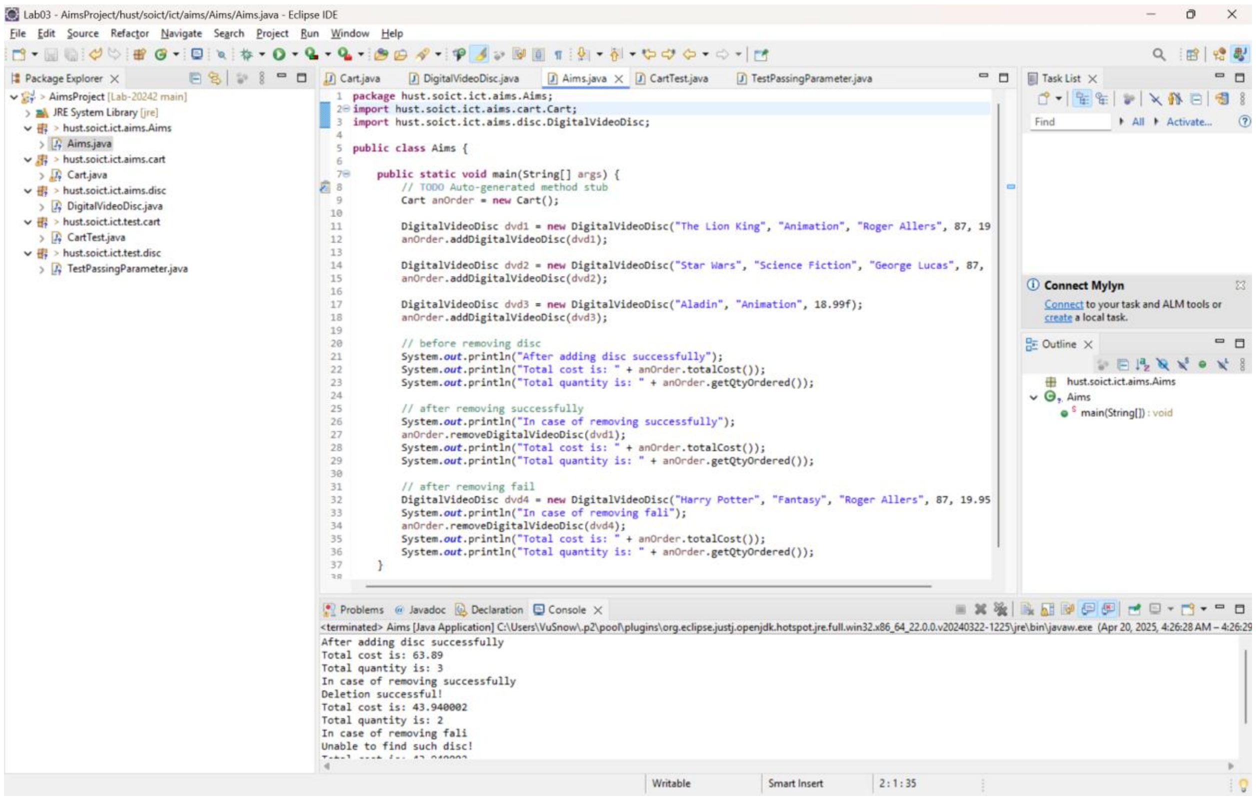
LAB 3 – Vũ Minh Dũng 20205179

Contents

1. Re-organize the project



Lab03 - AimsProject/hust/soict/ict/aims/Aims/Aims.java - Eclipse IDE

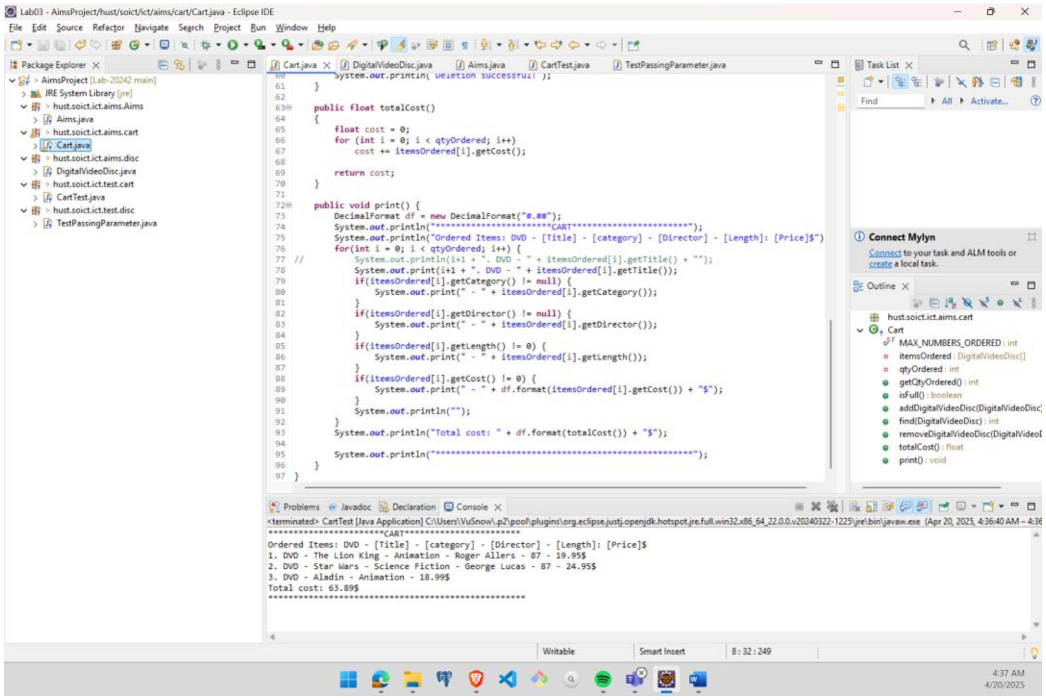
```
AimsProject [Lab-20242 main]
  JRE System Library [jre]
  hust.soict.ict.aims.Aims
    Aims.java
  hust.soict.ict.aims.cart
    Cart.java
  hust.soict.ict.aims.disc
    DigitalVideoDisc.java
  hust.soict.ict.test.cart
    CartTest.java
  hust.soict.ict.test.disc
    TestPassingParameter.java
```

```java
package hust.soict.ict.aims.Aims;
import hust.soict.ict.aims.cart.Cart;
import hust.soict.ict.aims.disc.DigitalVideoDisc;

public class Aims {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Cart anOrder = new Cart();

        DigitalVideoDisc dvd1 = new DigitalVideoDisc("The Lion King", "Animation", "Roger Allers", 87, 19
        anOrder.addDigitalVideoDisc(dvd1);

        DigitalVideoDisc dvd2 = new DigitalVideoDisc("Star Wars", "Science Fiction", "George Lucas", 87,
        anOrder.addDigitalVideoDisc(dvd2);

        DigitalVideoDisc dvd3 = new DigitalVideoDisc("Aladin", "Animation", 18.99f);
        anOrder.addDigitalVideoDisc(dvd3);

        // before removing disc
        System.out.println("After adding disc successfully");
        System.out.println("Total cost is: " + anOrder.totalCost());
        System.out.println("Total quantity is: " + anOrder.getQtyOrdered());

        // after removing successfully
        System.out.println("In case of removing successfully");
        anOrder.removeDigitalVideoDisc(dvd1);
        System.out.println("Total cost is: " + anOrder.totalCost());
        System.out.println("Total quantity is: " + anOrder.getQtyOrdered());

        // after removing fail
        DigitalVideoDisc dvd4 = new DigitalVideoDisc("Harry Potter", "Fantasy", "Roger Allers", 87, 19.95
        System.out.println("In case of removing fali");
        anOrder.removeDigitalVideoDisc(dvd4);
        System.out.println("Total cost is: " + anOrder.totalCost());
        System.out.println("Total quantity is: " + anOrder.getQtyOrdered());
    }
```

```
<terminated> Aims [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:26:28 AM – 4:26:29
After adding disc successfully
Total cost is: 63.89
Total quantity is: 3
In case of removing successfully
Deletion successful!
Total cost is: 43.940002
Total quantity is: 2
In case of removing fali
Unable to find such disc!
```

- After re-organizing, the structure of the project like the above image

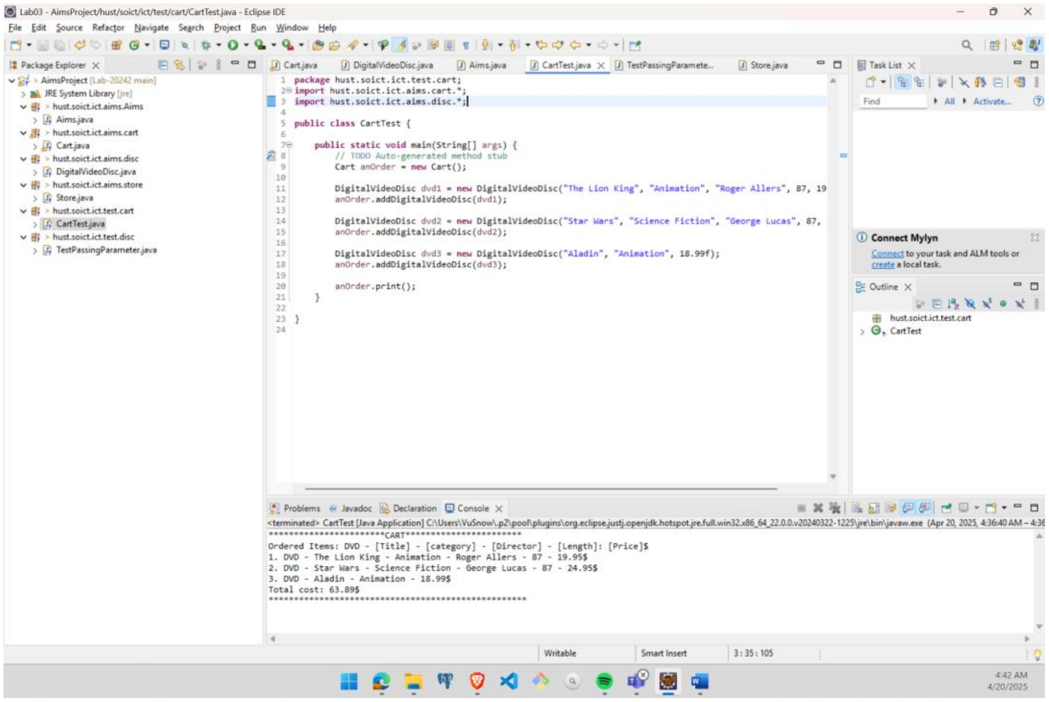
2. Update the Cart class and CartTest class



```java
        System.out.println("Deletion successful!");
    }

    public float totalCost()
    {
        float cost = 0;
        for (int i = 0; i < qtyOrdered; i++)
            cost += itemsOrdered[i].getCost();

        return cost;
    }

    public void print() {
        DecimalFormat df = new DecimalFormat("#.##");
        System.out.println("**********************CART**********************");
        System.out.println("Ordered Items: DVD - [Title] - [category] - [Director] - [Length]: [Price]$")
        for(int i = 0; i < qtyOrdered; i++) {
//          System.out.println(i+1 + ". DVD - " + itemsOrdered[i].getTitle() + "");
            System.out.print(i+1 + ". DVD - " + itemsOrdered[i].getTitle());
            if(itemsOrdered[i].getCategory() != null) {
                System.out.print(" - " + itemsOrdered[i].getCategory());
            }
            if(itemsOrdered[i].getDirector() != null) {
                System.out.print(" - " + itemsOrdered[i].getDirector());
            }
            if(itemsOrdered[i].getLength() != 0) {
                System.out.print(" - " + itemsOrdered[i].getLength());
            }
            if(itemsOrdered[i].getCost() != 0) {
                System.out.print(" - " + df.format(itemsOrdered[i].getCost()) + "$");
            }
            System.out.println("");
        }
        System.out.println("Total cost: " + df.format(totalCost()) + "$");

        System.out.println("**************************************************");
    }
}
```

```
<terminated> CartTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:36:40 AM – 4:36
**********************CART**********************
Ordered Items: DVD - [Title] - [category] - [Director] - [Length]: [Price]$
1. DVD - The Lion King - Animation - Roger Allers - 87 - 19.95$
2. DVD - Star Wars - Science Fiction - George Lucas - 87 - 24.95$
3. DVD - Aladin - Animation - 18.99$
Total cost: 63.89$
**************************************************
```

