

Experiment 6

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1. Aim: Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.

2. Objective:

- Develop Java programs using lambda expressions and stream operations for sorting, filtering, and processing large datasets efficiently.
- Implement easy, medium, and hard-level tasks involving sorting employees, filtering and sorting students, and processing products using streams.

3. Implementation/Code:

```
a. import java.util.*;
class Employee {
  String name;
  int age;
  double salary;
  Employee(String name, int age, double salary) {
    this.name = name;
    this.age = age;
    this.salary = salary;
  }
  @Override
  public String toString() {
    return name + " - Age: " + age + ", Salary: " + salary;
  }
}
public class EmployeeSort {
  public static void main(String[] args) {
    List<Employee> employees = Arrays.asList(
       new Employee("Ayush", 20, 90000),
       new Employee("Vinay", 22, 100000),
```

```
new Employee("Prakul", 23, 70000)
    );
    employees.sort(Comparator.comparing(emp -> emp.name));
    System.out.println("Sorted by Name: " + employees);
    employees.sort(Comparator.comparingInt(emp -> emp.age));
    System.out.println("Sorted by Age: " + employees);
    employees.sort(Comparator.comparingDouble(emp -> emp.salary));
    System.out.println("Sorted by Salary: " + employees);
  }
}
b. import java.util.*;
import java.util.stream.Collectors;
class Student {
  private String name;
  private double marks;
  public Student(String name, double marks) {
    this.name = name;
    this.marks = marks;
  public String getName() {
    return name;
  public double getMarks() {
    return marks;
  }
}
public class StudentFilter {
  public static void main(String[] args) {
    List<Student> students = List.of(
       new Student("Ayush", 85),
       new Student("Rajeev", 70),
       new Student("Vinay", 90),
       new Student("David", 60),
       new Student("Prakul", 80)
    );
```

```
List<String> topStudents = students.stream()
       .filter(s \rightarrow s.getMarks() > 75)
       .sorted(Comparator.comparingDouble(Student::getMarks).reversed())
       .map(Student::getName)
       .collect(Collectors.toList());
     System.out.println("Top Students: " + topStudents);
  }
}
c. import java.util.*;
import java.util.stream.Collectors;
class Product {
  String name;
  String category;
  double price;
  public Product(String name, String category, double price) {
     this.name = name;
     this.category = category;
     this.price = price;
  }
  @Override
  public String toString() {
     return name + " ($" + price + ")";
  }
}
public class ProductProcessor {
  public static void main(String[] args) {
    List<Product> products = Arrays.asList(
       new Product("Laptop", "Electronics", 1200),
       new Product("Phone", "Electronics", 800),
       new Product("TV", "Electronics", 1500),
       new Product("Shirt", "Clothing", 50),
       new Product("Jeans", "Clothing", 70),
       new Product("Blender", "Appliances", 200),
       new Product("Toaster", "Appliances", 100)
    );
```

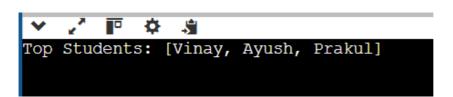
```
Map<String, List<Product>> productsByCategory = products.stream()
       .collect(Collectors.groupingBy(p -> p.category));
    System.out.println("Products grouped by category:");
    productsByCategory.forEach((category, productList) ->
       System.out.println(category + ": " + productList));
    Map<String, Optional<Product>> mostExpensiveByCategory = products.stream()
       .collect(Collectors.groupingBy(
         p -> p.category,
         Collectors.maxBy(Comparator.comparingDouble(p -> p.price))
    System.out.println("\nMost expensive product in each category:");
    mostExpensiveByCategory.forEach((category, product) ->
       System.out.println(category + ": " + product.orElse(null)));
    double averagePrice = products.stream()
       .mapToDouble(p -> p.price)
       .average()
       .orElse(0);
    System.out.println("\nAverage price of all products: $" + averagePrice);
  }
}
```

4. Output:

```
Sorted by Name: [Ayush - Age: 20, Salary: 90000.0, Prakul - Age: 23, Salary: 70000.0, Vinay - Age: 22, Salary: 100000.0]

Sorted by Age: [Ayush - Age: 20, Salary: 90000.0, Vinay - Age: 22, Salary: 100000.0, Prakul - Age: 23, Salary: 70000.0]

Sorted by Salary: [Prakul - Age: 23, Salary: 70000.0, Ayush - Age: 20, Salary: 90000.0, Vinay - Age: 22, Salary: 100000.0]
```



```
Products grouped by category:
Appliances: [Blender (200.0), Toaster (100.0)]
Clothing: [Shirt (50.0), Jeans (70.0)]
Electronics: [Laptop (1200.0), Phone (800.0), TV (1500.0)]

Most expensive product in each category:
Appliances: Blender (200.0)
Clothing: Jeans (70.0)
Electronics: TV (1500.0)

Average price of all products: $560.0
```

5. Learning Outcome:

- Understand and implement **lambda expressions** for sorting objects in a list based on different attributes.
- Utilize **Java Streams API** to perform operations like **filtering**, **sorting**, **and mapping** efficiently on large datasets.
- Learn Comparator and method references to simplify object comparisons for sorting.
- Apply **grouping and aggregation functions** using Collectors.groupingBy() and Collectors.maxBy() for processing categorized data.
- Gain hands-on experience in computing **statistical values** like the **average** from a dataset using mapToDouble() and average().
- Improve **code efficiency and readability** by using **functional programming** techniques in Java.