Java code refactoring with or without ChatGPT

This research aims to understand how ChatGPT can assist experienced Java programmers in improving their code refactoring skills. We will analyze code examples to see how developers use ChatGPT's suggestions and guidance to enhance their code refactoring process.

Dear Participants,

We are thrilled to have you join our research on the use of ChatGPT in enhancing code refactoring techniques for Java programmers. Your insights and experiences are invaluable to us as we explore how this AI tool can assist experts like you in refining their coding skills.

This survey is designed to gather your thoughts, suggestions, and feedback as you work with ChatGPT. Your contributions will help us gain a deeper understanding of how developers can leverage this technology to optimize their code refactoring process.

Thank you for your participation, and we look forward to learning from your experiences. Please proceed with the survey, and don't hesitate to reach out if you have any questions or need further assistance.

There are 31 questions in this survey.

Survey questionnaires (Part 1)

We will employ a survey with open-ended questions to gather valuable insights on participants' experiences with ChatGPT in code refactoring, aiming to uncover their perspectives, challenges faced, and successes achieved. This qualitative approach will enable us to delve deeper into the nuanced aspects of their interactions, providing rich data for a comprehensive understanding of how ChatGPT is utilized and perceived in the context of code refactoring.

How old are you? *

Only numbers may be entered in this field.
Please write your answer here:

-

How many years of experience do you have with Java programming? *

Only numbers may be entered in this field.
Please write your answer here:

-

For how many years have you been programming for larger software projects e.g. in a company? Please enter a number between 0 and 30. *

Only numbers may be entered in this field.
Please write your answer here:

-

How many years of experience do you have with code refactoring? *

Only numbers may be entered in this field.
Please write your answer here:

-

Did you study programming or computer science at a university? *

Please choose **only one** of the following:

- Yes
- No

During your education, how many courses did you take where Java was the primary language? *

Only numbers may be entered in this field.
Please write your answer here:

-

On a scale from 1 to 5, how would you rate your Java programming expertise (e.g 1-very inexperienced, 5-very experienced)? *

Please choose **only one** of the following:

- 1
- 2
- 3
- 4
- 5

How would you compare your Java expertise to those with over 20 years of practical experience (e.g 1-very inexperienced, 5-very experienced)?

*

Please choose **only one** of the following:

- 1
- 2
- 3
- 4
- 5

How would you rate your Java expertise in comparison to your peers or colleagues (e.g 1-very inexperienced, 5-very experienced)?

*

Please choose **only one** of the following:

- 1
- 2
- 3
- 4
- 5

How often have you used Chat GPT (e.g 1-low, 5-high)?

*

Please choose **only one** of the following:

- 1
- 2
- 3
- 4
- 5

Have you used ChatGPT for code refactoring tasks (e.g 1-low, 5-high)? *

Please choose **only one** of the following:

- 1
- 2
- 3
- 4
- 5

What is the average size of Java professional projects you typically work on, categorized as small-scale (up to 900 lines of code), medium-scale (900 to 40,000 lines of code), or large-scale (exceeding 40,000 lines of code)? *

Please write your answer here:

Task Explanation

Your expertise is crucial for advancing our understanding of code improvement practices. In this survey, you will be working on five Java code snippets in two sections, each presenting an opportunity for refinement.

Tasks Overview:

In each of the two sections, you will encounter five Java code snippets that require refactoring. The first five snippets must be refactored without assistance from ChatGPT, while the last five snippets can be refactored with the aid of ChatGPT. Primarily, you have two alternatives:

1. **Without Assistance: Refactor the code on your own, relying on your existing knowledge and skills.**
2. **With ChatGPT Assistance: Utilize the assistance of ChatGPT to receive suggestions and guidance for refactoring the code.**

Timing:

Each assignment must be completed within a strict time constraint of 3 minutes. You must complete the work within a 3-minute timeframe, otherwise, timeouts will occur. Efficiently allocate your time to ensure timely completion of all jobs.

Instructions:

1. **Read the code: Begin by thoroughly understanding the provided Java code snippet.**
2. **Refactor: Apply your refactoring skills to improve the code based on the given criteria (readability, efficiency, maintainability, etc.).**

Question 1 for Pretest (Part 2)

In the course of this study,you will engage in a code refactoring task wherein they are required to perform the task independently, without leveraging the assistance of ChatGPT or any other AI tools. You will receive five concise code snippets that necessitate refactoring, and they are expected to complete the task within a specified time limit.

Refactor the below code snippet without ChatGPT within 3 minutes.

```
public double getPayAmount() {
  double result;
  if (isDead) {
    result = deadAmount();
  } else {
    if (isSeparated) {
      result = separatedAmount();
    } else {
      if (isRetired) {
        result = retiredAmount();
```

```
      } else {
        result = normalPayAmount();
      }
    }
  }
  return result;
}
```

Please write your answer here:

Question 2

Refactor the below code snippet without ChatGPT within 3 minutes.

```
public class Customer {
    private String name;
    private String address;
    private double balance;

    public Customer(String name, String address) {
        this.name = name;
        this.address = address;
        this.balance = 0;
    }

    public void deposit(double amount) {

        this.balance += amount;
    }

    public void withdraw(double amount) {
        this.balance -= amount;
    }

    public double getBalance() {
        return balance;
    }

  }
```

Please write your answer here:

Question 3

Refactor the below code snippet without ChatGPT within 3 minutes.

```
public class Customer {
    private String name;
    private String address;
    private double balance;

    public Customer(String name, String address, double initialBalance) {
        this.name = name;
        this.address = address;
        this.balance = initialBalance;
    }

    public void processPayment(double amount) {
        if (amount > balance) {
            throw new InsufficientFundsException();
        }
        balance -= amount;
    }

    public void printStatement() {
        System.out.println("Customer name: " + name);
        System.out.println("Customer address: " + address);
        System.out.println("Customer balance: " + balance);
    }
}
```

