

ДОДАТОК А

Текст програмної реалізації використання Knowledge-Augmented NLP методів на основі PyTorch у поєднанні зі SpaCy

```
import torch
import torch.nn as nn
import torch.optim as optim
import spacy
from torch.utils.data import DataLoader, Dataset
from sklearn.model_selection import train_test_split
import pandas as pd
import numpy as np

# Завантаження моделі SpaCy
nlp = spacy.load("en_core_web_sm")

# Клас Dataset для роботи з PyTorch
class ReviewDataset(Dataset):
    def __init__(self, data):
        self.data = data

    def __len__(self):
        return len(self.data)

    def __getitem__(self, idx):
        item = self.data.iloc[idx]
        text, label = item["text"], item["label"]
        tokens = self.tokenize(text)
        tokens = torch.tensor(tokens, dtype=torch.float32)
        return tokens, torch.tensor(label,
dtype=torch.long)

    @staticmethod
    def tokenize(text):
        doc = nlp(text)
```

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        return [token.vector for token in doc if not
token.is_stop and not token.is_punct]

```

```

# Клас моделі

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class TextClassifier(nn.Module):

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    def __init__(self, input_dim, hidden_dim, output_dim):

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        super(TextClassifier, self).__init__()

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```

        self.fc1 = nn.Linear(input_dim, hidden_dim)

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        self.relu = nn.ReLU()

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        self.fc2 = nn.Linear(hidden_dim, output_dim)

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        self.softmax = nn.Softmax(dim=1)

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```

    def forward(self, x):

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        x = self.fc1(x)

```

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        x = self.relu(x)

```

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        x = self.fc2(x)

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        x = self.softmax(x)

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```

        return x

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```

    def load_data(file_path):

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        return pd.read_csv(file_path)

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```

    def train_model(train_loader, model, criterion, optimizer,
num_epochs=10):

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        model.train()

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        for epoch in range(num_epochs):

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            for inputs, labels in train_loader:

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                inputs = torch.stack([torch.mean(input, dim=0)

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for input in inputs])

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                outputs = model(inputs)

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                loss = criterion(outputs, labels)

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                optimizer.zero_grad()

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```

                loss.backward()

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```

                optimizer.step()

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        print(f'Epoch [{epoch+1}/{num_epochs}],          Loss:
{loss.item():.4f}')

def evaluate_model(test_loader, model):
    model.eval()
    correct = 0
    total = 0

    with torch.no_grad():
        for inputs, labels in test_loader:
            inputs = torch.stack([torch.mean(input, dim=0)
for input in inputs])

            outputs = model(inputs)
            _, predicted = torch.max(outputs.data, 1)
            total += labels.size(0)
            correct += (predicted == labels).sum().item()

    print(f'Accuracy: {100 * correct / total}%')

def main():
    # Завантаження даних
    data = load_data('reviews.csv') # Зовнішній файл з
даними для навчання
    train_data, test_data = train_test_split(data,
test_size=0.2, random_state=42)

    # Підготовка даних
    train_dataset = ReviewDataset(train_data)
    test_dataset = ReviewDataset(test_data)

    train_loader = DataLoader(train_dataset, batch_size=2,
shuffle=True)
    test_loader = DataLoader(test_dataset, batch_size=2,
shuffle=False)

    # Параметри моделі

```

```
input_dim = 96 # Розмір векторного представлення SpaCy
hidden_dim = 50
output_dim = 2

model = TextClassifier(input_dim, hidden_dim,
output_dim)

# Визначення функції втрат та оптимізатора
criterion = nn.CrossEntropyLoss()
optimizer = optim.Adam(model.parameters(), lr=0.001)

