

CSC2001F | Assignment 1 - Binary Search Trees

VSTJAL001

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About The Project

This is an introductory Data Structures and Algorithms assignment to test, analyse and demonstrate the efficiency of a traditional array against a binary search tree, specifically the number of operations it takes to insert and lookup data in these respective data structures.

Built With

- [Java 11](#) - Implementation of the Data Structures and Algorithms
- [Python 3.10](#) - Automating processes and analysing the data
 - [Pandas](#)
 - [Seaborn](#)
 - [Matplotlib](#)
 - [Numpy](#)

Getting Started

Make sure to always run commands from the project directory

Prerequisites

- A unix-based operating system
- Java 11+
- Python 3.8+

Installation

To run the Python scripts, it's recommended to use a virtual environment to be able to use the additional packages as to not install them in your global environment.

- Create the virtual environment, activate the virtual environment (from the project root), install the required packages

```
make install-venv
```

- For manual installation (tested on Arch Linux, for ubuntu see the end of the README)

```
python3 -m venv scripts/venv  
source scripts/venv/bin/activate  
pip install -r scripts/requirements.txt (or pip3)
```

Usage

General

- Compiling all your classes

```
make
```

- Removing all classes

```
make clean
```

- Clean project results

```
make clean-data
```

- Generate documentation for Java source code

```
make doccer
```

- Clean documentation

```
clean docs
```

Part 1

Running the VaccineArrayApp and VaccineBSTApp for Part 1 of the assignment

- For providing manual input

```
make run-array IN=input/vaccinations.csv
make run-bst IN=input/vaccinations.csv
```

- For redirecting input data

```
make run-array IN=input/vaccinations.csv < input/test_set_1.txt
make run-bst IN=input/vaccinations.csv < input/test_set_3.txt
```

- To automate the process, this runs all three tests in the `input/` directory and exports the command line output to `output/part_1/`

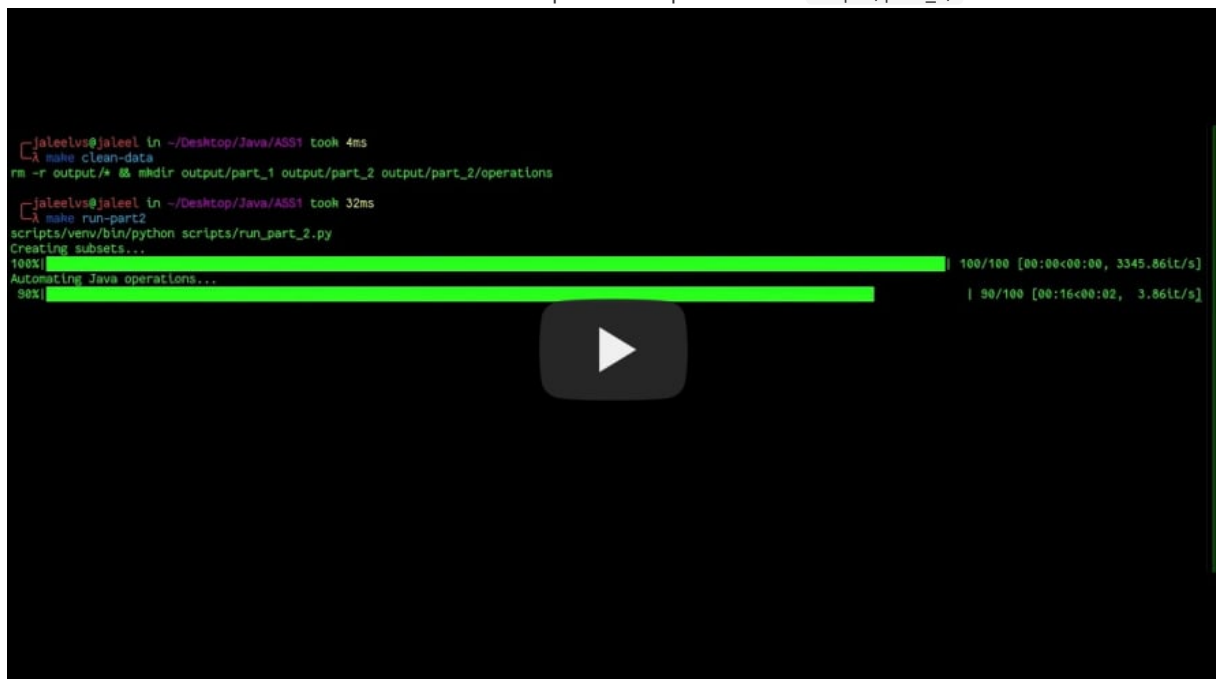
```
make run-part1
```

Part 2

To automatically run the experiment

```
make run-part2
```

- Creates 10 random subsets of $n = (991, 1982, \dots, 9910)$ and exports it to `input/`
- Runs the VaccineArrayApp and VaccineBSTApp for all 10 subsets
- Exports results to `output/part_2/operations`
- Analyses and summarises data to find the minimum, maximum and average for each of the insertion operations and the lookup operations and exports these results to `output/part_2/`
- Uses the data from summaries to create tables and line plots and exports them to `output/part_2/`



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- Hussein Suleman (My Computer Science professor for Data Structures and Algorithms)

Ubuntu python venv installation

For installation of pip

```
sudo apt-get install -y python3-pip
```

Additional packages to make your environment more consistent

```
sudo apt-get install build-essential libssl-dev libffi-dev python-dev
```