Figure 1: Cart class after updating

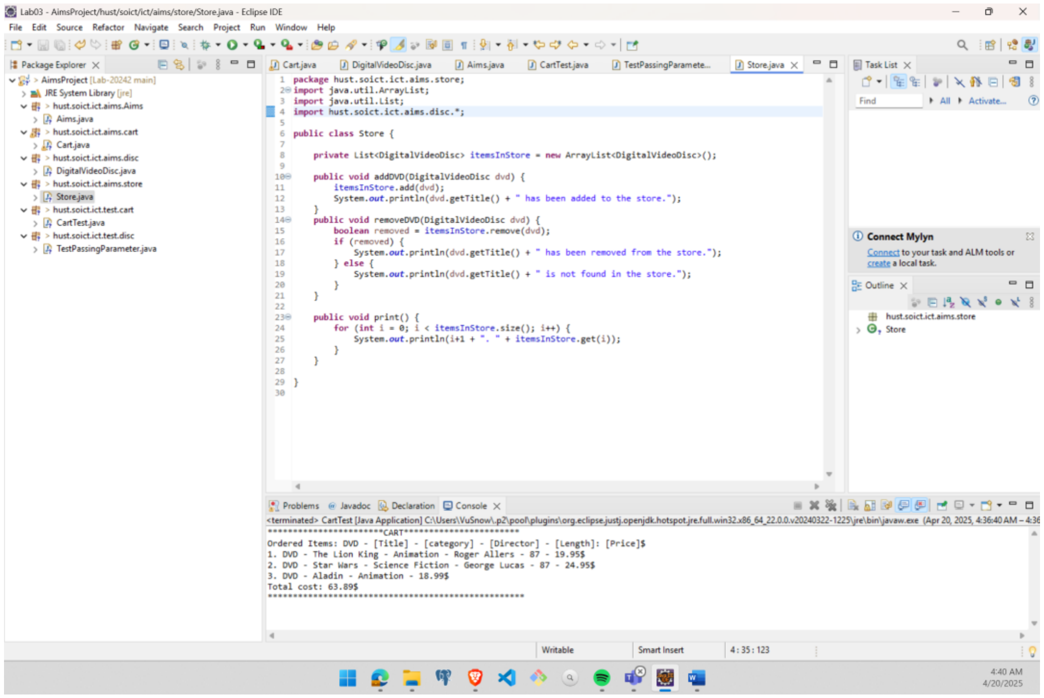


```java
package hust.soict.ict.test.cart;
import hust.soict.ict.aims.cart.*;
import hust.soict.ict.aims.disc.*;

public class CartTest {

    public static void main(String[] args) {
        // TODO Auto-generated method stub
        Cart anOrder = new Cart();

        DigitalVideoDisc dvd1 = new DigitalVideoDisc("The Lion King", "Animation", "Roger Allers", 87, 19
        anOrder.addDigitalVideoDisc(dvd1);

        DigitalVideoDisc dvd2 = new DigitalVideoDisc("Star Wars", "Science Fiction", "George Lucas", 87,
        anOrder.addDigitalVideoDisc(dvd2);

        DigitalVideoDisc dvd3 = new DigitalVideoDisc("Aladin", "Animation", 18.99f);
        anOrder.addDigitalVideoDisc(dvd3);

        anOrder.print();
    }

}
```

```
<terminated> CartTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:36:40 AM – 4:36
**********************CART**********************
Ordered Items: DVD - [Title] - [category] - [Director] - [Length]: [Price]$
1. DVD - The Lion King - Animation - Roger Allers - 87 - 19.95$
2. DVD - Star Wars - Science Fiction - George Lucas - 87 - 24.95$
3. DVD - Aladin - Animation - 18.99$
Total cost: 63.89$
**************************************************
```

Figure 2: CartTest class after updating and running

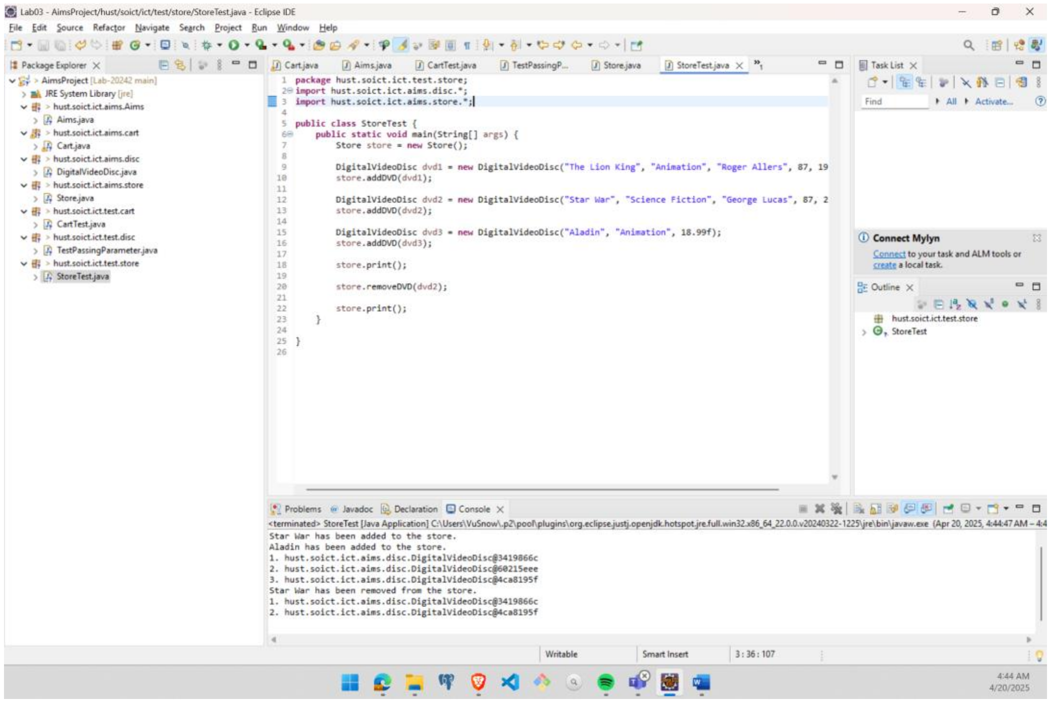
3. Implement the Store class



```java
package hust.soict.ict.aims.store;
import java.util.ArrayList;
import java.util.List;
import hust.soict.ict.aims.disc.*;

public class Store {

    private List<DigitalVideoDisc> itemsInStore = new ArrayList<DigitalVideoDisc>();

    public void addDVD(DigitalVideoDisc dvd) {
        itemsInStore.add(dvd);
        System.out.println(dvd.getTitle() + " has been added to the store.");
    }
    public void removeDVD(DigitalVideoDisc dvd) {
        boolean removed = itemsInStore.remove(dvd);
        if (removed) {
            System.out.println(dvd.getTitle() + " has been removed from the store.");
        } else {
            System.out.println(dvd.getTitle() + " is not found in the store.");
        }
    }

    public void print() {
        for (int i = 0; i < itemsInStore.size(); i++) {
            System.out.println(i+1 + ". " + itemsInStore.get(i));
        }
    }

}
```

```
<terminated> CartTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:36:40 AM – 4:36
***********************CART***********************
Ordered Items: DVD - [Title] - [category] - [Director] - [Length]: [Price]$
1. DVD - The Lion King - Animation - Roger Allers - 87 - 19.95$
2. DVD - Star Wars - Science Fiction - George Lucas - 87 - 24.95$
3. DVD - Aladin - Animation - 18.99$
Total cost: 63.89$
***************************************************
```

Figure 3: Store class after implementing

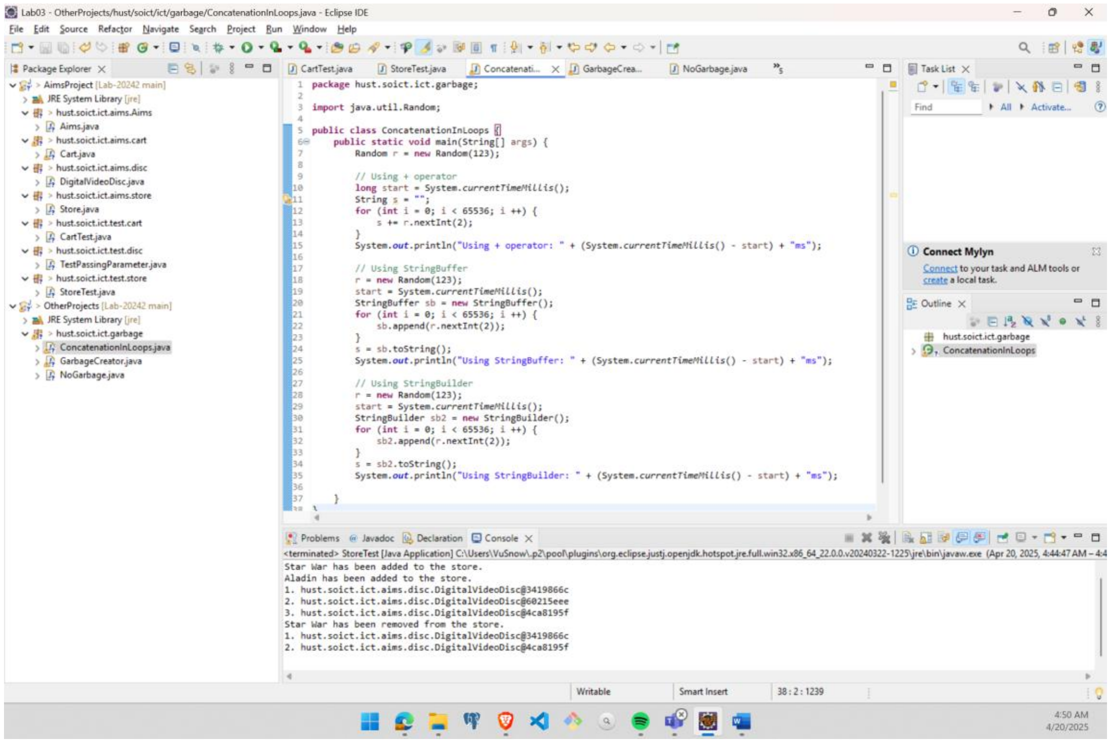


```java
package hust.soict.ict.test.store;
import hust.soict.ict.aims.disc.*;
import hust.soict.ict.aims.store.*;

public class StoreTest {
    public static void main(String[] args) {
        Store store = new Store();

        DigitalVideoDisc dvd1 = new DigitalVideoDisc("The Lion King", "Animation", "Roger Allers", 87, 19
        store.addDVD(dvd1);

        DigitalVideoDisc dvd2 = new DigitalVideoDisc("Star War", "Science Fiction", "George Lucas", 87, 2
        store.addDVD(dvd2);

        DigitalVideoDisc dvd3 = new DigitalVideoDisc("Aladin", "Animation", 18.99f);
        store.addDVD(dvd3);

        store.print();

        store.removeDVD(dvd2);

        store.print();
    }

}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
Aladin has been added to the store.
1. hust.soict.ict.aims.disc.DigitalVideoDisc@3419866c
2. hust.soict.ict.aims.disc.DigitalVideoDisc@60215eee
3. hust.soict.ict.aims.disc.DigitalVideoDisc@4ca8195f
Star War has been removed from the store.
1. hust.soict.ict.aims.disc.DigitalVideoDisc@3419866c
2. hust.soict.ict.aims.disc.DigitalVideoDisc@4ca8195f
```

Figure 4: StoreTest class after implementing and running

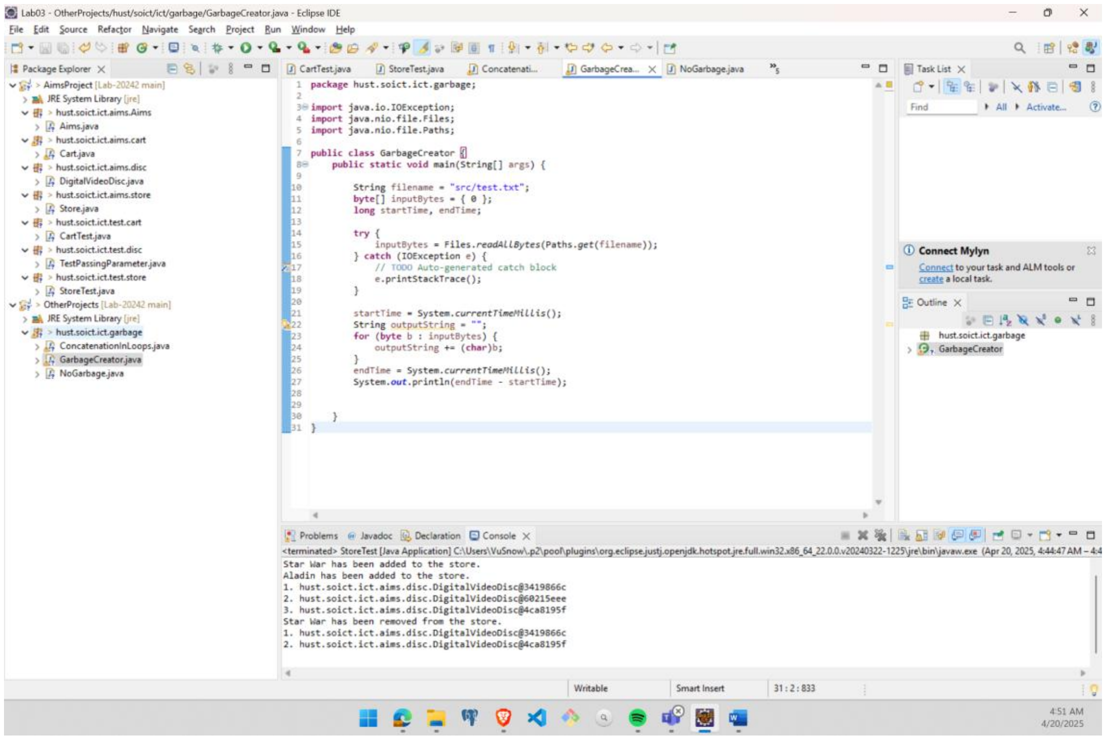
4. String, StringBuilder and StringBuffer



```java
package hust.soict.ict.garbage;

import java.util.Random;

public class ConcatenationInLoops {
    public static void main(String[] args) {
        Random r = new Random(123);

        // Using + operator
        long start = System.currentTimeMillis();
        String s = "";
        for (int i = 0; i < 65536; i ++) {
            s += r.nextInt(2);
        }
        System.out.println("Using + operator: " + (System.currentTimeMillis() - start) + "ms");

        // Using StringBuffer
        r = new Random(123);
        start = System.currentTimeMillis();
        StringBuffer sb = new StringBuffer();
        for (int i = 0; i < 65536; i ++) {
            sb.append(r.nextInt(2));
        }
        s = sb.toString();
        System.out.println("Using StringBuffer: " + (System.currentTimeMillis() - start) + "ms");

        // Using StringBuilder
        r = new Random(123);
        start = System.currentTimeMillis();
        StringBuilder sb2 = new StringBuilder();
        for (int i = 0; i < 65536; i ++) {
            sb2.append(r.nextInt(2));
        }
        s = sb2.toString();
        System.out.println("Using StringBuilder: " + (System.currentTimeMillis() - start) + "ms");

    }
}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
Aladin has been added to the store.
1. hust.soict.ict.aims.disc.DigitalVideoDisc@3419866c
2. hust.soict.ict.aims.disc.DigitalVideoDisc@60215eee
3. hust.soict.ict.aims.disc.DigitalVideoDisc@4ca8195f
Star War has been removed from the store.
1. hust.soict.ict.aims.disc.DigitalVideoDisc@3419866c
2. hust.soict.ict.aims.disc.DigitalVideoDisc@4ca8195f
```

