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In [1]:
```
import numpy as np
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras import layers
```

```
C:\Users\anike\anaconda3\lib\site-packages\scipy\__init__.py:146: UserWarning: A NumPy version >=1.16.5 and <1.23.0 is required
for this version of SciPy (detected version 1.26.2
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
```

```
WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\losses.py:2976: The name tf.losses.sparse_softmax_
cross_entropy is deprecated. Please use tf.compat.v1.losses.sparse_softmax_cross_entropy instead.
```

In [2]:
```
# Generate random data
np.random.seed(0)
x_train = np.random.rand(1000, 1)
y_train = 3 * x_train + 2 + 0.1 * np.random.randn(1000, 1)
```

In [3]:
```
# Define a simple neural network model
def build_model():
    model = keras.Sequential([
        layers.Dense(10, activation='relu', input_shape=(1,)),
        layers.Dense(1)
    ])
    return model
```

In [4]:
```
# Compile function to build and compile the model with specified optimizer
```

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Run Code

In [4]:
```
# Compile function to build and compile the model with specified optimizer
def compile_and_train_model(optimizer):
    model = build_model()
    model.compile(optimizer=optimizer, loss='mse')
    history = model.fit(x_train, y_train, epochs=50, verbose=0)
    return history.history['loss']
```

In [5]:
```
# List of optimization algorithms to experiment with
optimizers = ['sgd', 'adam', 'rmsprop', 'adagrad']
```

In [6]:
```
# Dictionary to store loss history for each optimizer
loss_history = {}
```

In [7]:
```
# Train the model with each optimizer
for optimizer_name in optimizers:
    print(f"Training model with {optimizer_name} optimizer...")
    loss_history[optimizer_name] = compile_and_train_model(optimizer_name)
    print(f"Training with {optimizer_name} optimizer completed.")
```

```
Training model with sgd optimizer...
WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\backend.py:873: The name tf.get_default_graph is d
eprecated. Please use tf.compat.v1.get_default_graph instead.

WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\optimizers\__init__.py:309: The name tf.train.Opti
mizer is deprecated. Please use tf.compat.v1.train.Optimizer instead.
```

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Run Code

In [5]:
```
# List of optimization algorithms to experiment with
optimizers = ['sgd', 'adam', 'rmsprop', 'adagrad']
```

In [6]:
```
# Dictionary to store loss history for each optimizer
loss_history = {}
```

In [7]:
```
# Train the model with each optimizer
for optimizer_name in optimizers:
    print(f"Training model with {optimizer_name} optimizer...")
    loss_history[optimizer_name] = compile_and_train_model(optimizer_name)
    print(f"Training with {optimizer_name} optimizer completed.")
```

```
Training model with sgd optimizer...
WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\backend.py:873: The name tf.get_default_graph is d
eprecated. Please use tf.compat.v1.get_default_graph instead.

WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\optimizers\__init__.py:309: The name tf.train.Opti
mizer is deprecated. Please use tf.compat.v1.train.Optimizer instead.

WARNING:tensorflow:From C:\Users\anike\anaconda3\lib\site-packages\keras\src\utils\tf_utils.py:492: The name tf.ragged.RaggedTe
nsorValue is deprecated. Please use tf.compat.v1.ragged.RaggedTensorValue instead.

Training with sgd optimizer completed.
Training model with adam optimizer...
Training with adam optimizer completed.
Training model with rmsprop optimizer...
Training with rmsprop optimizer completed.
Training model with adagrad optimizer...
Training with adagrad optimizer completed.
```

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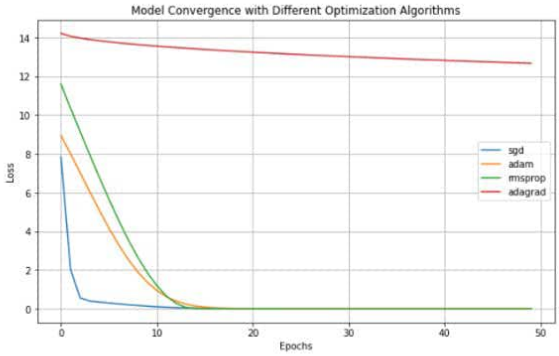
```
Training with rmsprop optimizer completed.
Training model with adagrad optimizer...
Training with adagrad optimizer completed.
```

In [8]:
```
# Plot the loss history for each optimizer
import matplotlib.pyplot as plt

plt.figure(figsize=(10, 6))
for optimizer_name, losses in loss_history.items():
    plt.plot(losses, label=optimizer_name)
plt.title('Model Convergence with Different Optimization Algorithms')
plt.xlabel('Epochs')
plt.ylabel('Loss')
plt.legend()
plt.grid(True)
plt.show()
```



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