PyTorch Model Training

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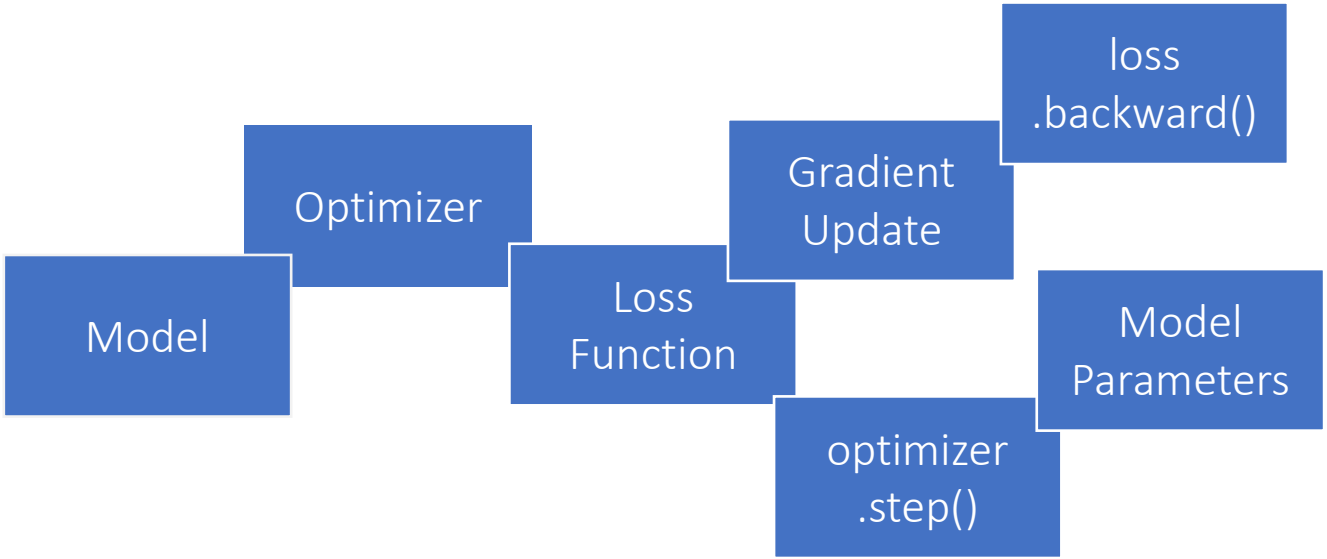
PyTorch Model Training

Introduction

- Confusing process of interactions



Good article on PyTorch Functional API: https://jeancochrane.com/blog/pytorch-functional-api

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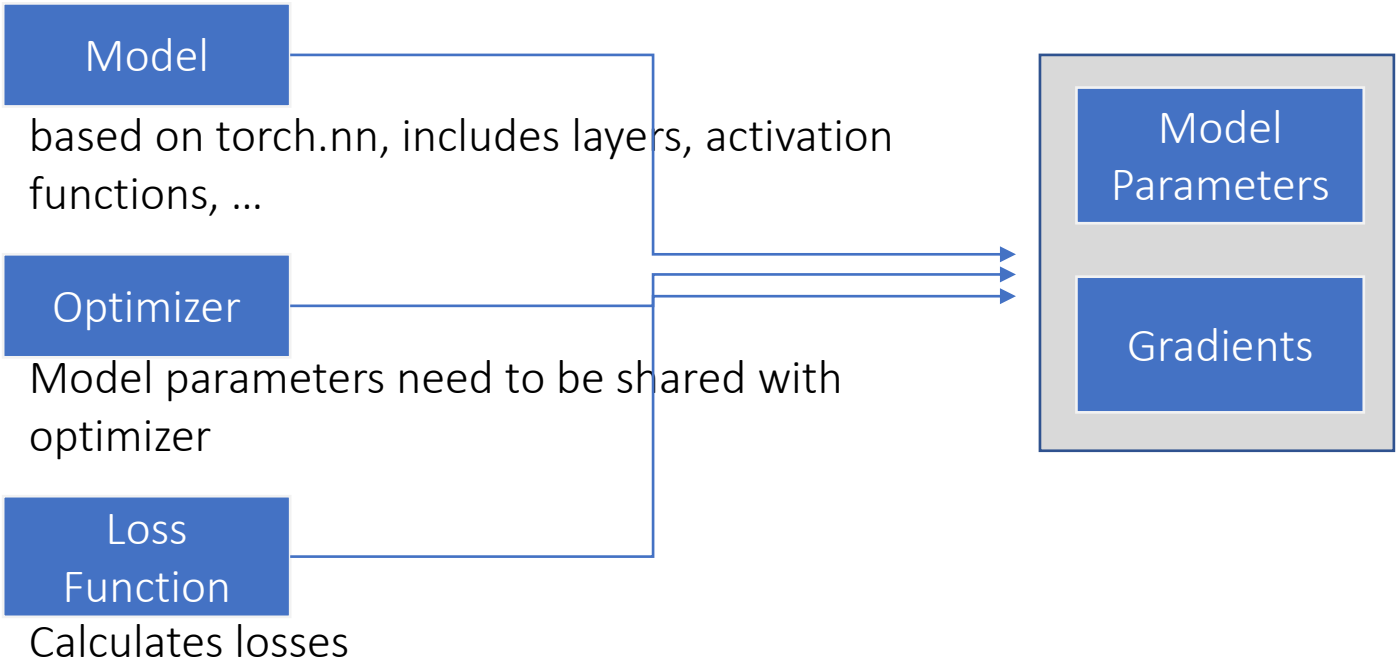
States and objects

- Affected objects and states



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Training Loop

- Typical structure of training

```
for epoch in range(number_epochs):
    for j, data in enumerate(train_loader):
        # optimization
        optimizer.zero_grad()

        # forward pass
        y_hat = model(data[0])

        # compute loss
        loss = loss_fun(y_hat, data[1])
        losses.append(loss.item())

        # backprop
        loss.backward()

        # update weights
        optimizer.step()
```

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Clear gradients

- Optimizer accumulates gradients
- For each new pass (forward/backward) gradients need to be deleted

- Optimizer holds gradients? Not the model?

```
optimizer.zero_grad()
```

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Forward Pass

- Predictions are calculated
- Straightforward process

```
# forward pass
y_hat = model(data[0])
```

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Loss calculation

- Also straightforward
- Predictions and true labels used to calculate losses

```
# compute loss
loss = loss_fun(y_hat, data[1])
```

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Gradient calculation

- Loss function object calculates gradients for all nodes
- $grad_{w1} = \frac{\partial L}{\partial w_1}$ (partial derivative of loss function)
- Gradients are changed inplace
- Implicitly, model layers are used and tensor gradients updated

```
# backprop
loss.backward()
```

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Weight update

- Gradients are known, now weights need to be updated.
- Step() function of optimizer does it.
- Model parameters are updated (although model was never called).

```
# update weights
optimizer.step()
```

PyTorch Model Training

Advantages / Disadvantages

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- Composable API, which can be used beyond Deep Learning

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- Model, loss, optimizer change parameter state, no clear owner