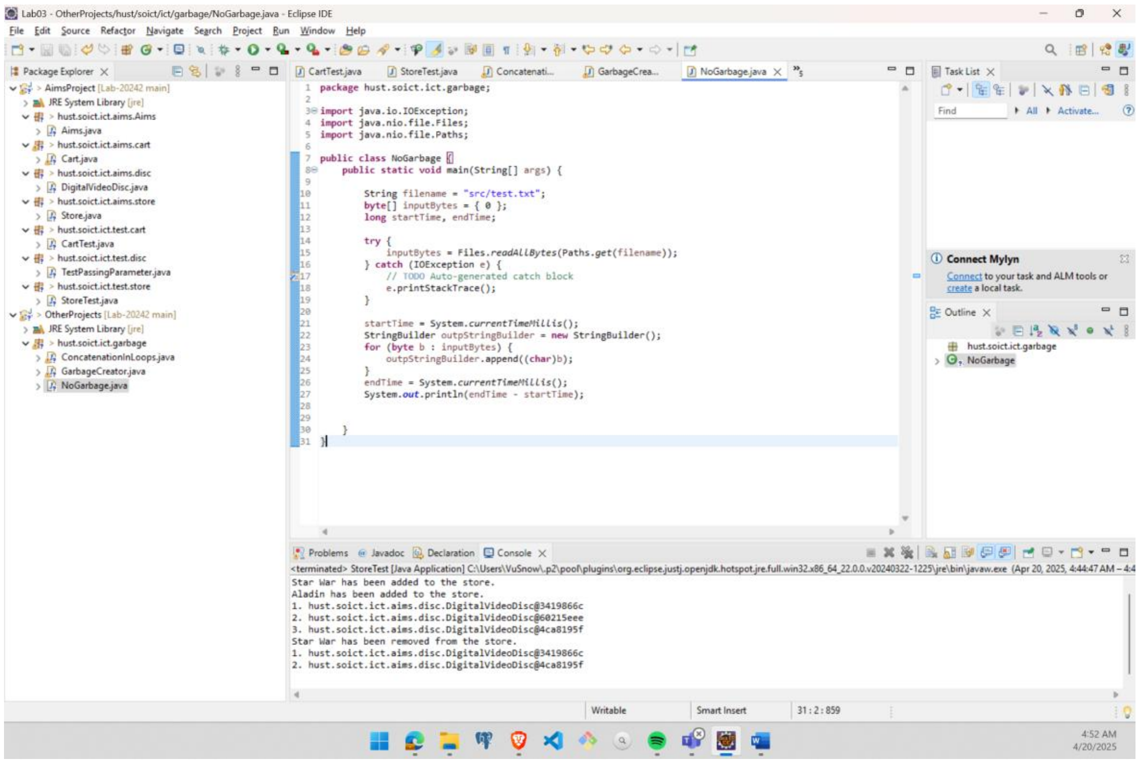
Figure 5: ConcatenationInLoops class



```java
package hust.soict.ict.garbage;

import java.io.IOException;
import java.nio.file.Files;
import java.nio.file.Paths;

public class GarbageCreator {
    public static void main(String[] args) {

        String filename = "src/test.txt";
        byte[] inputBytes = { 0 };
        long startTime, endTime;

        try {
            inputBytes = Files.readAllBytes(Paths.get(filename));
        } catch (IOException e) {
            // TODO Auto-generated catch block
            e.printStackTrace();
        }

        startTime = System.currentTimeMillis();
        String outputString = "";
        for (byte b : inputBytes) {
            outputString += (char)b;
        }
        endTime = System.currentTimeMillis();
        System.out.println(endTime - startTime);


    }
}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
Aladin has been added to the store.
1. hust.soict.ict.aims.disc.DigitalVideoDisc@3419866c
2. hust.soict.ict.aims.disc.DigitalVideoDisc@60215eee
3. hust.soict.ict.aims.disc.DigitalVideoDisc@4ca8195f
Star War has been removed from the store.
1. hust.soict.ict.aims.disc.DigitalVideoDisc@3419866c
2. hust.soict.ict.aims.disc.DigitalVideoDisc@4ca8195f
```

Figure 6: GarbageCreator class

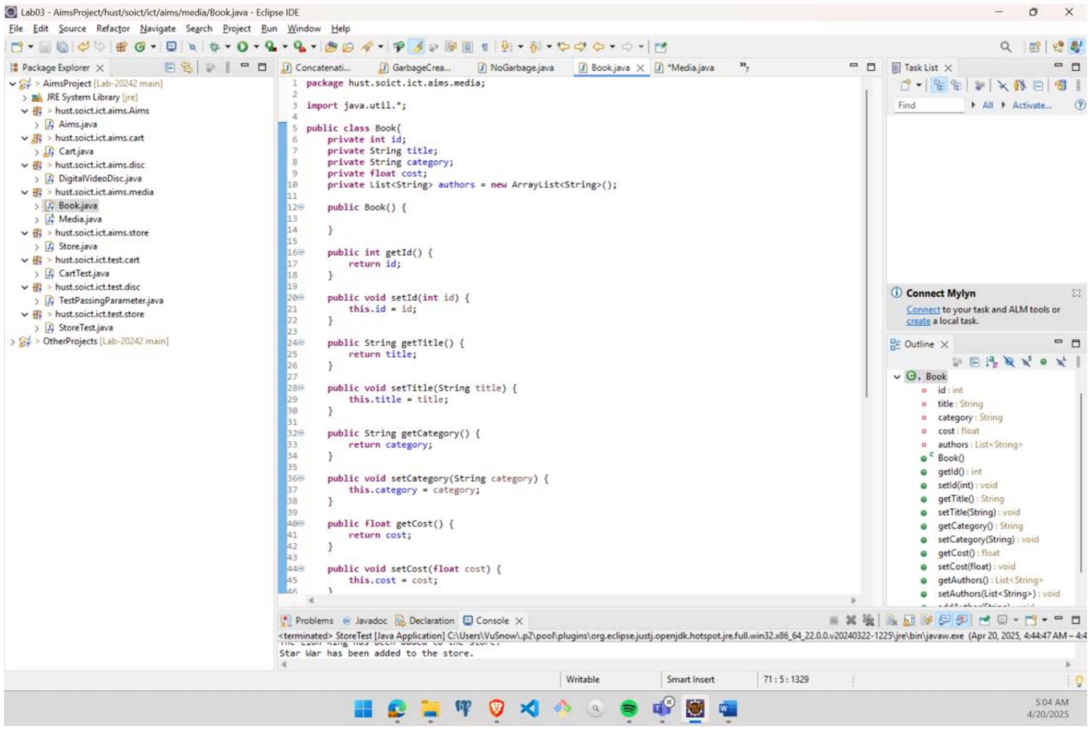


```java
package hust.soict.ict.garbage;

import java.io.IOException;
import java.nio.file.Files;
import java.nio.file.Paths;

public class NoGarbage {
    public static void main(String[] args) {

        String filename = "src/test.txt";
        byte[] inputBytes = { 0 };
        long startTime, endTime;

        try {
            inputBytes = Files.readAllBytes(Paths.get(filename));
        } catch (IOException e) {
            // TODO Auto-generated catch block
            e.printStackTrace();
        }

        startTime = System.currentTimeMillis();
        StringBuilder outpStringBuilder = new StringBuilder();
        for (byte b : inputBytes) {
            outpStringBuilder.append((char)b);
        }
        endTime = System.currentTimeMillis();
        System.out.println(endTime - startTime);


    }
}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
Aladin has been added to the store.
1. hust.soict.ict.aims.disc.DigitalVideoDisc@3419866c
2. hust.soict.ict.aims.disc.DigitalVideoDisc@60215eee
3. hust.soict.ict.aims.disc.DigitalVideoDisc@4ca8195f
Star War has been removed from the store.
1. hust.soict.ict.aims.disc.DigitalVideoDisc@3419866c
2. hust.soict.ict.aims.disc.DigitalVideoDisc@4ca8195f
```

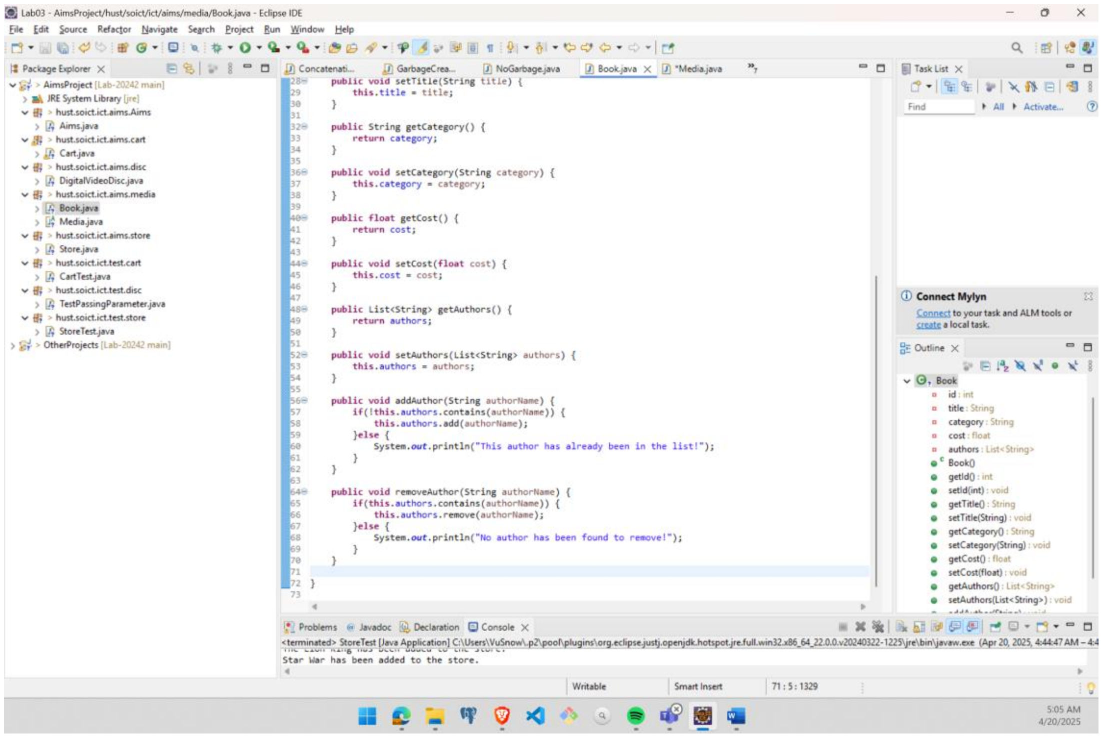
Figure 7: NoGabage class

5. Implementation of the Book class



```java
package hust.soict.ict.aims.media;

import java.util.*;

public class Book{
    private int id;
    private String title;
    private String category;
    private float cost;
    private List<String> authors = new ArrayList<String>();

    public Book() {

    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getTitle() {
        return title;
    }

    public void setTitle(String title) {
        this.title = title;
    }

    public String getCategory() {
        return category;
    }

    public void setCategory(String category) {
        this.category = category;
    }

    public float getCost() {
        return cost;
    }

    public void setCost(float cost) {
        this.cost = cost;
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

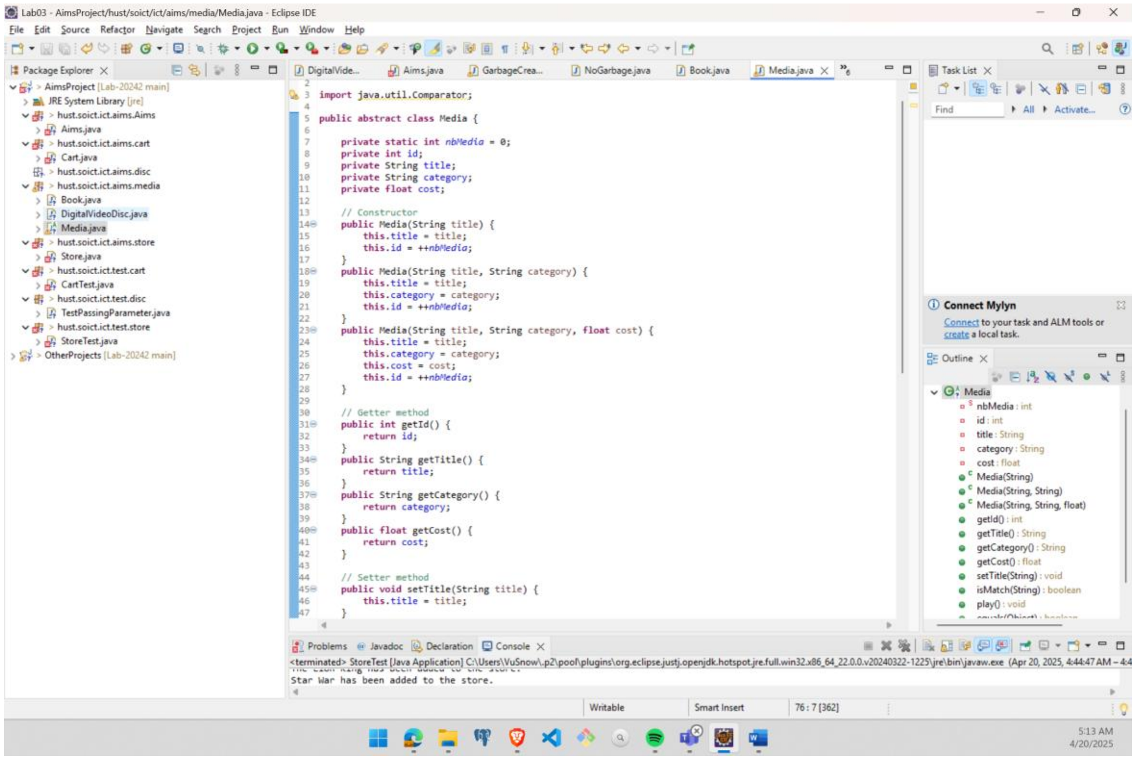


