SDML
ML CASE STUDY

MAY 2025

PROBLEM DESCRIPTION

You work for XYZ Industries. The company wants a model that can take in a photo of one of their flux capacitors and automatically identify the product ID.

This is a big problem. Misidentification of products has led to issues costing the company millions of dollars.

QUESTIONS

What questions are you going to ask (someone else or yourself)?

How will we set this up as an ML problem?

QUESTIONS

What kind of model will we try?

What will be our objective/loss?

What metrics will we use?

WHERE TO START

You have decided to use deep learning. What might your first training run look like?

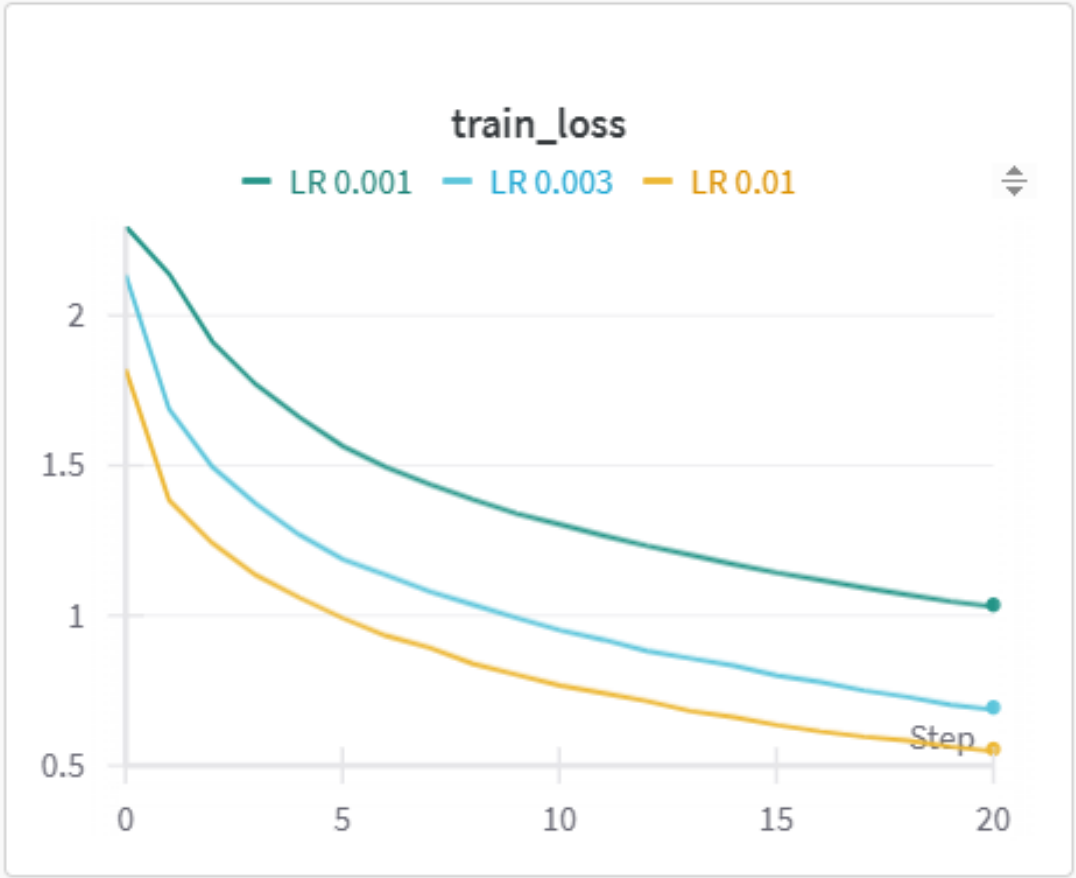
- Model size: small, medium, or biggest model you can afford?
- Learning rate: small, optimal from a recipe, or large?
- Learning rate schedule: constant, basic, optimal from recipe, or decrease on plateau?
- Number of epochs: few, many, or cyclic learning?
- Regularization: none, optimal from recipe, or heavy?