# Навчання моделі
train_model(train_loader, model, criterion, optimizer)

# Оцінка моделі
evaluate_model(test_loader, model)

# Застосування моделі до нового тексту
new_data = load_data('new_reviews.csv') # Зовнішній
файл з текстами для аналізу
new_dataset = ReviewDataset(new_data)
new_loader = DataLoader(new_dataset, batch_size=1,
shuffle=False)

for inputs, _ in new_loader:
    inputs = torch.stack([torch.mean(input, dim=0) for
input in inputs])
    outputs = model(inputs)
    _, predicted = torch.max(outputs.data, 1)
    print(f'Predicted Label: {predicted.item()}')

if __name__ == "__main__":
    main()
```

ДОДАТОК Б

CSV-файл з даними з соціальних мереж для навчання моделі.

"The movie was fantastic and very entertaining.",1
"I hate this weather. It's so depressing.",0
"Great job on the presentation! Very well done.",1
"This food is terrible, I will never eat here again.",0
"I had a wonderful time with my family at the park.",1
"The product broke after one use. Waste of money.",0
"Absolutely delighted with the customer support.",1
"The experience was awful and I regret coming here.",0
"This game is so much fun! Highly recommend it.",1
"The staff was rude and unhelpful. Never coming back.",0
"I am very happy with my new purchase.",1
"This place is disgusting. Horrible hygiene.",0
"Loved the concert last night! The band was great.",1
"The hotel was dirty and the service was terrible.",0
"I can't stop smiling after that amazing news.",1
"This app crashes all the time. So frustrating.",0
"The new update is fantastic and works perfectly.",1
"I am so disappointed with this product.",0
"Had a blast at the party! It was awesome.",1
"This website is full of bugs. Very annoying.",0
"The delivery was quick and the item is perfect.",1
"I will never use this service again. Terrible.",0
"Feeling great after the workout. So refreshing.",1
"This restaurant has the worst customer service.",0
"The book was inspiring and very well written.",1
"My flight was delayed for hours. Terrible experience.",0
"Had an amazing vacation with my friends.",1
"The car broke down on the first day. Horrible.",0
"Enjoyed the webinar today. Very informative.",1
"The software is outdated and not user-friendly.",0
"Great atmosphere at the event. Really enjoyed it.",1
"The product does not match the description.
Disappointed.",0

"Fantastic support from the team. Very helpful.",1
"The sound quality is poor. Not worth the price.",0
"Had a relaxing day at the spa. Loved it.",1
"This is the worst movie I have ever seen.",0
"The class was engaging and I learned a lot.",1
"The internet connection is very slow and unreliable.",0
"Impressed with the quick response from the support team.",1
"The food was cold and tasteless. Never again.",0
"Had a great weekend getaway with my partner.",1
"The package arrived damaged. Very disappointed.",0
"Wonderful performance by the orchestra. Truly magical.",1
"This gadget stopped working after a week.",0
"I am thrilled with the results. Exceeded my expectations.",1
"The customer service is terrible. Unacceptable.",0
"Fantastic app with lots of useful features.",1
"This place is a scam. Don't waste your money.",0
"Feeling rejuvenated after the yoga session.",1
"The movie was a complete waste of time.",0
"Great value for money. Very satisfied.",1
"The service was slow and unprofessional.",0
"Enjoyed every moment of the trip. Amazing experience.",1
"The product was defective. Had to return it.",0
"Best concert I've been to in years.",1
"The service at the restaurant was below average.",0
"Had a lovely evening with friends.",1
"The bed was uncomfortable and I couldn't sleep.",0
"The training session was very productive.",1
"The coffee machine stopped working after a month.",0
"Great customer experience. Very pleased.",1
"The washing machine is very noisy and inefficient.",0
"Feeling very happy with the purchase.",1
"The event was poorly organized. Disappointing.",0
"Had a wonderful time at the beach.",1
"The quality of the clothes is very low.",0
"Fantastic weather today. Feeling great.",1

"The software keeps crashing. Very frustrating.",0
"Enjoyed the workshop. Very informative.",1