```java
    public void setTitle(String title) {
        this.title = title;
    }

    public String getCategory() {
        return category;
    }

    public void setCategory(String category) {
        this.category = category;
    }

    public float getCost() {
        return cost;
    }

    public void setCost(float cost) {
        this.cost = cost;
    }

    public List<String> getAuthors() {
        return authors;
    }

    public void setAuthors(List<String> authors) {
        this.authors = authors;
    }

    public void addAuthor(String authorName) {
        if(!this.authors.contains(authorName)) {
            this.authors.add(authorName);
        }else {
            System.out.println("This author has already been in the list!");
        }
    }

    public void removeAuthor(String authorName) {
        if(this.authors.contains(authorName)) {
            this.authors.remove(authorName);
        }else {
            System.out.println("No author has been found to remove!");
        }
    }

}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

Figure 8: Book class

6. Implementation of the abstract Media class

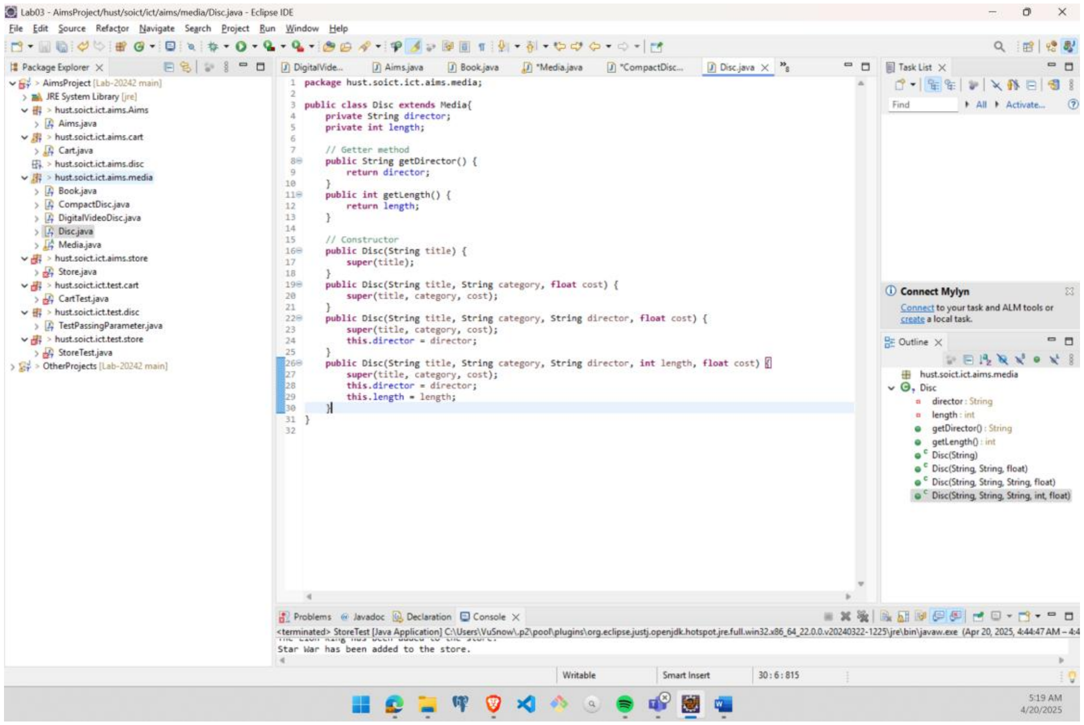


```java

import java.util.Comparator;

public abstract class Media {

    private static int nbMedia = 0;
    private int id;
    private String title;
    private String category;
    private float cost;

    // Constructor
    public Media(String title) {
        this.title = title;
        this.id = ++nbMedia;
    }
    public Media(String title, String category) {
        this.title = title;
        this.category = category;
        this.id = ++nbMedia;
    }
    public Media(String title, String category, float cost) {
        this.title = title;
        this.category = category;
        this.cost = cost;
        this.id = ++nbMedia;
    }

    // Getter method
    public int getId() {
        return id;
    }
    public String getTitle() {
        return title;
    }
    public String getCategory() {
        return category;
    }
    public float getCost() {
        return cost;
    }

    // Setter method
    public void setTitle(String title) {
        this.title = title;
    }
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

Figure 9: Media class

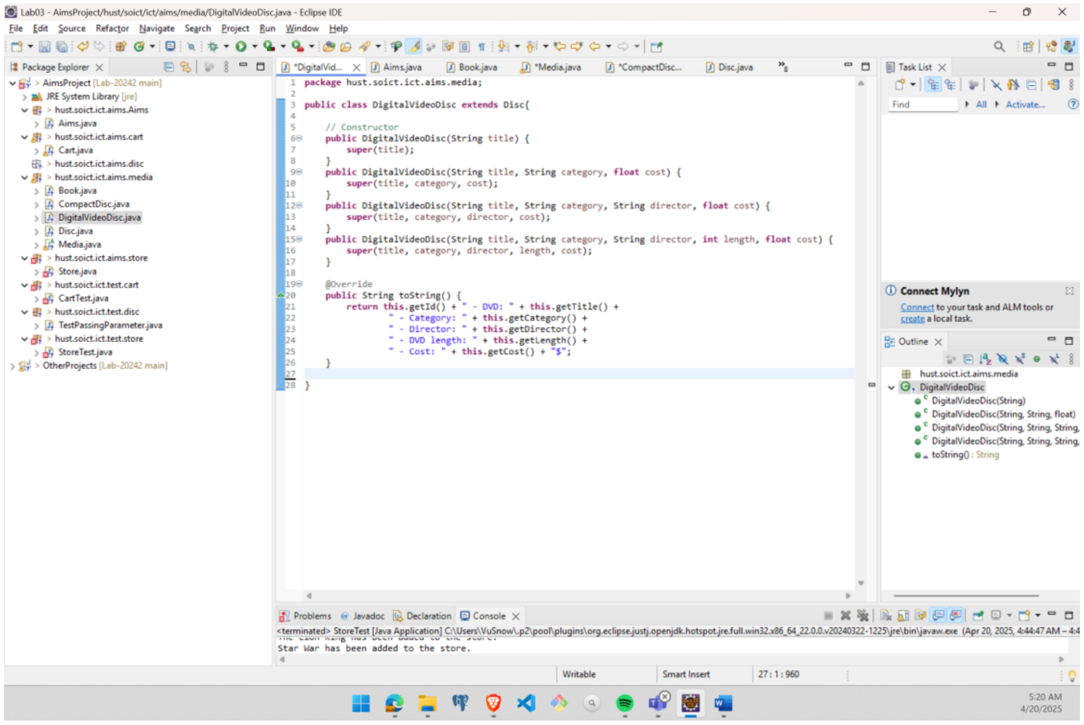
7. Implementation of the CompactDisc class



```java
package hust.soict.ict.aims.media;

public class Disc extends Media{
    private String director;
    private int length;

    // Getter method
    public String getDirector() {
        return director;
    }
    public int getLength() {
        return length;
    }

    // Constructor
    public Disc(String title) {
        super(title);
    }
    public Disc(String title, String category, float cost) {
        super(title, category, cost);
    }
    public Disc(String title, String category, String director, float cost) {
        super(title, category, cost);
        this.director = director;
    }
    public Disc(String title, String category, String director, int length, float cost) {
        super(title, category, cost);
        this.director = director;
        this.length = length;
    }
}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

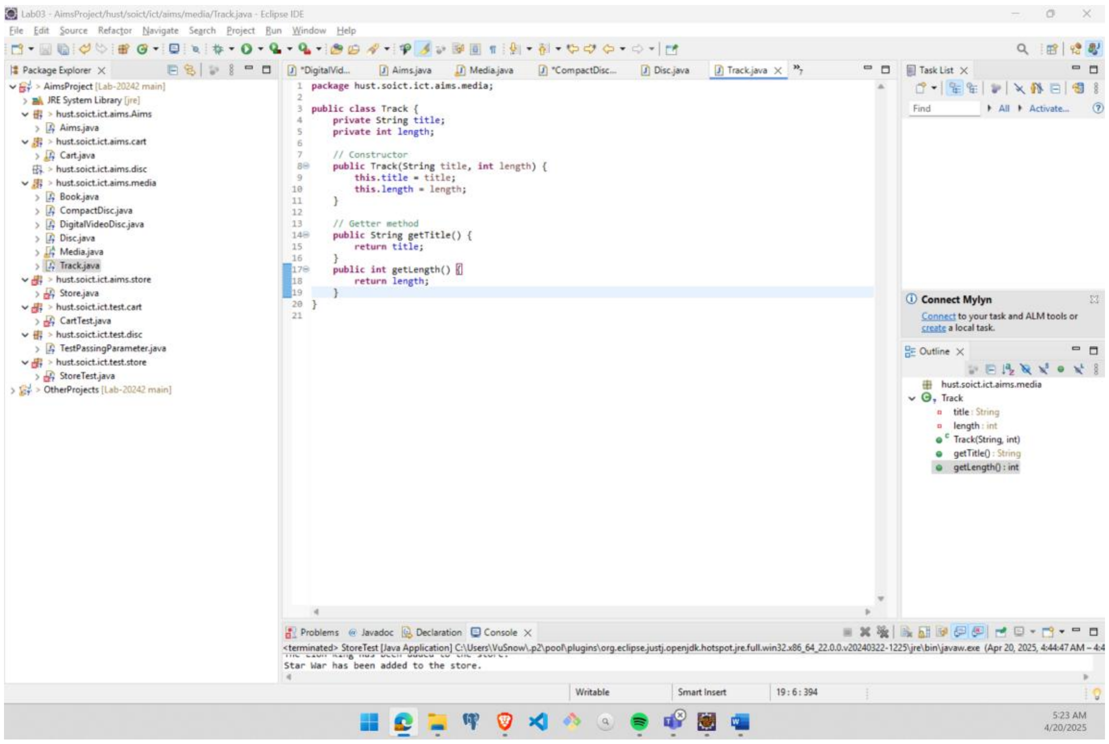
Figure 10: Disc class



```java
package hust.soict.ict.aims.media;

public class DigitalVideoDisc extends Disc{

    // Constructor
    public DigitalVideoDisc(String title) {
        super(title);
    }
    public DigitalVideoDisc(String title, String category, float cost) {
        super(title, category, cost);
    }
    public DigitalVideoDisc(String title, String category, String director, float cost) {
        super(title, category, director, cost);
    }
    public DigitalVideoDisc(String title, String category, String director, int length, float cost) {
        super(title, category, director, length, cost);
    }

    @Override
    public String toString() {
        return this.getId() + " - DVD: " + this.getTitle() +
                " - Category: " + this.getCategory() +
                " - Director: " + this.getDirector() +
                " - DVD length: " + this.getLength() +
                " - Cost: " + this.getCost() + "$";
    }

}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

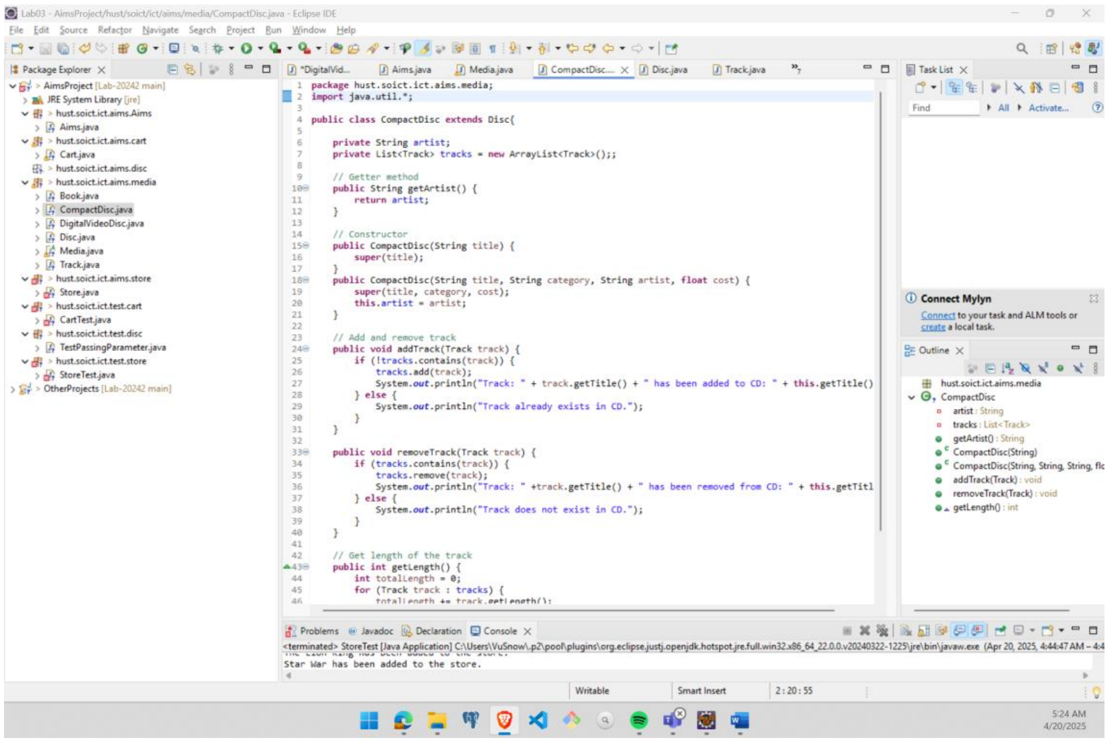
Figure 11: DigitalVideoDisc extends Disc



