

# Assignment 1

CSC2001F

Chris Scheepers

SCHCHR077

8 March 2024

## **Object-Orientated Design**

My object-oriented design was fairly simple as I only created one class for the array version of the assignment (the main class) and I only imported the following:

```
import java.util.Arrays;

import java.util.Scanner;

import java.io.BufferedReader;

import java.io.FileReader;

import java.io.IOException;
```

I saw no need to create more classes for as there was no need to overcomplicate the program. There was no need to encapsulate functions within the program as the functions were unique to the array version and could not be implemented in the BST version of this code.

My reasoning behind implementing these classes is quite simple as I needed the “Arrays” class to create my arrays and the “Scanner” class to read input. As The “BufferedReader” class is used for efficient reading of characters from an input stream and buffers the input, it allowed me to read larger chunks of data at once rather than one character at a time. This significantly improves performance, especially when reading from large files. So, this in conjunction with “FileReader” allowed me to read lines of text from a file and buffering it for efficient reading of lines using the readLine() method. Upon researching methods on the internet, it was apparent that this approach is often preferred over directly reading from FileReader because it provides higher-level functionality and better performance. Finally, I implemented the “IOException” class purely as a catch mechanism just in case the program encountered an error during the reading of the file.

Furthermore, my object-oriented design for the Binary Search Tree version of this assignment was also rudimentary as I only created a “TreeNode”, “BinarySearchTree” and main class. I imported the following:

```
import java.io.File;

import java.io.FileNotFoundException;

import java.util.Scanner;
```

I implemented the nodes (“TreeNode”) and binary search tree (“BinarySearchTree”) as classes for code organization and abstraction as there was no need for the main class to be overcomplicated and excessively large, making it harder to logically understand the code and to later debug. Furthermore, it made sense to make these into classes as I am sure I will use these classes in later projects.

The reasoning behind importing these classes is similar to the array version of this program as the BST version of the program and the array version handle file input differently, which is why they have different import statements. I used the “File” and “FileNotFoundException” approach as it was suitable for reading files line by line, which is necessary when constructing the BST by inserting data from the file.

## Test Values

While testing, I tried to:

- First cycle through the entire program as intended.
- Randomly go through options in the program (e.g. inputs = 1,3,4,2).
- Give inputs that are not in the knowledge base.
- Tried various inputs that would break the program or give unexpected outputs.

The test outputs for the **array** version are as follows:

```
schchr077@PC:~/CSC2001F/CSC2001F/Assignment 1$ make runArray
java -classpath bin GenericsKbArrayApp
```

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 2

Knowledge base has not been loaded yet.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 1

Enter file name: GenericsKB.txt

Knowledge base loaded successfully.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 2

Enter the term: redwood trees

Enter the statement: Redwood trees are very tall.

Enter the confidence score: 0.8

Statement for term redwood trees has been updated.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 3

Enter the term to search: redwood trees

Statement found: Redwood trees are very tall. (Confidence score: 0.8)

Enter your choice: 4

Enter the term: albatross

Enter the statement to search for: sdsad

Term and statement: "albatross" and "sdsad" not found in the knowledge base.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 3

Enter the term to search: adfdg

Term "adfdg" not found in the knowledge base.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term

4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 4

Enter the term: part

Enter the statement to search for: Parts are concepts.

The statement was found and has a confidence score of 1.0.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 3

Enter the term to search: police

Statement found for police car: Police cars are cars. (Confidence score: 1.0)

Statement found for round rock police: Round rock police have cases. (Confidence score: 1.0)

Statement found for city police: City police work with police. (Confidence score: 1.0)

Statement found for police: Police arrest men. (Confidence score: 1.0)

Statement found for military police: A military police is a personnel (Confidence score: 1.0)

Statement found for state police officer: State police officers have duties. (Confidence score: 1.0)

Statement found for police investigation: Police investigations reveal answers. (Confidence score: 1.0)

Statement found for police station: Police stations are stations. (Confidence score: 1.0)

Statement found for italian police: Italian police arrest men. (Confidence score: 1.0)

Statement found for police sergeant: Police sergeants receive phone calls. (Confidence score: 1.0)

Statement found for indiana state police detective: Indiana state police detectives investigate death. (Confidence score: 1.0)

Statement found for police department: A police department is a local department (Confidence score: 1.0)

Statement found for police chief: A police chief is a policeman (Confidence score: 1.0)

Statement found for police constable: A police constable is a policeman (Confidence score: 1.0)

Statement found for police van: A police van is a van (Confidence score: 1.0)

Statement found for police dog: A police dog is a dog (Confidence score: 1.0)

Statement found for state police: State police provide protection. (Confidence score: 1.0)

Statement found for police agency: Police agencies take actions. (Confidence score: 1.0)

Statement found for campus police: Campus police are security services.  
(Confidence score: 1.0)

Statement found for police work: Police work is jobs. (Confidence score: 1.0)

Statement found for police force: Police forces are capable of arm officers.  
(Confidence score: 1.0)

Statement found for local police: Local police have people. (Confidence score: 1.0)

Statement found for police state: A police state is tyranny (Confidence score: 1.0)

Statement found for foster city police: Foster city police use dogs. (Confidence score: 1.0)

Statement found for police academy: Police academies are films. (Confidence score: 1.0)

Statement found for police officer: Police officers are humans. (Confidence score: 1.0)

Statement found for houston police: Houston police deal with similar incidents.  
(Confidence score: 1.0)

Statement found for police cruiser: A police cruiser is a car (Confidence score: 1.0)

Statement found for many police agency: Many police agencies take actions.  
(Confidence score: 1.0)

Statement found for police detective: Police detectives work on cases. (Confidence score: 1.0)

Statement found for uniform police officer: Uniform police officers respond to calls. (Confidence score: 1.0)

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 5

The test outputs for the **Binary Search Tree** version are as follows:

```
schchr077@PC:~/CSC2001F/CSC2001F/Assignment 1$ make runBST
mkdir -p bin
javac -d bin -sourcepath src src/GenericsKbArrayApp.java
java -classpath bin GenericsKbBSTApp
```

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 2

Knowledge base has not been loaded yet.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 1

Enter file name: GenericsKB.txt

Knowledge base loaded successfully.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 2

Enter the term: ice cream

Enter the statement: Ice cream is made from milk.