"The shoes are very uncomfortable.",0
"Great service and friendly staff.",1
"The phone's battery drains very quickly.",0
"Feeling excited about the new project.",1
"The room was dirty and smelled bad.",0
"Excellent performance by the cast.",1
"The laptop is slow and lags a lot.",0
"Had a fun time at the amusement park.",1
"The customer support is useless.",0
"Lovely decor and friendly atmosphere.",1
"The TV screen has dead pixels.",0
"Had an awesome workout at the gym.",1
"The game is boring and repetitive.",0
"Feeling accomplished after finishing the task.",1
"The product arrived late and was damaged.",0
"Great feedback from the team. Very encouraging.",1
"The keyboard stopped working after a week.",0
"Enjoyed the live music at the bar.",1
"The food was overpriced and bland.",0
"Fantastic journey with lots of memories.",1
"The heater is not working properly.",0
"Had a great discussion with my mentor.",1
"The watch stopped working after a month.",0
"Feeling grateful for all the support.",1
"The chair is uncomfortable and squeaky.",0
"I love the new features in the app.",1
"The internet service is horrible.",0
"Had a wonderful birthday celebration.",1
"The package never arrived. Very upset.",0
"This camera takes amazing photos!",1
"The noise from the construction is unbearable.",0
"Feeling very motivated after the seminar.",1
"The customer service did not help at all.",0
"Great taste and flavor. Will buy again.",1

"The device overheats very quickly.",0
"Enjoyed the new episode of my favorite show.",1
"The service was very poor. Very disappointed.",0
"Had a great time at the festival.",1
"The product is faulty and does not work.",0
"Feeling blessed and happy today.",1
"The food delivery was very late.",0
"The vacation was perfect. Loved it.",1
"The phone screen cracked easily.",0
"Had a fantastic time at the concert.",1
"The software has too many bugs.",0
"The service at the salon was excellent.",1
"The hotel room was very dirty.",0
"The new menu is delicious and diverse.",1
"The product stopped working after a month.",0
"Had an amazing workout at the gym.",1
"The restaurant's food was tasteless.",0
"Feeling relaxed after the spa session.",1
"The app is very slow and unresponsive.",0
"Enjoyed the performance at the theater.",1
"The support team was very unhelpful.",0
"The new collection is very stylish.",1
"The washing machine is very noisy.",0
"The coffee at this cafe is excellent.",1
"The internet connection is very slow.",0
"Had a blast at the amusement park.",1
"The car broke down after a week.",0
"The music at the party was fantastic.",1
"The service at the store was very poor.",0
"The book was very inspiring.",1
"The phone's battery life is terrible.",0
"Had a great time with friends.",1
"The product quality is very poor.",0
"Feeling very optimistic about the future.",1
"The delivery service is very unreliable.",0
"The event was very well organized.",1

"The food at the restaurant was terrible.",0
"Had an awesome time at the beach.",1
"The software keeps crashing.",0
"Feeling very productive today.",1
"The product arrived damaged.",0
"The class was very interesting.",1
"The movie was very boring.",0
"The new features are very useful.",1
"The customer support is awful.",0
"Feeling very energetic after the run.",1
"The laptop is very slow.",0
"Had a wonderful dinner with family.",1
"The service at the hotel was bad.",0
"The course was very informative.",1
"The product stopped working.",0
"Feeling very grateful today.",1
"The internet speed is terrible.",0
"Had a great time at the concert.",1
"The package arrived late.",0
"Feeling very happy today.",1
"The phone is not working.",0
"Had a wonderful day out.",1
"The service is terrible.",0
"The new app update is great.",1
"The product is defective.",0
"Feeling very content today.",1
"The support team is useless.",0
"The new book is fantastic.",1
"The delivery was very slow.",0
"Feeling very excited today.",1
"The website is not working.",0
"Had a great workout today.",1
"The food was very bad.",0
"Feeling very refreshed today.",1
"The product broke quickly.",0
"Had an amazing day out.",1

"The service was horrible.",0
"The new features are great.",1