```java
package hust.soict.ict.aims.media;

public class Track {
    private String title;
    private int length;

    // Constructor
    public Track(String title, int length) {
        this.title = title;
        this.length = length;
    }

    // Getter method
    public String getTitle() {
        return title;
    }
    public int getLength() {
        return length;
    }
}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

Figure 12: Track class

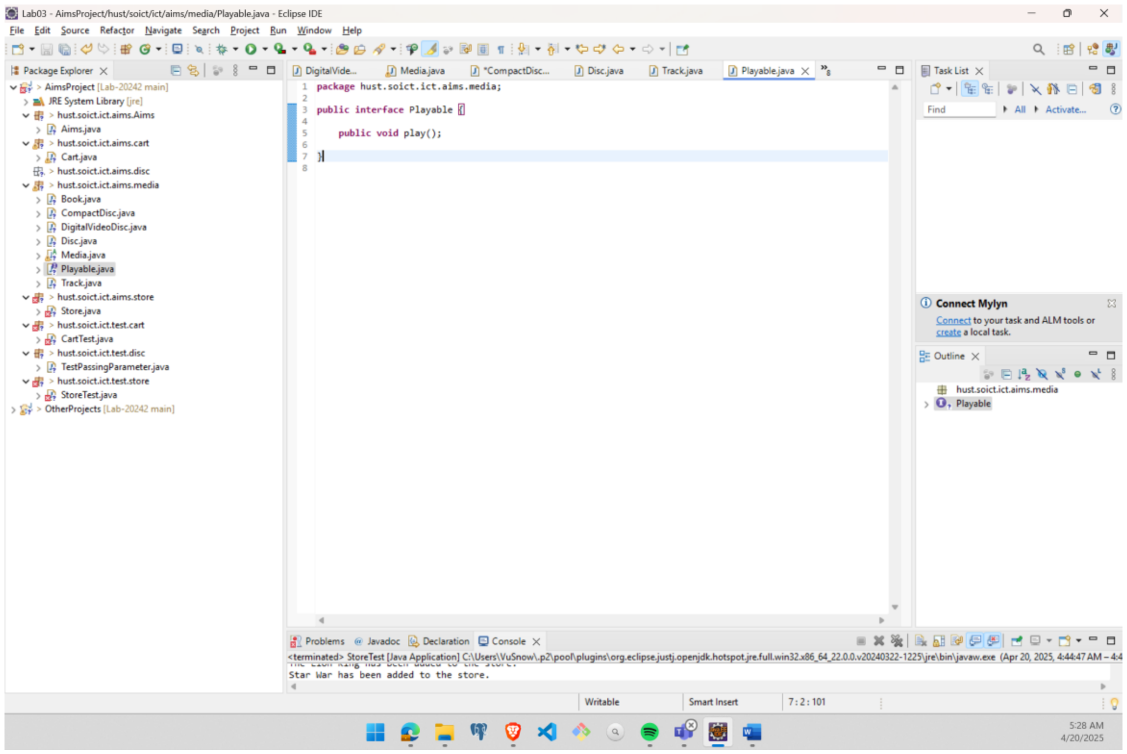


```java
package hust.soict.ict.aims.media;
import java.util.*;

public class CompactDisc extends Disc{

    private String artist;
    private List<Track> tracks = new ArrayList<Track>();;

    // Getter method
    public String getArtist() {
        return artist;
    }

    // Constructor
    public CompactDisc(String title) {
        super(title);
    }
    public CompactDisc(String title, String category, String artist, float cost) {
        super(title, category, cost);
        this.artist = artist;
    }

    // Add and remove track
    public void addTrack(Track track) {
        if (!tracks.contains(track)) {
            tracks.add(track);
            System.out.println("Track: " + track.getTitle() + " has been added to CD: " + this.getTitle()
        } else {
            System.out.println("Track already exists in CD.");
        }
    }

    public void removeTrack(Track track) {
        if (tracks.contains(track)) {
            tracks.remove(track);
            System.out.println("Track: " +track.getTitle() + " has been removed from CD: " + this.getTitl
        } else {
            System.out.println("Track does not exist in CD.");
        }
    }

    // Get length of the track
    public int getLength() {
        int totalLength = 0;
        for (Track track : tracks) {
            totalLength += track.getLength();
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

Figure 13: Updating CompactDisc class

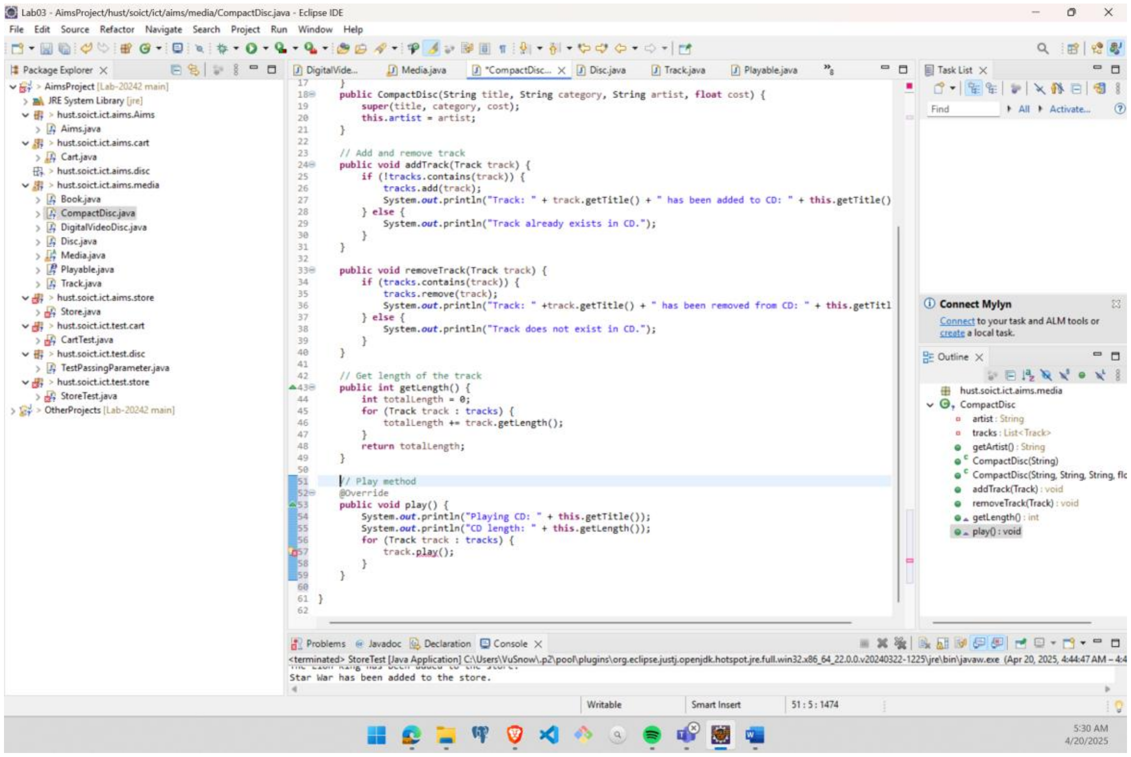
8. Implementation of the Playable interface



```
package hust.soict.ict.aims.media;

public interface Playable {

    public void play();

}
```

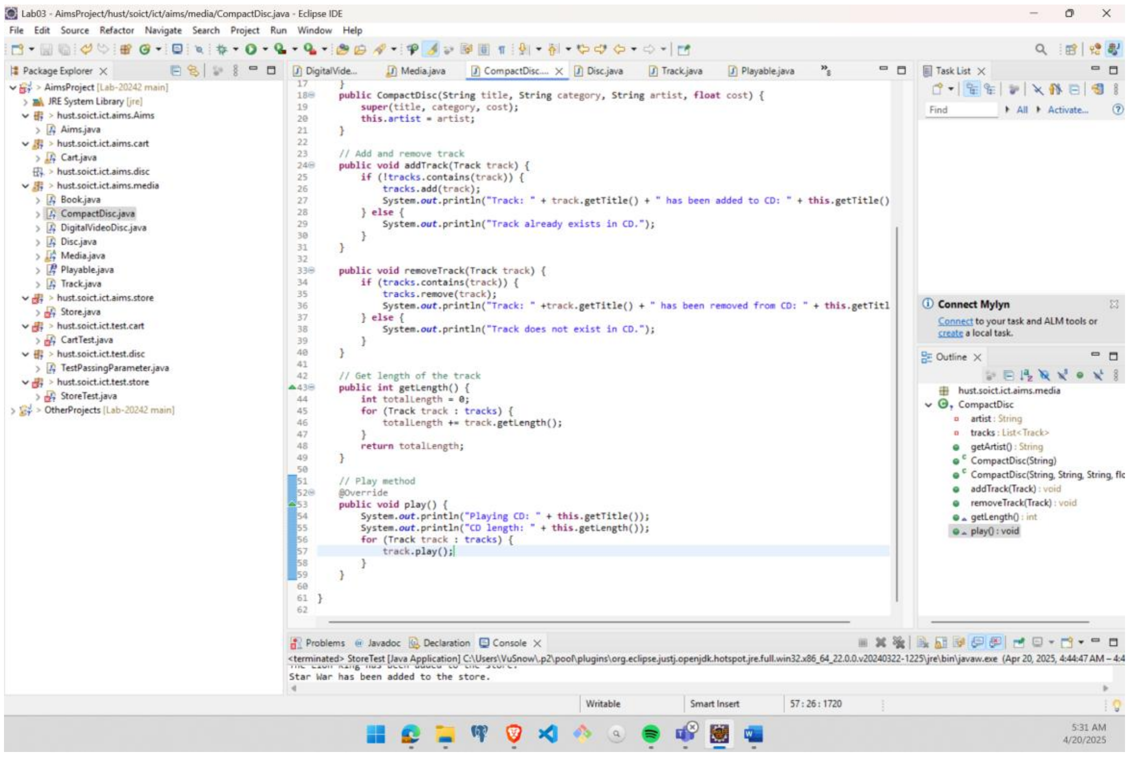
```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

Figure 14: Playable interface



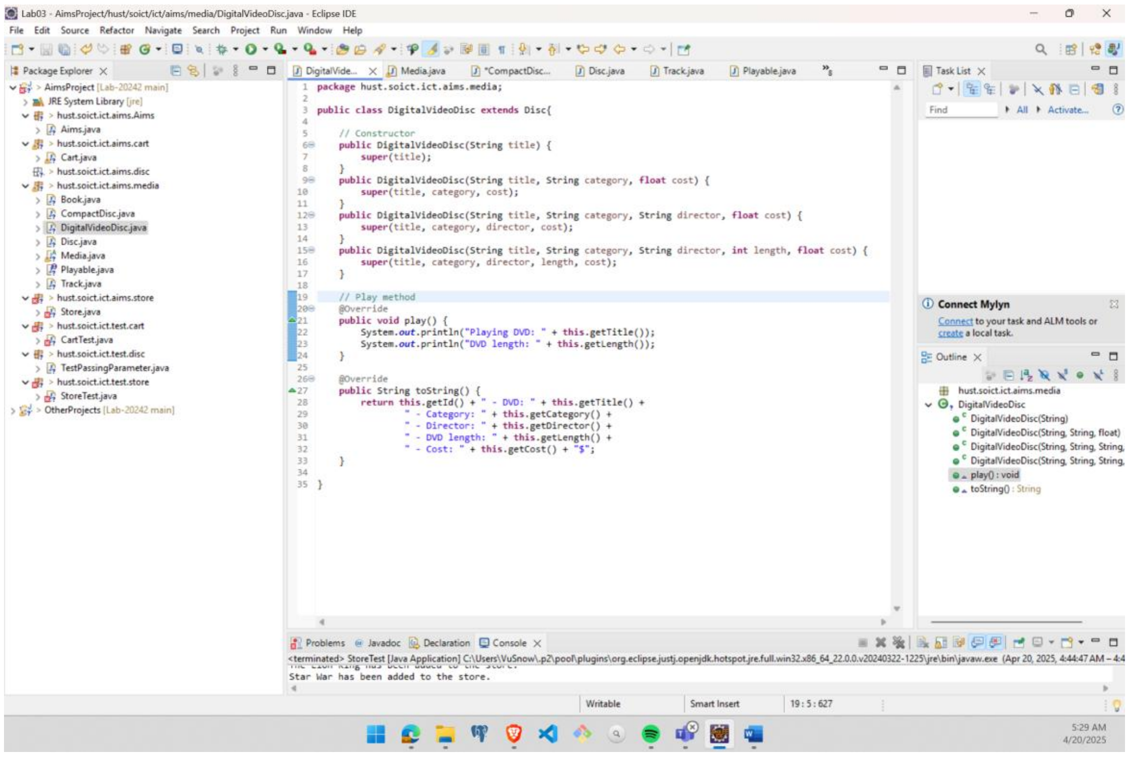
```
    }
    public CompactDisc(String title, String category, String artist, float cost) {
        super(title, category, cost);
        this.artist = artist;
    }

    // Add and remove track
    public void addTrack(Track track) {
        if (!tracks.contains(track)) {
            tracks.add(track);
            System.out.println("Track: " + track.getTitle() + " has been added to CD: " + this.getTitle()
        } else {
            System.out.println("Track already exists in CD.");
        }
    }

    public void removeTrack(Track track) {
        if (tracks.contains(track)) {
            tracks.remove(track);
            System.out.println("Track: " +track.getTitle() + " has been removed from CD: " + this.getTitl
        } else {
            System.out.println("Track does not exist in CD.");
        }
    }

    // Get length of the track
    public int getLength() {
        int totalLength = 0;
        for (Track track : tracks) {
            totalLength += track.getLength();
        }
        return totalLength;
    }

    // Play method
    @Override
    public void play() {
        System.out.println("Playing CD: " + this.getTitle());
        System.out.println("CD length: " + this.getLength());
        for (Track track : tracks) {
            track.play();
        }
    }

}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```