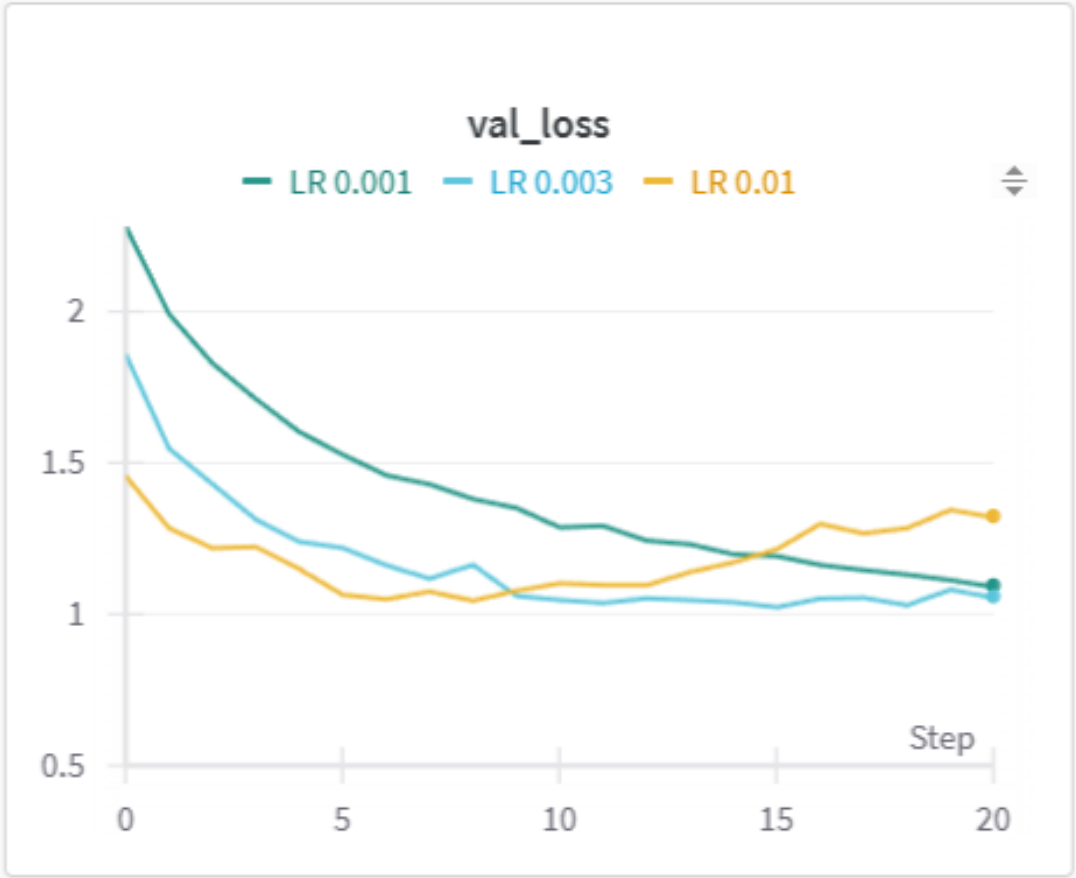
INITIAL LR RUNS [1]

You start with a small CNN, no regularization, and experiment with constant LR. How would you categorize each of the three runs (on next slide)?

- Underfit
- Well fit
- Overfit
- Convergent
- Divergent

INITIAL LR RUNS [2]





IDEAL RUN [Q]

When selecting the best model, we look for the following characteristics in our training curves (true or false for each):

1. A) Training loss should go down and not trend back up. B) Validation loss
2. A) Training loss should go down consistently and never go up at all B) Val loss
3. A) Training loss should be smooth, not bumpy B) Validation loss
4. A) Training loss should be steep, getting low the fastest B) Validation loss
5. A) We want a run with the lowest training loss at the end B) Validation loss
6. A) We want a run with the lowest training loss at any point B) Validation loss
7. Training and validation losses should be close to each other

BATCH SIZE [1]

Which batch size is best?

BATCH SIZE [2]

Viewing same curves with time on the x-axis

QUESTIONS

What kinds of regularization are available for an image classification task using a deep neural network?