"The device is malfunctioning.",0
"Feeling very happy today.",1
"The app is very buggy.",0
"Had a great time today.",1
"The product is faulty.",0
"Feeling very relaxed today.",1
"The phone is broken.",0
"Had a wonderful time.",1
"The service was bad.",0
"Feeling very good today.",1
"The product is defective.",0
"Had an amazing experience.",1
"The delivery was late.",0
"Feeling very joyful today.",1
"The phone is not charging.",0
"Had a fantastic day.",1

ДОДАТОК В

CSV-файл записами для навчання моделі фільтрації спаму.

"Congratulations! You've won a \$1,000 Walmart gift card. Click here to claim your prize.",1
"Hey, how are you? Just wanted to check in.",0
"Please confirm your subscription by clicking this link.",1
"Can we schedule a meeting for tomorrow?",0
"Your account has been temporarily suspended. Please update your information.",1
"Happy Birthday! Hope you have a great day!",0
"Urgent! Your account has been compromised. Verify your identity now.",1
"Looking forward to our lunch date next week.",0
"Get cheap meds online without a prescription.",1
"Just checking to see if you received my last email.",0
"You've been selected to win a brand new car. Click here to enter.",1
"Are you coming to the meeting later today?",0
"Earn money from home with this simple trick.",1
"Thanks for the help with the project.",0
"Claim your free trial of our new software today.",1
"Can you send me the report by EOD?",0
"Win an all-expenses-paid vacation. Click here.",1
"Looking forward to seeing you at the event.",0
"Act now! Limited time offer on life insurance.",1
"Let's catch up over coffee sometime.",0
"You've won a free cruise! Call now to claim.",1
"Are you available for a call this afternoon?",0
"Special promotion: Buy one, get one free.",1
"Please review the attached document.",0
"Free entry to our exclusive giveaway. Sign up now.",1
"Thank you for your feedback.",0
"Receive a free gift with your purchase.",1
"Can we reschedule our meeting to next week?",0

"Exclusive offer for valued customers. Click to learn more.",1

"Don't forget about our team meeting tomorrow.",0

"Lowest prices on electronics. Shop now.",1

"Hope you're doing well!",0

"Get a free quote for home insurance.",1

"Let's discuss the proposal in our next meeting.",0

"Congratulations! You've been pre-approved for a loan.",1

"Do you have any updates on the project?",0

"Save big on your next purchase. Limited time offer.",1

"Can we move our meeting to Thursday?",0

"Get your free credit score report today.",1

"Looking forward to your presentation.",0

"Claim your free sample of our new product.",1

"Can you review the attached file?",0

"Special offer: 50% off on all items. Shop now.",1

"Thank you for your prompt response.",0

"Win a \$500 gift card. Enter now.",1

"Are you free for a call tomorrow?",0

"Unlock exclusive discounts with our membership.",1

"Let's touch base on the project status.",0

"Click here to claim your free gift.",1

"Thank you for attending the meeting.",0

"Special deal: Buy now and save 20%",1

"Can we have a quick call later today?",0

"Limited time offer: Subscribe now and save.",1

"Looking forward to our meeting next week.",0

"Get a free trial of our premium service.",1

"Thanks for the update on the project.",0

"Win a free iPhone. Enter today.",1

"Are you available for a meeting tomorrow?",0

"Special promotion: Save on your next order.",1

"Can you please send me the latest report?",0

"Claim your exclusive discount now.",1

"Thank you for your cooperation.",0

"Get a free sample with every order.",1

"Let's meet to discuss the project details.",0
"Exclusive offer: Buy one, get one free.",1
"Just checking in to see how things are going.",0
"Win big with our latest contest. Click here to enter.",1
"Can you join the meeting later today?",0
"Limited time offer: Buy now and save.",1
"Thanks for your help with the presentation.",0
"Special offer: Free shipping on all orders.",1
"Are you available for a quick call?",0
"Get a free trial of our new service.",1
"Looking forward to your feedback.",0
"Win a \$1,000 shopping spree. Enter now.",1
"Can we discuss the project over a call?",0
