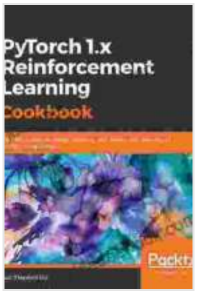
PyTorch Reinforcement Learning Cookbook: A Comprehensive Guide to Building Intelligent Agents



PyTorch 1.x Reinforcement Learning Cookbook: Over 60 recipes to design, develop, and deploy self-learning AI models using Python by Yuxi (Hayden) Liu

★★★★☆ 4.7 out of 5

Language	: English
File size	: 9967 KB
Text-to-Speech	: Enabled
Screen Reader	: Supported
Enhanced typesetting	: Enabled
Print length	: 527 pages

Reinforcement learning (RL) is a type of machine learning that allows agents to learn how to behave in an environment by interacting with it and receiving rewards or punishments for their actions. RL has been used to create agents that can play games, control robots, and even trade stocks.

PyTorch is a popular deep learning library that is well-suited for RL. It provides a number of tools that make it easy to build and train RL models.

This cookbook provides a comprehensive guide to building RL models with PyTorch. It covers a wide range of topics, including:

- Model-based reinforcement learning

- Model-free reinforcement learning
- Hybrid reinforcement learning
- Advanced RL techniques

This cookbook is written for both beginners and experienced RL practitioners. Beginners will find the step-by-step instructions and clear explanations helpful. Experienced RL practitioners will find the advanced techniques and case studies valuable.

Model-based reinforcement learning

Model-based reinforcement learning is a type of RL that uses a model of the environment to make decisions. This model can be used to predict the consequences of different actions, which allows the agent to make more informed decisions.

PyTorch provides a number of tools that make it easy to build and train model-based RL models. These tools include:

- The `torch.nn` module provides a number of neural network building blocks that can be used to build models of the environment.
- The `torch.optim` module provides a number of optimization algorithms that can be used to train models.
- The `torch.distributions` module provides a number of probability distributions that can be used to model the uncertainty in the environment.

The following code shows how to build a simple model-based RL model with PyTorch:

```
python import torch import torch.nn as nn import torch.optim as optim
import torch.distributions as distributions

# Define the environment model class EnvironmentModel(nn.Module): def
__init__(self): super(EnvironmentModel, self).__init__() self.fc1 =
nn.Linear(4, 64) self.fc2 = nn.Linear(64, 64) self.fc3 = nn.Linear(64, 1)

def forward(self, state): x = F.relu(self.fc1(state)) x = F.relu(self.fc2(x)) x =
self.fc3(x) return x

# Define the RL agent class RLAgent(nn.Module): def __init__(self):
super(RLAgent, self).__init__() self.fc1 = nn.Linear(4, 64) self.fc2 =
nn.Linear(64, 64) self.fc3 = nn.Linear(64, 1)

def forward(self, state): x = F.relu(self.fc1(state)) x = F.relu(self.fc2(x)) x =
self.fc3(x) return x

# Define the training loop def train(env, agent, model, optimizer,
num_episodes): for episode in range(num_episodes): # Reset the
environment state = env.reset()

# Loop until the episode is finished while True: # Get the agent's action
action = agent(state)

# Take the action and observe the reward and next state next_state,
reward, done, _ = env.step(action)

# Update the model loss = F.mse_loss(model(state),reward)
optimizer.zero_grad() loss.backward() optimizer.step()
```

# Update the state state = next_state

# Check if the episode is finished if done: break

# Create the environment env = gym.make('CartPole-v0')

# Create the agent agent = RLAgent()

# Create the model model = EnvironmentModel()

# Create the optimizer optimizer = optim.Adam(model.parameters())

# Train the model train(env, agent, model, optimizer, 1000)

Model-free reinforcement learning

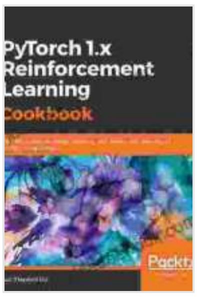
Model-free reinforcement learning is a type of RL that does not use a model of the environment. Instead, it learns directly from experience.

PyTorch provides a number of tools that make it easy to build and train model-free RL models. These tools include:

- The `torch.nn` module provides a number of neural network building blocks that can be used to build RL models.
- The `torch.optim` module provides a number of optimization algorithms that can be used to train models.
- The `torch.distributions` module provides a number of probability distributions that can be used to model the uncertainty in the environment.

The following code shows how to build a simple model-free RL model with PyTorch:

```
python import torch import torch.nn as nn import torch.optim as optim import torch.distributions as distributions

# Define the RL agent class RLAgent(nn.Module): def __init__(self): super(RLAgent, self).__init__() self.fc1 = nn.Linear(4, 64) self.fc2 = nn.Linear(64, 64) self.fc3 = nn.Linear(64, 1)

def forward(self, state): x = F.relu(self.fc1(state)) x = F.relu(self.fc2(x)) x = self.fc3(x) return x

# Define the training loop def train(env, agent, optimizer, num_episodes): for episode in range(num_episodes): # Reset the environment state = env.reset()

# Loop until the episode is finished while True: # Get the agent's action action = agent(state)

# Take the action and observe the reward and next state
```



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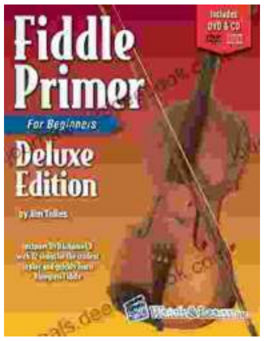

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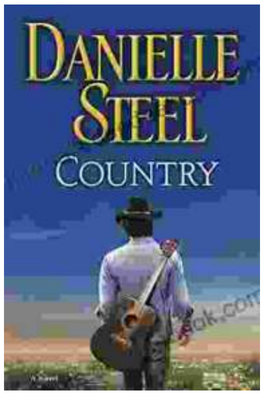

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