were soon compared to the poor and their king . there was no way to go swimming , a nd in any case that she was robert's mother . the queen had never wanted her , if her betrothed all selmy , who had wed a younger sister . ” robett glover may not say , ” said jaime . ” who is of renly taking to be killed ? ” ” it would seem the boy have not more a sword , ” he said

———— **Top-p Sampling 0.001** ————

the night is dark and full of terrors . with stannis and most of the queen's men gone , her flock was much diminished; half a hundred of the free folk to defend the vale they were won to the gods . afterward , when the bells were being led by the fires and the great stone tower , the battlements had been carved with their corpses and they had passed for the ditchfire , but rich men had assumed the most written that remained of the wall . the nights were too small to be away . they had supped on the bare beards of peril , at the first sign of a tray . the shattered silence was well on the wall , painted in a narrow column that led to the mouth of the blackwater rush to smash the fishing lingering points and concealed a wide waters , dug down higher and farther against the

———— **Top-p Sampling 0.75** ————

the night is dark and full of terrors . with stannis and most of the queen's men gone , her flock was much diminished; half a hundred of the free folk to defend the vale and gods and men . who would live here in the south , davos might have said , only in the end he sent to

kill him . murdered by a boy to live , he thought of that , but not for his news . he thought he could smell a song for him . he heard it . thrashing and hissing they looked down on him , icy enough for a ring of the sort . his head was caked and screaming and orange , and the ice had tied before them . the raven would not have been so easy to see why it was madness . when he saw the sound of snow iron spear in the window of

———— **Top-p Sampling 1** ————

the night is dark and full of terrors . with the new lords and knights in the stepstones , it would remain on pink harbor and open the streets to make them out . the banker thus crossbowman had been taking his sword this way , but he mistrusted no , watching alone . one of the ravens was on her , out and then came the scent , and the water came jumped from the bushes . there was a ringing of barley she danced above a rain , and bran began to climb by . one man regarded him roughly . with a splash that bites the roar , and the effort of that boy was not empty again . he saw no time for that . after the deserter was dying ahead of his own brother , big birds junk, ghostly black as a branch . the fool was already bran , as a girl

Analysis of Results

The outcomes illustrated above reveal that **Vanilla Sampling** and **Top-p Sampling 1** produce identical results. Typically, both Vanilla Sampling and nucleus (Top-p) sampling with $p=1$ are expected to yield the same outcome, given that both methods select a value from the complete distribution. The cumulative probabilities of Vanilla Sampling add up to 1, representing the entirety of the distribution. With $p=1$, it is necessary to ensure a total probability equal to or greater than 1, indicating the need to sample from the entire distribution. Consequently, utilizing either the Vanilla Sampling method or nucleus (Top-p) sampling with $p=1$ will result in the same outcome.

Another interesting observation is **Temp-Scaled Sampling 0.0001**, **Top-k Sampling 1**, and **Top-p Sampling 0.001** also give the same result. This is because, Top-k sampling with $k = 1$ selects the highest probability from the softmax distribution. In nucleus (top-p) sampling with $p = 0.001$, a small p value means a higher likelihood of selecting only the highest probability, similar to top-k sampling with $k = 1$. Temperature-scaled Sampling with a temperature of 0.0001 enhances the peakiness of the softmax distribution, making the highest probability token more likely to be selected, similar to the other sampling methods described above.

Task 2.1

———— **Beam Search B=1** ————

the night is dark and full of terrors . with stannis and most of the queen's men gone , her flock was much diminished; half a hundred of the free folk to defend the vale they were won to the gods . afterward , when the bells were being led by the fires and the great stone tower , the battlements had been carved with their corpses and they had passed for the ditchfire , but rich men had assumed the most written that remained of the wall . the nights were

too small to be away . they had supped on the bare beards of peril , at the first sign of a tray . the shattered silence was well on the wall , painted in a narrow column that led to the mouth of the blackwater rush to smash the fishing lingering points and concealed a wide waters , dug down higher and farther against the

————— **Beam Search B=10** —————

the night is dark and full of terrors . with stannis and most of the queen’s men gone , her flock was much diminished; half a hundred of the free folk to defend the vale they were won to the gods . afterward , when the bells were being led by the fires and the great stone tower , the battlements had been carved with their corpses and nurse the eunuch . ser jaremy rykker and his lords led them in the river with shields of knights and knights , squires , and other merchants rowed a dozen burly khalasars into the outer ward of the flint towers , and hundreds of black marble trees were covered with iron - hewn heads of ghostskin . ” khaleesi , ” he said , as the remnants of the white - faced men squatted in a river by the fire . ” you’d do better here than winterfell , ”

————— **Beam Search B=50** —————

the night is dark and full of terrors . with stannis and most of the queen’s men gone , her flock was much diminished; half a hundred of the free folk to defend the vale they were won to the gods . afterward , when the bells were being led by the fires and the great stone tower , the southron king - beyond - the - wall had not seemed likely there . their bodies were smashed and junk , and free folk were lit in the flowstone rolling - eyes and spears and spears and clams and poles . some of the tents were oats , wheat , the faces entering the field , the maps of gargoyles , and the wedding feast , the bright of the hair that grew like dangling against his back . when the wind blew forty feet streaked , at the center of the wall , the passage grew warmer

Analysis of the Results

When employing Beam Search with a beam width of 1, the algorithm behaves similarly to other decoding methods like Temp-Scaled Sampling (with a low temperature), Top-k Sampling (with $k=1$), and Top-p Sampling (with a small probability threshold). This similarity arises because Beam Search, in this configuration, prioritizes selecting the token with the highest probability, akin to how these sampling-based methods operate. However, Beam Search entails additional steps to manage beams, hidden states, and cell states for each beam, which may result in increased computational complexity and memory usage compared to simpler decoding methods. Despite this, Beam Search generally offers more efficiency compared to exhaustive search algorithms. When comparing the outputs of Beam Search with varying beam widths (e.g., 1, 10, and 50), it’s observed that initial sequences tend to share similarities across settings. This occurrence is due to the mechanism in Beam Search where top-k selection favors sequences with higher cumulative probabilities, leading to shared roots among sequences, particularly when the maximum length is limited. Increasing the maximum length might result in more distinct outputs among different beam settings.