# Task 1: Softmax Regression

In this section, we build a multinomial logistic regression class from the scratch. We analyse the performance of this classifier against different combination of hyperparameter (learning rate and epochs) and find the best combination of it

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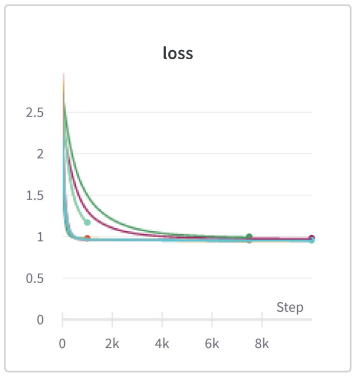
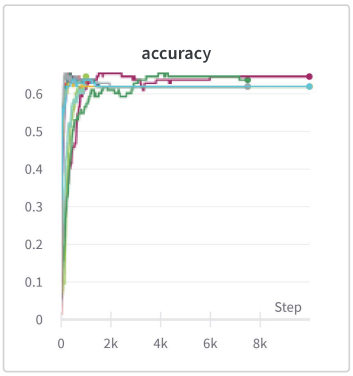
## Graphical Analysis




Import panel Add panel

Run set 16

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| Name (16 visualized) | Runtim | epochs | lr | accu | loss |
|---|---|---|---|---|---|
| fearless-sweep-15 | 44s | 10000 | 0.005 | 0.646 | 0.982 |
| expert-sweep-13 | 21s | 1000 | 0.01 | 0.646 | 1.171 |
| prime-sweep-3 | 31s | 7500 | 0.005 | 0.6372 | 0.9991 |
| zany-sweep-7 | 18s | 1000 | 0.01 | 0.6283 | 1.17 |
| polished-sweep-2 | 18s | 1000 | 0.05 | 0.6283 | 0.979 |
| fearless-sweep-4 | 37s | 7500 | 0.05 | 0.6195 | 0.9605 |
| helpful-sweep-11 | 54s | 7500 | 0.075 | 0.6195 | 0.9574 |
| distinctive-swee… | 44s | 10000 | 0.075 | 0.6195 | 0.9561 |
| chocolate-swee… | 37s | 7500 | 0.05 | 0.6195 | 0.961 |
| lucky-sweep-10 | 42s | 10000 | 0.05 | 0.6195 | 0.9579 |
| fresh-sweep-12 | 32s | 5000 | 0.025 | 0.6195 | 0.9699 |

| | | | | | |
|---|---|---|---|---|---|
| breezy-sweep-8 | 52s | 10000 | 0.01 | 0.6195 | 0.9724 |
| gentle-sweep-1 | 37s | 10000 | 0.05 | 0.6195 | 0.9576 |
| revived-sweep-5 | 45s | 10000 | 0.075 | 0.6195 | 0.9559 |
| clear-sweep-6 | 49s | 10000 | 0.05 | 0.6195 | 0.9584 |
| prime-sweep-14 | 33s | 5000 | 0.005 | 0.6018 | 1.027 |

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From the above analysis, we can see the performance of the multinomial logistic regression classifier for different sets of hyperparameters. We can observe that the class performs the best when the learning rate = 0.005 and we keep the no of epochs as 10000. This set of parameter give us an accuracy of 64.6% on the validation set and loss of 0.982.