Enter the confidence score: 1

Statement for term ice cream has been updated.

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 3

Enter the term to search: ice cream

ice cream	Ice cream is made from milk.	1
ice cream	Ice cream is mixture.	1.0

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: asdf

Choose an action from the menu:

1. Load a knowledge base from a file



2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 4

Enter the term: police

Enter the statement to search for: Police arrest men.

Statement found: Police arrest men. (Confidence score: 1.0)

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 3

Enter the term to search: police

police	Police arrest men.	1.0	
police academy	Police academies are films.	1.0	
police agency	Police agencies take actions.	1.0	
police car	Police cars are cars.	1.0	
police chief	A police chief is a policeman	1.0	
police constable	A police constable is a policeman	1.0	
police cruiser	A police cruiser is a car	1.0	
police department	A police department is a local department	1.0	
police detective	Police detectives work on cases.	1.0	
police dog	A police dog is a dog	1.0	
police force	Police forces are capable of arm officers.	1.0	
police investigation	Police investigations reveal answers.	1.0	
police officer	Police officers are humans.	1.0	
police sergeant	Police sergeants receive phone calls.	1.0	
police state	A police state is tyranny	1.0	
police station	Police stations are stations.	1.0	
police van	A police van is a van	1.0	
police work	Police work is jobs.	1.0	

Choose an action from the menu:

1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit

Enter your choice: 5

## **Creativity**

There are various things I implemented into my code that I believe went above and beyond the assignment criteria. Along with general good coding practices, I added catch statements and other safeguards to make sure the program doesn't crash when interacting with files. Furthermore, I implemented arrays that are the exact size of the dataset of the text file loaded that increases as more statements are added. Finally, for both the array and BST versions, I improved the search function to pick up single whole words in multiword terms. E.g. the term "police" will find "police", "mountain police", "uniform police officer", "police van" etc. but not "policeman" or "policewoman".

## **Git Log**

//beginning of file

Date: Sun Mar 3 20:43:52 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit fa7ce5316d19db10405a9bc7dfc2633ead791f38

Changed File Name and added main argument

Date: Sun Mar 3 20:51:05 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 577b20cb4ff7897dd8a35b97486312fbeb13bdef

Method to get text file size is created

Date: Sun Mar 3 21:09:02 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit be78c7cd290c35547d39d9a82be17f3ce9e6cae2

Array contains all lines from text file

Date: Sun Mar 3 21:15:52 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 7ad548bb6273a68ae4844c59320b706ba3b91b51

Added scanner functionality

Date: Sun Mar 3 21:31:00 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit fc41fb3a0176c30b8e1eda1106e9641528ed002b

Added functionality to Option 1 and 2 for the Generics search

Date: Sun Mar 3 22:01:12 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 034f10e7b53773e5d86dca0fe3bd81390618c7a9

finished array appendage functionality

Date: Sun Mar 3 22:22:26 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 9c2a4ce75b624cfdcc73c619fc8dfa973af05af9

Finished option 3 functionality (Search Generics)

Date: Sun Mar 3 22:39:13 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 047cc636e817dafdd7bd3c15b284a17e53b9677d

Option 4 functionality complete (Search by Term and Statement)

Date: Mon Mar 4 16:22:04 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 83df21eef941a7399dc2a0c91a225d0e1974e845

Completed the option 1-5 completely and added quality of life improvements.

Date: Mon Mar 4 17:32:29 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 2e4bf1768866af5beca781a3eea25dbcd55c5e53

Implemented a BST

//end of file

Date: Wed Mar 6 11:13:05 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 3346d5518ed4b49859c1e11ffc17a145aece6e21

Updated Option 4 Functionality

Date: Wed Mar 6 11:22:21 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 0abec3420c81e78e88145a91b80453885e5cf644

Added error messages and formatted output messages.

Date: Wed Mar 6 11:51:55 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 62061b4d08c4fae943ef1b21e78aa09af349bea0

Formatting changes

Date: Wed Mar 6 11:58:58 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 621ffc8da04a32ea437ed52b25a5188916a20a71

Made Makefile

Date: Wed Mar 6 12:06:03 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit fa7cef004ec58fd3134534fa4dd7729275f95829

Added a Makefile

Date: Wed Mar 6 12:42:34 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit f2407b933786c419f3b41c8a3aaca5568762b8e5

Fixed Git issues, finished the Makefile and added a Javadoc

Date: Wed Mar 6 12:58:53 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 90ca886426ea0b9ccc277608e8927b228feb83fd

Got rid of redundant files

Date: Wed Mar 6 13:05:26 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 633cb20c6cafb887041930199282e463634c24a7

Finished coding the makefile. Added different run commands for the Array and BST version of the app.

Date: Thu Mar 7 09:21:21 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit c5d0d636d66e27869ee663ab12c11d4b156a7a89

Fixed search by term in the array app (was getting partial matches)

Date: Fri Mar 8 09:58:29 2024 +0200  
Author: skippy <schchr077@myuct.ac.za>  
commit 5c43a62f2689df86cfe8cc59b60dbea0af0ffd52

formatting changes