"Claim your free gift with purchase.",1
"Thank you for your attention to this matter.",0
"Special promotion: Save 30% on your next order.",1
"Can you please review the attached document?",0
"Unlock special discounts with our membership.",1
"Thanks for the update.",0
"Win a trip to Hawaii. Click here to enter.",1
"Are you free for a meeting tomorrow?",0
"Special deal: Save on your next purchase.",1
"Can you send me the latest version of the report?",0
"Claim your exclusive offer today.",1
"Thank you for your assistance.",0
"Get a free gift with every purchase.",1
"Let's schedule a call to discuss the project.",0
"Exclusive offer: Save 20% on your next order.",1
"Just wanted to follow up on our last meeting.",0
"Win a \$500 Amazon gift card. Enter now.",1
"Are you available for a quick call tomorrow?",0
"Special offer: Free shipping on orders over \$50.",1
"Can you join the call later today?",0
"Claim your free trial of our premium service.",1
"Thanks for the quick response.",0
"Win a brand new car. Enter today.",1

"Can we schedule a meeting for next week?",0
"Special promotion: Buy now and save.",1
"Please find the attached document for your review.",0
"Get a free quote for car insurance.",1
"Looking forward to our call later today.",0
"Claim your free sample of our latest product.",1
"Thank you for your feedback on the project.",0
"Special offer: Save 50% on your next purchase.",1
"Can you please send me the updated report?",0
"Unlock exclusive benefits with our premium membership.",1
"Thanks for your help.",0
"Win a free vacation. Enter now.",1
"Are you available for a call later today?",0
"Special deal: Buy one, get one free.",1
"Can you please review the attached file?",0
"Claim your exclusive discount now.",1
"Thank you for your cooperation with the project.",0
"Get a free sample with your next order.",1
"Let's meet to discuss the project updates.",0
"Exclusive offer: Save on your next order.",1
"Just wanted to check in and see how you're doing.",0
"Win big with our latest giveaway. Click here to enter.",1
"Can you join the call tomorrow?",0
"Limited time offer: Buy now and save 20%.",1
"Thanks for your assistance with the presentation.",0
"Special promotion: Free shipping on all orders over \$100.",1
"Are you available for a quick chat?",0
"Get a free trial of our new premium service.",1
"Looking forward to your thoughts on this.",0
"Win a \$1,000 gift card. Enter today.",1
"Can we discuss the project over the phone?",0
"Claim your free gift with every purchase.",1
"Thank you for your attention.",0
"Special offer: Save 25% on your next order.",1

"Can you please review the attached document for feedback?",0

"Unlock special offers with our premium membership.",1

"Thanks for your prompt response.",0

"Win a trip to Europe. Click here to enter.",1

"Are you available for a meeting later today?",0

"Special deal: Save on your next purchase.",1

"Can you send me the updated version of the report?",0

"Claim your exclusive offer today.",1

"Thank you for your assistance with the project.",0

"Get a free gift with your order.",1

"Let's schedule a call to discuss the project updates.",0

"Exclusive offer: Save 20% on your next purchase.",1

"Just wanted to follow up on our last call.",0

"Win a \$500 Visa gift card. Enter now.",1

"Are you available for a quick call tomorrow?",0

"Special offer: Free shipping on orders over \$75.",1

"Can you join the call later today?",0

"Claim your free trial of our premium service today.",1

"Thanks for your quick response.",0

"Win a brand new laptop. Enter today.",1

"Can we schedule a meeting for next week?",0

"Special promotion: Buy now and save 25%",1

"Please find the attached document for your review and feedback.",0

"Get a free quote for life insurance.",1

"Looking forward to our call tomorrow.",0

"Claim your free sample of our latest product today.",1

"Thank you for your feedback on the project update.",0

"Special offer: Save 30% on your next purchase.",1

"Can you please send me the updated report by EOD?",0

"Unlock exclusive benefits with our premium membership today.",1

"Thanks for your help with the presentation.",0