Please write your answer here:

Question 4

Refactor the below code snippet without ChatGPT within 3 minutes.

```
public class ShippingService {
    public double calculateShippingCost(Order order) {
        double totalPrice = order.getTotalPrice();
        double weight = order.getWeight();

        if (totalPrice > 100) {
            if (weight > 10) {

                return totalPrice * 0.2;
            } else {

                return totalPrice * 0.05;
            }
        } else {

            return 0;
        }
    }
}
```

Please write your answer here:

Question 5

Refactor the below code snippet without ChatGPT within 3 minutes.

```
import java.util.concurrent.atomic.AtomicInteger;

public class Order {
    private String customerName;
    private String productName;
    private double price;
    private int orderId;

    private static final AtomicInteger orderIdGenerator = new AtomicInteger(1000);

    public Order(String customerName, String productName, double price) {
        this.customerName = customerName;
        this.productName = productName;
        this.price = price;
        this.orderId = orderIdGenerator.incrementAndGet();
    }

    public String toString() {
        String nameAndPrice = customerName + "," + String.valueOf(price);
        return nameAndPrice + "," + orderId;
    }
}
```

Please write your answer here:

Question 1 for Posttest (Part 3)

In the course of this study,you will engage in a code refactoring task wherein they are required to perform the task with of ChatGPT. You will receive five concise code snippets that necessitate refactoring, and they are expected to complete the task within a specified time limit.

Refactor the below code snippet with ChatGPT within 3 minutes.

```
public double getPayAmount() {
  double result;
  if (isDead) {
    result = deadAmount();
  } else {
    if (isSeparated) {
      result = separatedAmount();
    } else {
      if (isRetired) {
        result = retiredAmount();
```

```
      } else {
        result = normalPayAmount();
      }
    }
  }
  return result;
}
```

Please write your answer here:

Question 2

Refactor the below code snippet with ChatGPT within 3 minutes.

```
public class Customer {
    private String name;
    private String address;
    private double balance;

    public Customer(String name, String address) {
        this.name = name;
        this.address = address;
        this.balance = 0;
    }

    public void deposit(double amount) {

        this.balance += amount;
    }

    public void withdraw(double amount) {
        this.balance -= amount;
    }

    public double getBalance() {
        return balance;
    }

  }
```

Please write your answer here:

Question 3

Refactor the below code snippet with ChatGPT within 3 minutes.

```
public class Customer {
    private String name;
    private String address;
    private double balance;

    public Customer(String name, String address, double initialBalance) {
        this.name = name;
        this.address = address;
        this.balance = initialBalance;
    }

    public void processPayment(double amount) {
        if (amount > balance) {
            throw new InsufficientFundsException();
        }
        balance -= amount;
    }

    public void printStatement() {
        System.out.println("Customer name: " + name);
        System.out.println("Customer address: " + address);
        System.out.println("Customer balance: " + balance);
    }
}
```

Please write your answer here:

Question 4

Refactor the below code snippet with ChatGPT within 3 minutes.

```
public class ShippingService {
    public double calculateShippingCost(Order order) {
        double totalPrice = order.getTotalPrice();
        double weight = order.getWeight();

        if (totalPrice > 100) {
            if (weight > 10) {

                return totalPrice * 0.2;
            } else {

                return totalPrice * 0.05;
            }
        } else {

            return 0;
        }
    }
}
```

Please write your answer here:

Question 5

Refactor the below code snippet with ChatGPT within 3 minutes.

```
import java.util.concurrent.atomic.AtomicInteger;

public class Order {
    private String customerName;
    private String productName;
    private double price;
    private int orderId;

    private static final AtomicInteger orderIdGenerator = new AtomicInteger(1000);

    public Order(String customerName, String productName, double price) {
        this.customerName = customerName;
        this.productName = productName;
        this.price = price;
        this.orderId = orderIdGenerator.incrementAndGet();
    }

    public String toString() {
        String nameAndPrice = customerName + "," + String.valueOf(price);
        return nameAndPrice + "," + orderId;
    }
}
```

Please write your answer here:

Interview Question (Part 4)

The answers to the interview questions will aid us in ensuring precise transcription and analysis of the responses. This, in turn, will enable a thorough examination of the provided information, establishing a dependable resource for future reference and research purposes.

Can you share your experiences using ChatGPT for code refactoring? What were the specific benefits or advantages you observed during the process?

Please write your answer here:

In what ways did ChatGPT enhance your productivity and efficiency in completing code

refactoring tasks? Please provide specific examples.

Please write your answer here:

Did ChatGPT help you discover new refactoring techniques or approaches that you were previously unaware of? If yes, please elaborate on these insights.

Please write your answer here:

How did ChatGPT contribute to the maintainability and readability of the code you produced during refactoring? Were there any notable improvements or challenges in this aspect?

Please write your answer here:

Were there any specific challenges or limitations you encountered while using ChatGPT for code refactoring? How did you overcome them, if at all?

Please write your answer here:

In what scenarios do you believe AI assistance, like ChatGPT, is most beneficial for code refactoring? Conversely, are there situations where you think it might be less effective or not suitable at all?

Please write your answer here:

How does ChatGPT's performance vary depending on the complexity of the code?

Please write your answer here:

Would you recommend ChatGPT to other Java programmers?

Please write your answer here:

Your contributions will make a meaningful impact, and we appreciate your time and effort in completing this survey. If you have any additional comments or suggestions, please feel free to share them with us. Thank you once again for your participation and collaboration.

Submit your survey.
Thank you for completing this survey.