```java
    }
    public CompactDisc(String title, String category, String artist, float cost) {
        super(title, category, cost);
        this.artist = artist;
    }

    // Add and remove track
    public void addTrack(Track track) {
        if (!tracks.contains(track)) {
            tracks.add(track);
            System.out.println("Track: " + track.getTitle() + " has been added to CD: " + this.getTitle()
        } else {
            System.out.println("Track already exists in CD.");
        }
    }

    public void removeTrack(Track track) {
        if (tracks.contains(track)) {
            tracks.remove(track);
            System.out.println("Track: " +track.getTitle() + " has been removed from CD: " + this.getTitl
        } else {
            System.out.println("Track does not exist in CD.");
        }
    }

    // Get length of the track
    public int getLength() {
        int totalLength = 0;
        for (Track track : tracks) {
            totalLength += track.getLength();
        }
        return totalLength;
    }

    // Play method
    @Override
    public void play() {
        System.out.println("Playing CD: " + this.getTitle());
        System.out.println("CD length: " + this.getLength());
        for (Track track : tracks) {
            track.play();
        }
    }

}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

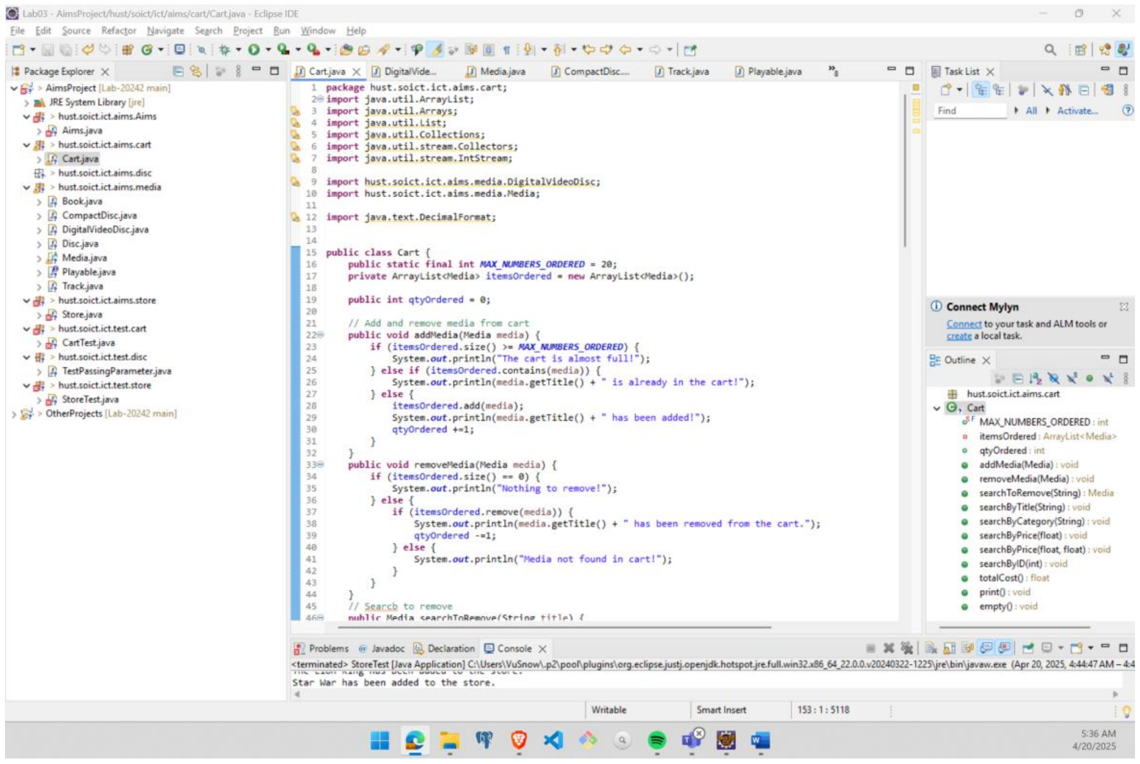


```java
package hust.soict.ict.aims.media;

public class DigitalVideoDisc extends Disc{

    // Constructor
    public DigitalVideoDisc(String title) {
        super(title);
    }
    public DigitalVideoDisc(String title, String category, float cost) {
        super(title, category, cost);
    }
    public DigitalVideoDisc(String title, String category, String director, float cost) {
        super(title, category, director, cost);
    }
    public DigitalVideoDisc(String title, String category, String director, int length, float cost) {
        super(title, category, director, length, cost);
    }

    // Play method
    @Override
    public void play() {
        System.out.println("Playing DVD: " + this.getTitle());
        System.out.println("DVD length: " + this.getLength());
    }

    @Override
    public String toString() {
        return this.getId() + " - DVD: " + this.getTitle() +
                " - Category: " + this.getCategory() +
                " - Director: " + this.getDirector() +
                " - DVD length: " + this.getLength() +
                " - Cost: " + this.getCost() + "$";
    }

}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

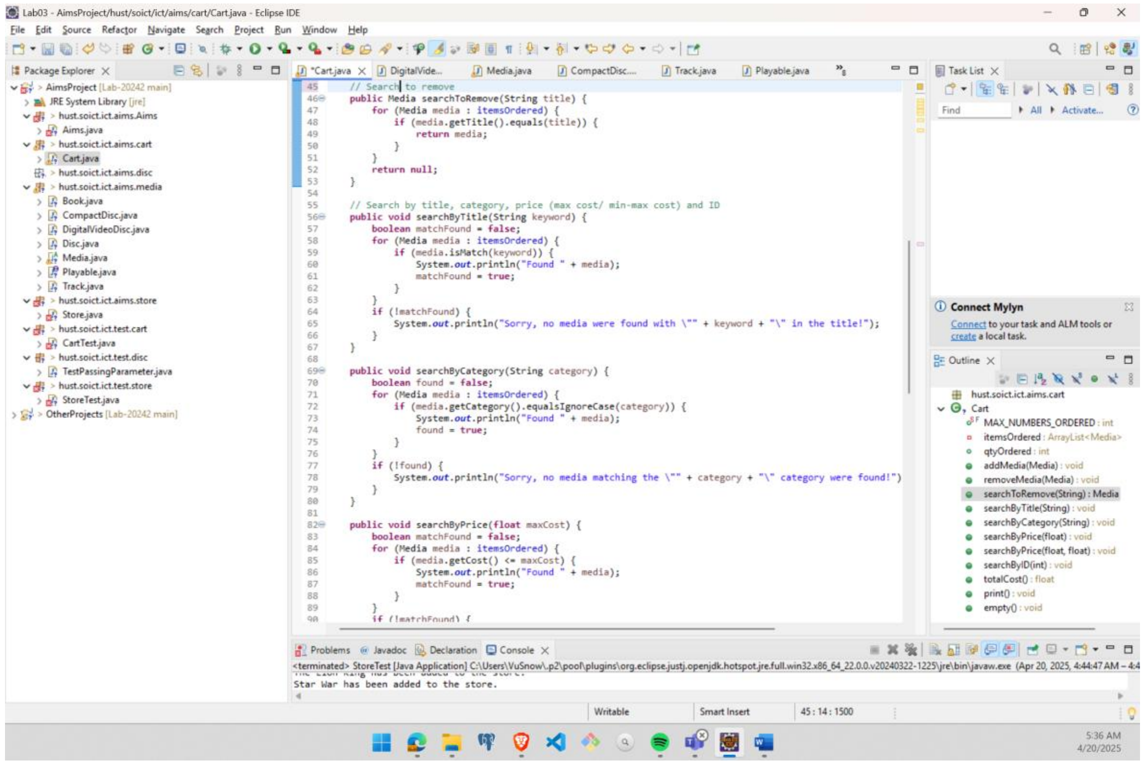
Figure 15: Updating play() method in CompactDisc, DigitalVideoDisc, Track

9. Updating the Cart class to work with Media



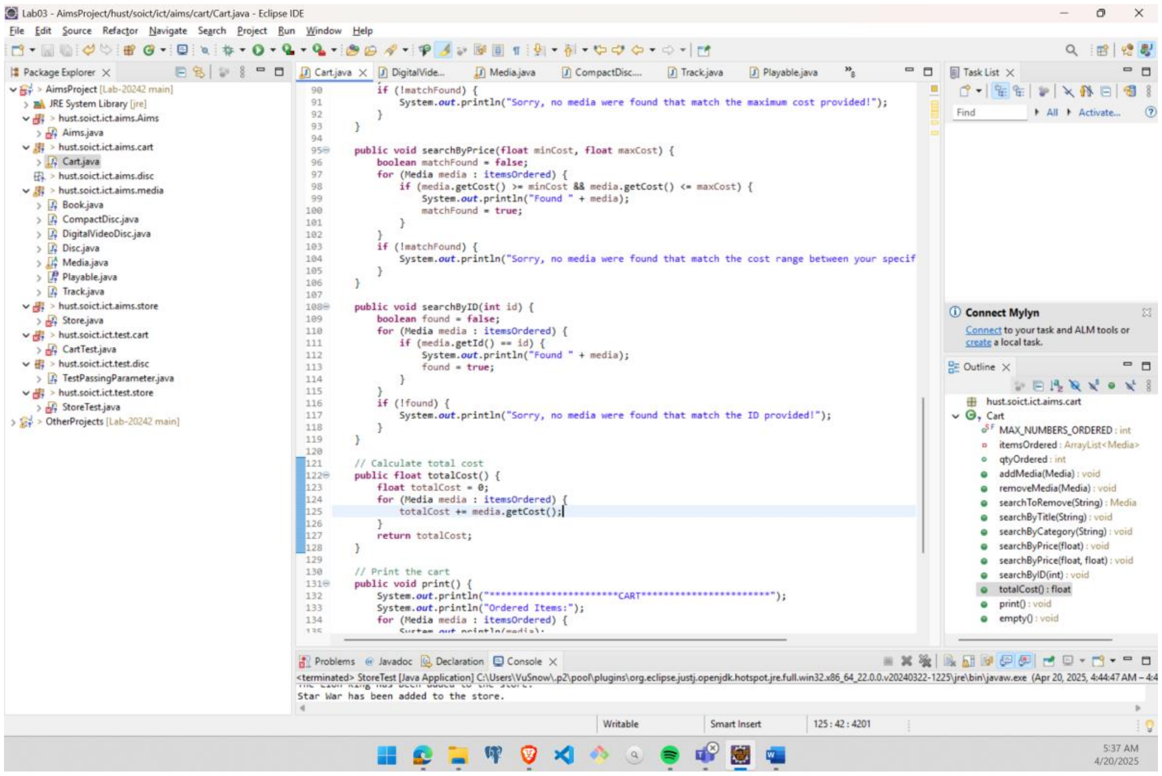
```java
package hust.soict.ict.aims.cart;
import java.util.ArrayList;
import java.util.Arrays;
import java.util.List;
import java.util.Collections;
import java.util.stream.Collectors;
import java.util.stream.IntStream;

import hust.soict.ict.aims.media.DigitalVideoDisc;
import hust.soict.ict.aims.media.Media;

import java.text.DecimalFormat;


public class Cart {
    public static final int MAX_NUMBERS_ORDERED = 20;
    private ArrayList<Media> itemsOrdered = new ArrayList<Media>();

    public int qtyOrdered = 0;

    // Add and remove media from cart
    public void addMedia(Media media) {
        if (itemsOrdered.size() >= MAX_NUMBERS_ORDERED) {
            System.out.println("The cart is almost full!");
        } else if (itemsOrdered.contains(media)) {
            System.out.println(media.getTitle() + " is already in the cart!");
        } else {
            itemsOrdered.add(media);
            System.out.println(media.getTitle() + " has been added!");
            qtyOrdered +=1;
        }
    }
    public void removeMedia(Media media) {
        if (itemsOrdered.size() == 0) {
            System.out.println("Nothing to remove!");
        } else {
            if (itemsOrdered.remove(media)) {
                System.out.println(media.getTitle() + " has been removed from the cart.");
                qtyOrdered -=1;
            } else {
                System.out.println("Media not found in cart!");
            }
        }
    }
    // Searcb to remove
    public Media searchToRemove(String title) {
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:
Star War has been added to the store.
```



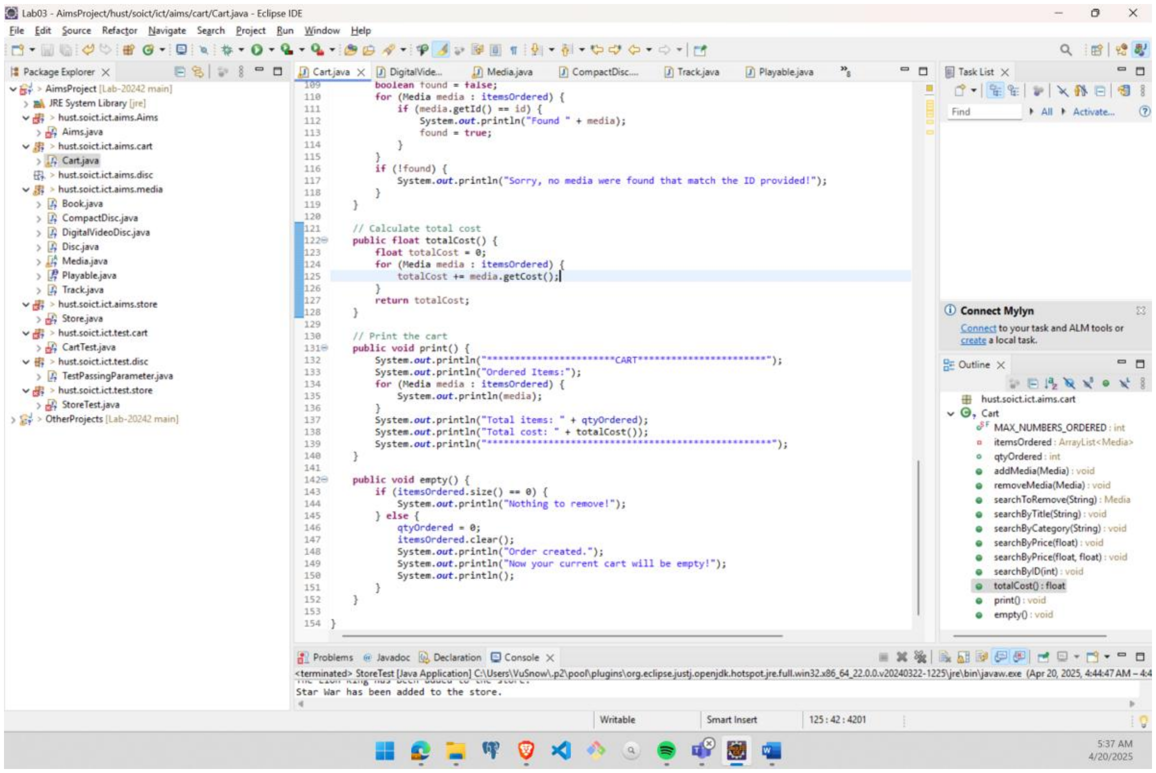
```java
    // Search to remove
    public Media searchToRemove(String title) {
        for (Media media : itemsOrdered) {
            if (media.getTitle().equals(title)) {
                return media;
            }
        }
        return null;
    }

