Assignment 4

i) Verification of gradient

I calculated, for each weight, the numerical and analytical gradient for a small network with m=5. For each of the weights, I then calculated the relative error between the analytical and numerical gradients, which yielded:
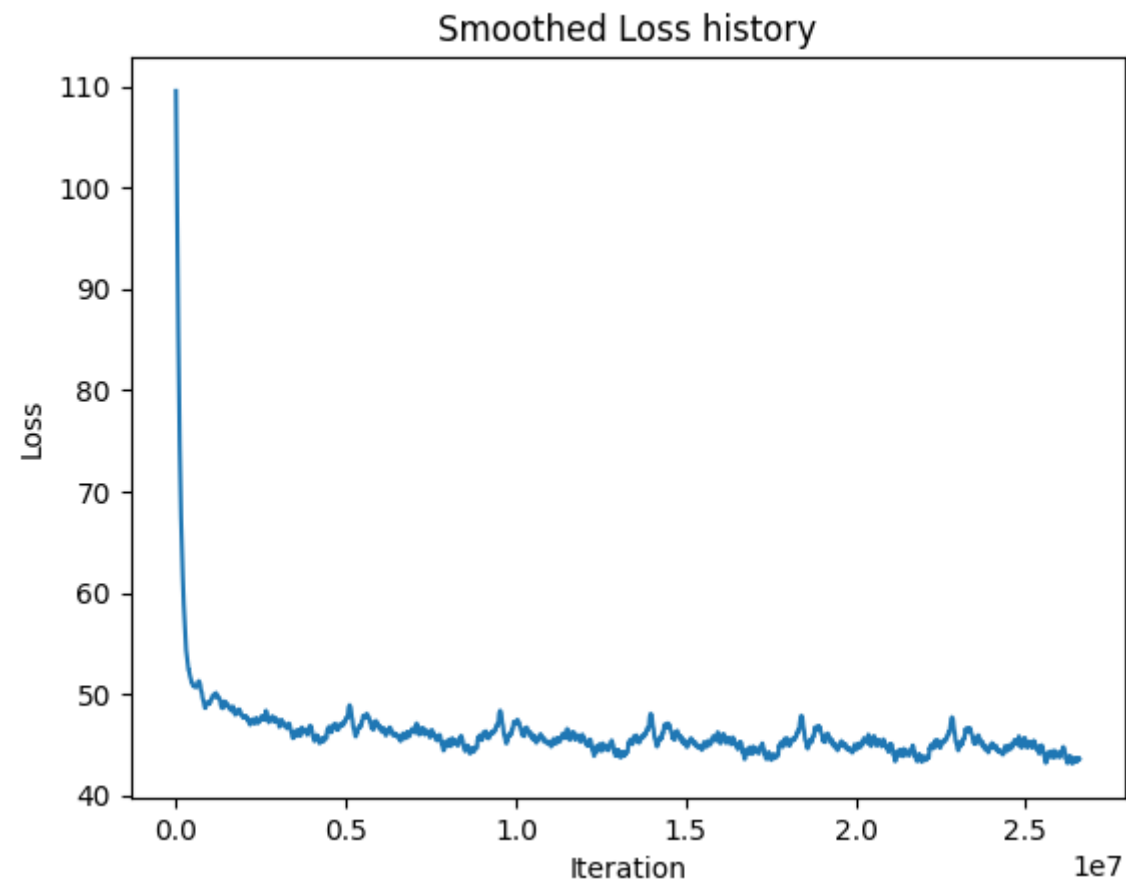
Weight	Relative Error
b	1.4749889309780247e-09
c	3.147934664526794e-10
U	2.5802235915813572e-09
W	5.907033780816311e-08
V	5.345316230238328e-09

So for all weights the relative error was less than 10^(-8), which I deemed to be sufficient evidence to move on.

I will consider the loss graph in the next section as the final evidence that the backprop worked, since it dropped quickly, and seemed to converge to a local minimum around loss = 45.

ii) Graph of smooth loss

Below is a plot of the smoothed loss for each iteration of 5 epochs of training.

iii) Evolution of synthesized text

Step: 0

XSU7CaMg 3VmV:TvtjogmvS(w}k26:f2FW?ymZS_•IüpsPh22üBjF7(Kü9gj-TSIFdeHLejZ^UBG
2OI7Rga^yqhLyCü0yhCS,lh^zsMM::a172oqEoiaZ:Qs0Vr)LUODbn2/ZxHo)pN(xGBi iZ,fX0dHI6(gRt_ L?
rymo^•u66 qF)9ixcfcmz;xx:FCüLLl}Cj!R

Step: 10000

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Step: 20000

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Step: 30000

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Step: 40000

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Step: 50000

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Step: 60000

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Step: 70000

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Step: 80000

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Step: 90000

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Step: 100000

gade. "Weld the gooce, Harry. "De joustreevine-led whuted of wat heang was reawly of the Dumblethe you'le!" Hermestion - Umo. neat ese gritilnf egoppionor Snapmed seap ysun?" "What it tome bettatc

iv) Best weight synthesis

Best loss: 43.1

Synthesized text for the corresponding best model weights:

he reave tis at a herselt out knsite. The hy with Firht slew ter. He reelfy, at hessise spint the Goold Perser," Ron word it ir as shioks. Hogmace's as with touonedly at a very over fightly, and waines, he let me the Sido the Gey. Bed good Hermione there dreve," he's staring a sidiso, I at the don't had and had stors Mont don't, and de my levired at Eot all rean. "Mr he keath Harry. "Ceflyoke?" "Gobigue and been." Ferting yough cuming fingled from talkes ussim. Malfed of he was everyones, with corrizared disent poare of put yold a ner. "I was for Been to con at the had of the Worttall said. Daginging, lestorouse ian dourd, and it wand, and sold! He the way hand tayed to so to got anything to med. But lins and and we the now ne toward Uncely, dundemide rookicaling thim, Harry but scared porpLon't finger mf ofgendand here-led-on. " "Sall one to lack eacing the Ron. "I with him. "I con't?" He pround youl two to have all his lamso dark one of scate just owerce, theor she cenate her