    // Search by title, category, price (max cost/ min-max cost) and ID
    public void searchByTitle(String keyword) {
        boolean matchFound = false;
        for (Media media : itemsOrdered) {
            if (media.isMatch(keyword)) {
                System.out.println("Found " + media);
                matchFound = true;
            }
        }
        if (!matchFound) {
            System.out.println("Sorry, no media were found with \"" + keyword + "\" in the title!");
        }
    }

    public void searchByCategory(String category) {
        boolean found = false;
        for (Media media : itemsOrdered) {
            if (media.getCategory().equalsIgnoreCase(category)) {
                System.out.println("Found " + media);
                found = true;
            }
        }
        if (!found) {
            System.out.println("Sorry, no media matching the \"" + category + "\" category were found!")
        }
    }

    public void searchByPrice(float maxCost) {
        boolean matchFound = false;
        for (Media media : itemsOrdered) {
            if (media.getCost() <= maxCost) {
                System.out.println("Found " + media);
                matchFound = true;
            }
        }
        if (!matchFound) {
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:
Star War has been added to the store.
```



```java
        if (!matchFound) {
            System.out.println("Sorry, no media were found that match the maximum cost provided!");
        }
    }

    public void searchByPrice(float minCost, float maxCost) {
        boolean matchFound = false;
        for (Media media : itemsOrdered) {
            if (media.getCost() >= minCost && media.getCost() <= maxCost) {
                System.out.println("Found " + media);
                matchFound = true;
            }
        }
        if (!matchFound) {
            System.out.println("Sorry, no media were found that match the cost range between your specif
        }
    }

    public void searchByID(int id) {
        boolean found = false;
        for (Media media : itemsOrdered) {
            if (media.getId() == id) {
                System.out.println("Found " + media);
                found = true;
            }
        }
        if (!found) {
            System.out.println("Sorry, no media were found that match the ID provided!");
        }
    }

    // Calculate total cost
    public float totalCost() {
        float totalCost = 0;
        for (Media media : itemsOrdered) {
            totalCost += media.getCost();
        }
        return totalCost;
    }

    // Print the cart
    public void print() {
        System.out.println("**********************CART**********************");
        System.out.println("Ordered Items:");
        for (Media media : itemsOrdered) {
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

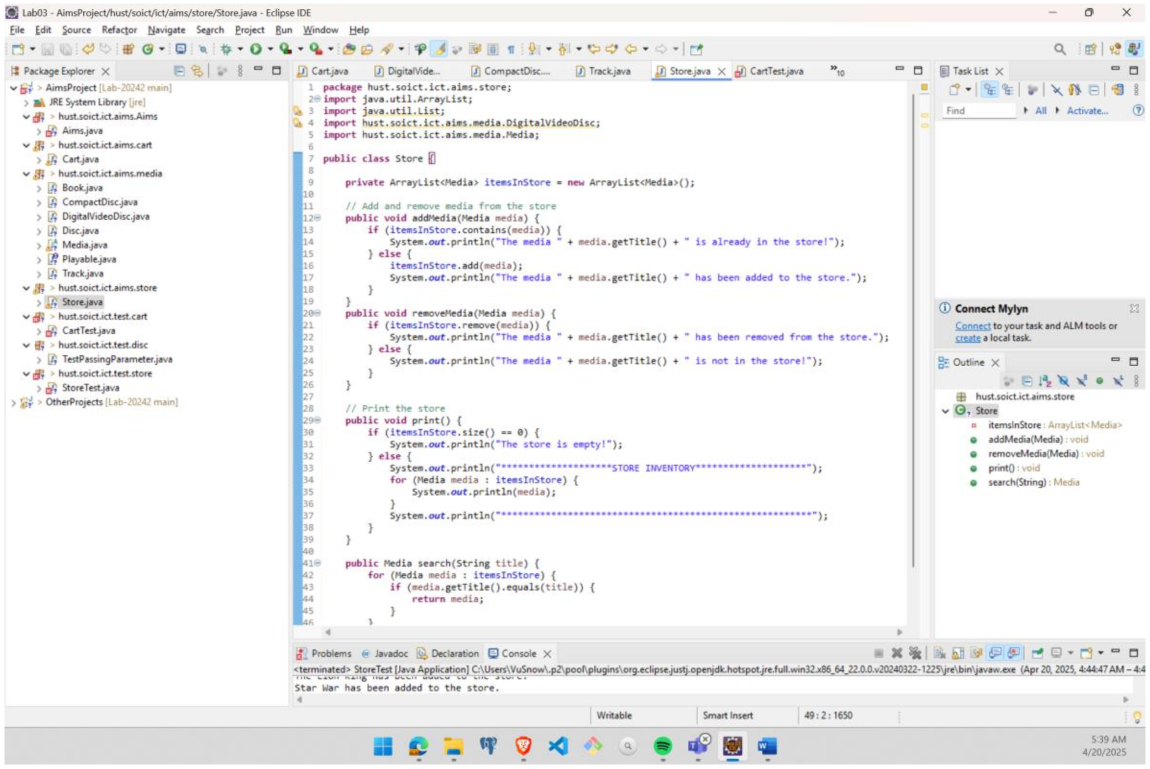


```java
        boolean found = false;
        for (Media media : itemsOrdered) {
            if (media.getId() == id) {
                System.out.println("Found " + media);
                found = true;
            }
        }
        if (!found) {
            System.out.println("Sorry, no media were found that match the ID provided!");
        }
    }

    // Calculate total cost
    public float totalCost() {
        float totalCost = 0;
        for (Media media : itemsOrdered) {
            totalCost += media.getCost();
        }
        return totalCost;
    }

    // Print the cart
    public void print() {
        System.out.println("**********************CART**********************");
        System.out.println("Ordered Items:");
        for (Media media : itemsOrdered) {
            System.out.println(media);
        }
        System.out.println("Total items: " + qtyOrdered);
        System.out.println("Total cost: " + totalCost());
        System.out.println("**************************************************");
    }

    public void empty() {
        if (itemsOrdered.size() == 0) {
            System.out.println("Nothing to remove!");
        } else {
            qtyOrdered = 0;
            itemsOrdered.clear();
            System.out.println("Order created.");
            System.out.println("Now your current cart will be empty!");
            System.out.println();
        }
    }

}
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

Figure 16: Updating Cart class

10. Updating the Store class to work with Media

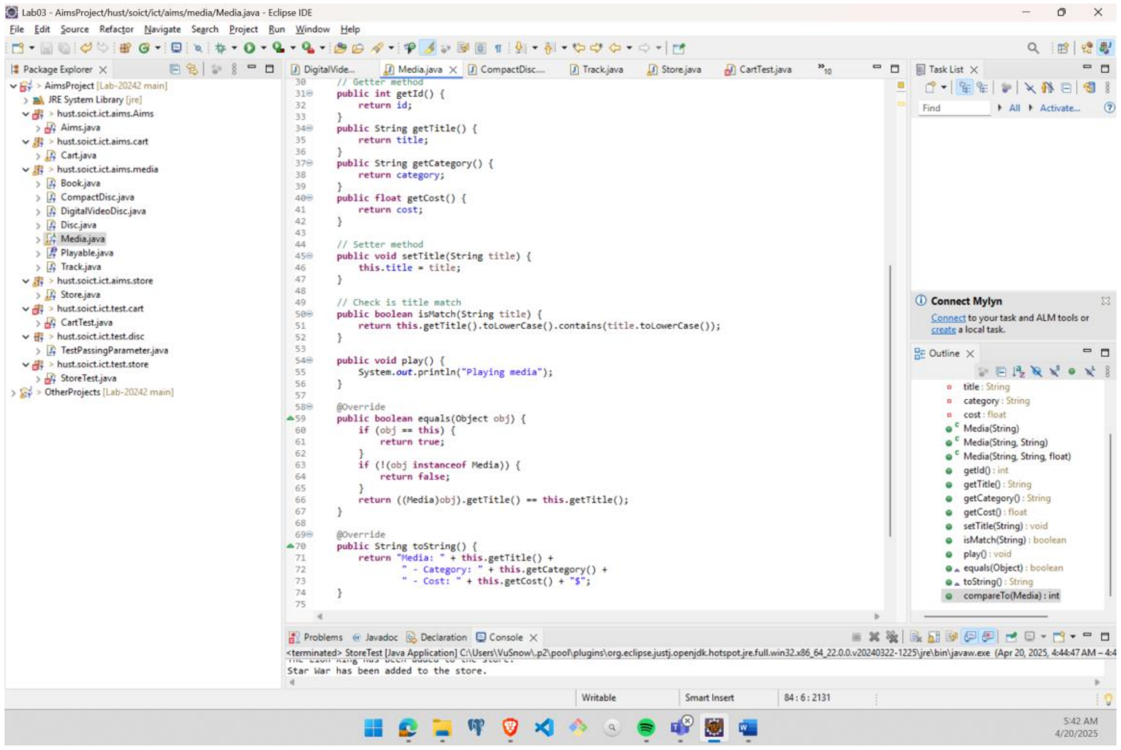


```java
package hust.soict.ict.aims.store;
import java.util.ArrayList;
import java.util.List;
import hust.soict.ict.aims.media.DigitalVideoDisc;
import hust.soict.ict.aims.media.Media;

public class Store {

    private ArrayList<Media> itemsInStore = new ArrayList<Media>();

    // Add and remove media from the store
    public void addMedia(Media media) {
        if (itemsInStore.contains(media)) {
            System.out.println("The media " + media.getTitle() + " is already in the store!");
        } else {
            itemsInStore.add(media);
            System.out.println("The media " + media.getTitle() + " has been added to the store.");
        }
    }
    public void removeMedia(Media media) {
        if (itemsInStore.remove(media)) {
            System.out.println("The media " + media.getTitle() + " has been removed from the store.");
        } else {
            System.out.println("The media " + media.getTitle() + " is not in the store!");
        }
    }

    // Print the store
    public void print() {
        if (itemsInStore.size() == 0) {
            System.out.println("The store is empty!");
        } else {
            System.out.println("********************STORE INVENTORY********************");
            for (Media media : itemsInStore) {
                System.out.println(media);
            }
            System.out.println("**********************************************************");
        }
    }

    public Media search(String title) {
        for (Media media : itemsInStore) {
            if (media.getTitle().equals(title)) {
                return media;
            }
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
Star War has been added to the store.
```

Figure 17: Store class after updating

11. Polymorphism with toString method

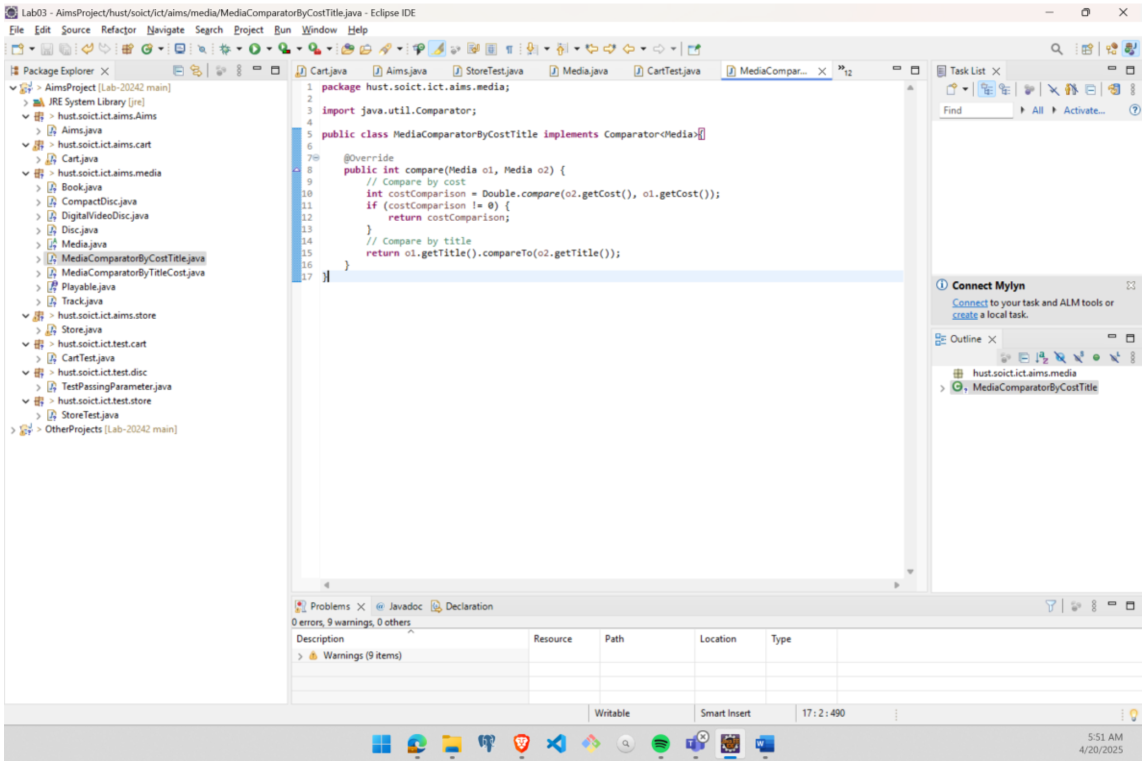


```java
    // Getter method
    public int getId() {
        return id;
    }
    public String getTitle() {
        return title;
    }
    public String getCategory() {
        return category;
    }
    public float getCost() {
        return cost;
    }

    // Setter method
    public void setTitle(String title) {
        this.title = title;
    }

    // Check is title match
    public boolean isMatch(String title) {
        return this.getTitle().toLowerCase().contains(title.toLowerCase());
    }

    public void play() {
        System.out.println("Playing media");
    }

    @Override
    public boolean equals(Object obj) {
        if (obj == this) {
            return true;
        }
        if (!(obj instanceof Media)) {
            return false;
        }
        return ((Media)obj).getTitle() == this.getTitle();
    }

    @Override
    public String toString() {
        return "Media: " + this.getTitle() +
                " - Category: " + this.getCategory() +
                " - Cost: " + this.getCost() + "$";
    }
```

```
<terminated> StoreTest [Java Application] C:\Users\VuSnow\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_22.0.0.v20240322-1225\jre\bin\javaw.exe (Apr 20, 2025, 4:44:47 AM – 4:4
The Lion King has been added to the store.
Star War has been added to the store.
```

Figure 18: toString and equals

12. Sort media in the cart

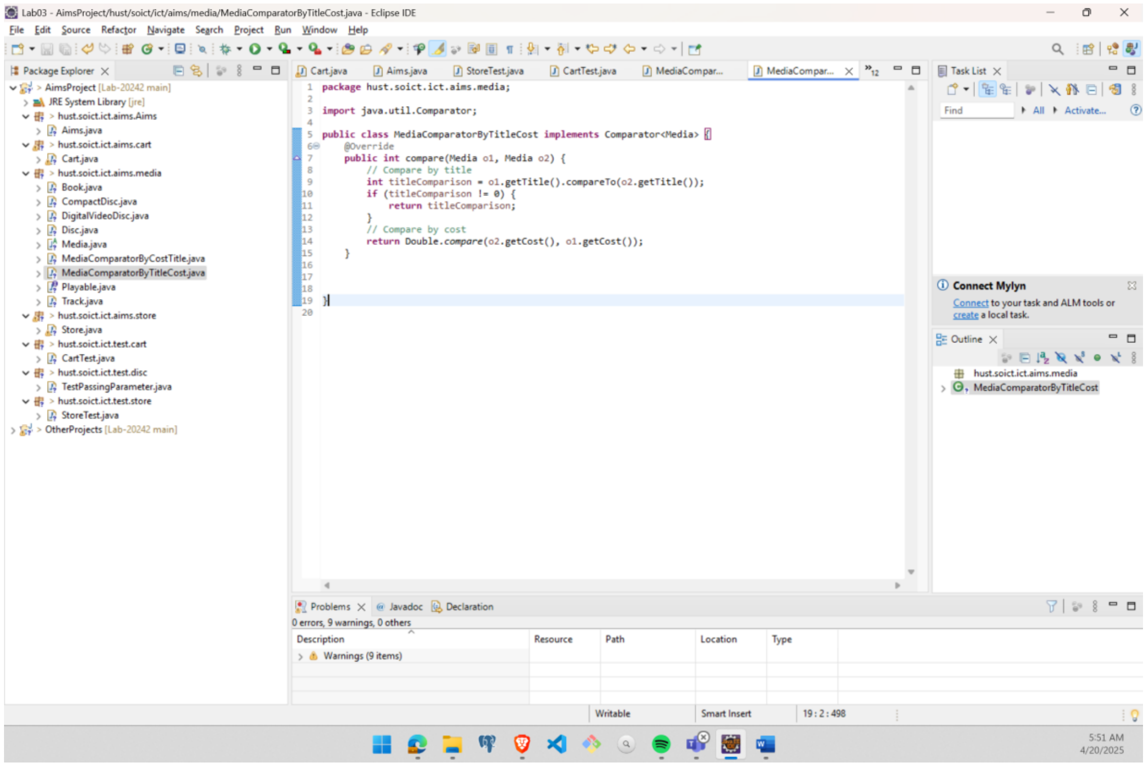


Lab03 - AimsProject/hust/soict/ict/aims/media/MediaComparatorByCostTitle.java - Eclipse IDE

```java
package hust.soict.ict.aims.media;

import java.util.Comparator;

public class MediaComparatorByCostTitle implements Comparator<Media>{

    @Override
    public int compare(Media o1, Media o2) {
        // Compare by cost
        int costComparison = Double.compare(o2.getCost(), o1.getCost());
        if (costComparison != 0) {
            return costComparison;
        }
        // Compare by title
        return o1.getTitle().compareTo(o2.getTitle());
    }
}
```

0 errors, 9 warnings, 0 others

Warnings (9 items)

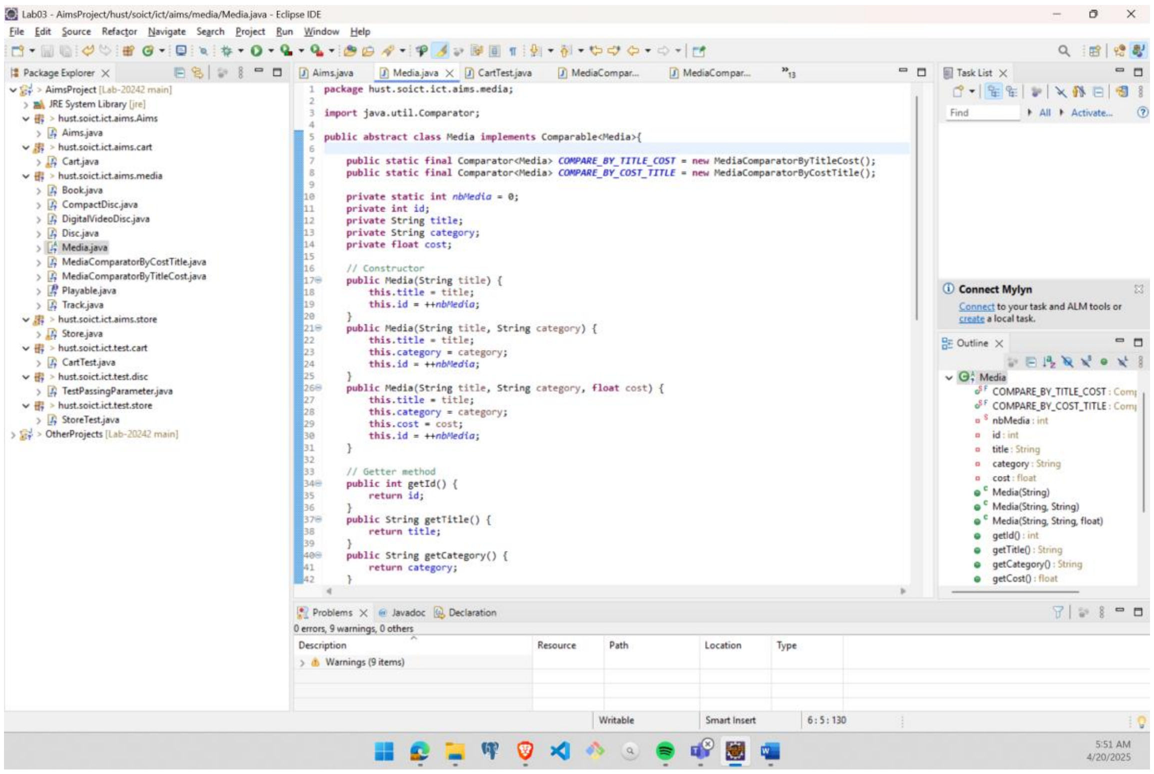


Lab03 - AimsProject/hust/soict/ict/aims/media/MediaComparatorByTitleCost.java - Eclipse IDE

```java
package hust.soict.ict.aims.media;

import java.util.Comparator;

public class MediaComparatorByTitleCost implements Comparator<Media> {
    @Override
    public int compare(Media o1, Media o2) {
        // Compare by title
        int titleComparison = o1.getTitle().compareTo(o2.getTitle());
        if (titleComparison != 0) {
            return titleComparison;
        }
        // Compare by cost
        return Double.compare(o2.getCost(), o1.getCost());
    }



}
```

0 errors, 9 warnings, 0 others

Warnings (9 items)

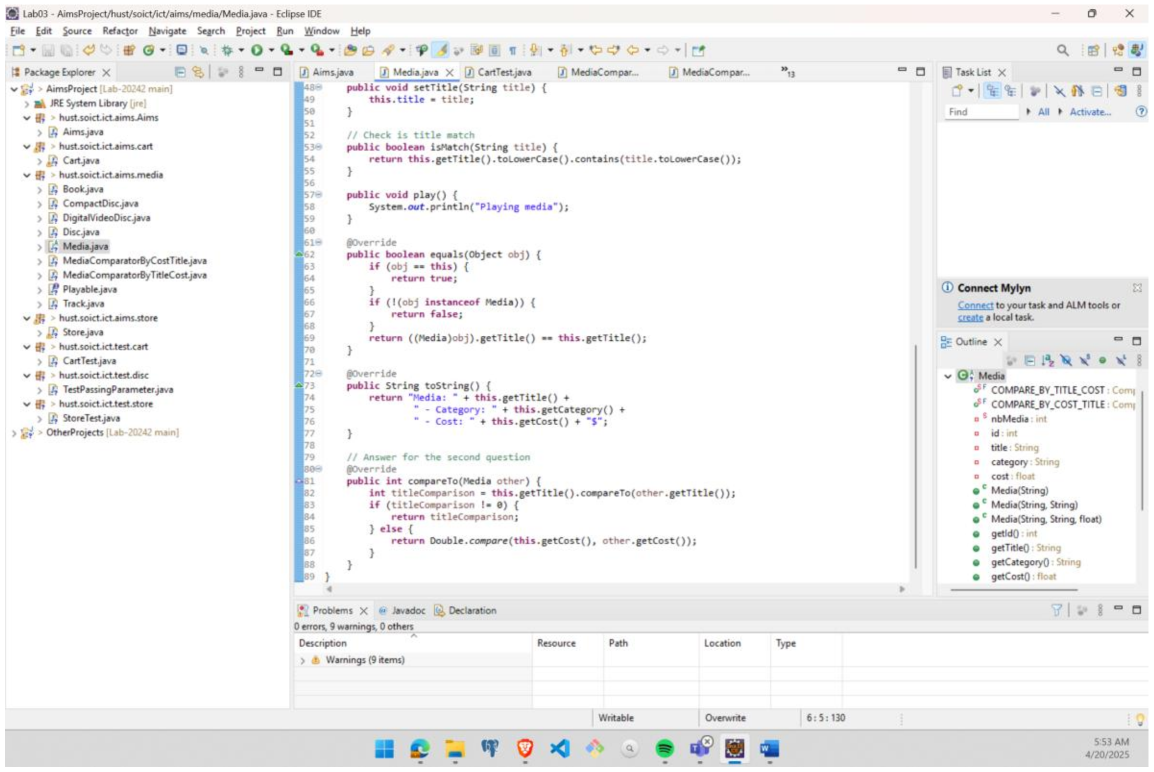


```java
package hust.soict.ict.aims.media;

import java.util.Comparator;

public abstract class Media implements Comparable<Media>{

    public static final Comparator<Media> COMPARE_BY_TITLE_COST = new MediaComparatorByTitleCost();
    public static final Comparator<Media> COMPARE_BY_COST_TITLE = new MediaComparatorByCostTitle();

    private static int nbMedia = 0;
    private int id;
    private String title;
    private String category;
    private float cost;

    // Constructor
    public Media(String title) {
        this.title = title;
        this.id = ++nbMedia;
    }
    public Media(String title, String category) {
        this.title = title;
        this.category = category;
        this.id = ++nbMedia;
    }
    public Media(String title, String category, float cost) {
        this.title = title;
        this.category = category;
        this.cost = cost;
        this.id = ++nbMedia;
    }

    // Getter method
    public int getId() {
        return id;
    }
    public String getTitle() {
        return title;
    }
    public String getCategory() {
        return category;
    }
```

```
0 errors, 9 warnings, 0 others
Description    Resource    Path    Location    Type
> Warnings (9 items)
```

Figure 19: Implementing two comparator

- **Answer the question:**



```java
    public void setTitle(String title) {
        this.title = title;
    }

    // Check is title match
    public boolean isMatch(String title) {
        return this.getTitle().toLowerCase().contains(title.toLowerCase());
    }

    public void play() {
        System.out.println("Playing media");
    }

    @Override
    public boolean equals(Object obj) {
        if (obj == this) {
            return true;
        }
        if (!(obj instanceof Media)) {
            return false;
        }
        return ((Media)obj).getTitle() == this.getTitle();
    }

    @Override
    public String toString() {
        return "Media: " + this.getTitle() +
                " - Category: " + this.getCategory() +
                " - Cost: " + this.getCost() + "$";
    }

    // Answer for the second question
    @Override
    public int compareTo(Media other) {
        int titleComparison = this.getTitle().compareTo(other.getTitle());
        if (titleComparison != 0) {
            return titleComparison;
        } else {
            return Double.compare(this.getCost(), other.getCost());
        }
    }
}
```

```
0 errors, 9 warnings, 0 others
Description    Resource    Path    Location    Type
> Warnings (9 items)
```

13. Create a complete console application in the Aims class

- Full source code: **https://github.com/VuSnow/OOP-Lab-20242**