CPSC 535 Advanced Algorithms

Project 2: It's a small world

Instructor: Prof. Doina Bein

Submission date: 9th December 2022

Janhvi Guha
[885186973]
jguha@csu.fullerton.edu

Divyansh Mohan Rao
[885191403]
divyanshrao@csu.fullerton.edu

Summary

This project has been implemented using python 3.8.2. We installed python from https://www.python.org/downloads/. We used visual studio code as our IDE. The code is expecting an input cast text file, each input should be of the format- the first line should be the number of casts, followed by comma-separated names of the cast in each new line. The expected output is if there is the shortest connection between cast0 and cast1 or if not if then give the mutual actors list number.

Pseudocode

For each input,

check if cast[0] and cast[1] have any same actor,

return shortest path=1 and same actor(s) name(s}

else check for each input i, in range (2, number of casts).

check if there is an intersection between i^{th} cast, cast 0 and ith cast, cast 1

return shortest path = 2 and cast list

return shortest path > 2 or no connection

How to execute code

To execute code, we need to navigate to the code directory, which in this case is *Users/JanhviGuha/Desktop/project2*, and then execute the code in the terminal using the command *python3 smallWorldCast.py* and then provide all the required inputs in order to get output.

Code

```
def getConnections(cast):
  try:
    # check if the first two casts have any actors in common
    if set(cast[0]) & set(cast[1]):
      intersect = set(cast[0]) & set(cast[1])
      outputtext =""
      if len(intersect) == 1:
        outputtext = "actor"
      else:
        outputtext = "cast"
      # if so return the intersection
      return f'Shortest Connection = 1, {outputtext} = {set(cast[0]) & set(cast[1])}'
    else:
      # else for each remaining cast i, check if there is any intersection between cast 0 and i and
cast 1 and i
      for i in cast:
        if set(cast[0]) & set(i) and set(cast[1]) & set(i):
          return f'Shortest connection = 2, cast = {set(i)}'
      return f'shortest connection > 2 or no connection'
  except:
    return "Something went wrong please try again by refining the inputs accoring to the
constraints"

if __name__ == "__main__":
  # please provide input in the input cast text file, each input should be of the following format,
  # first line should be the number of casts , followed by comma separeted names of the cast in
each new line
  file = open('inputcast.txt')
  while True:
    # read the number of casts for first example
    numberOfCasts = file.readline()
    cast = []
    if numberOfCasts:
      # create a 2D array for storing each casts
      cast = [[]] * int(numberOfCasts)
      for i in range(int(numberOfCasts)):
        # read new cast on new line and separte them based on comma ","
        cast[i] = list(map(str.strip,file.readline().lstrip().split(',')))
      # for each input example call the getConnection function and print the resuly
```

```
        print(getConnections(cast))
    else:
        break
```

Time Complexity

The time complexity of this algorithm is asymptotically O(n+m) where n is the number of casts and m is the number of actors in the cast. For taking the input, the for loop in the __main__ function will run for the number of casts for each input, and then the for loop in the getConnection function will run for n times in the worse case.

Space complexity

The space complexity of this algorithm will be number of casts(n) * number of actors in the cast (m),i.e., O(nm)

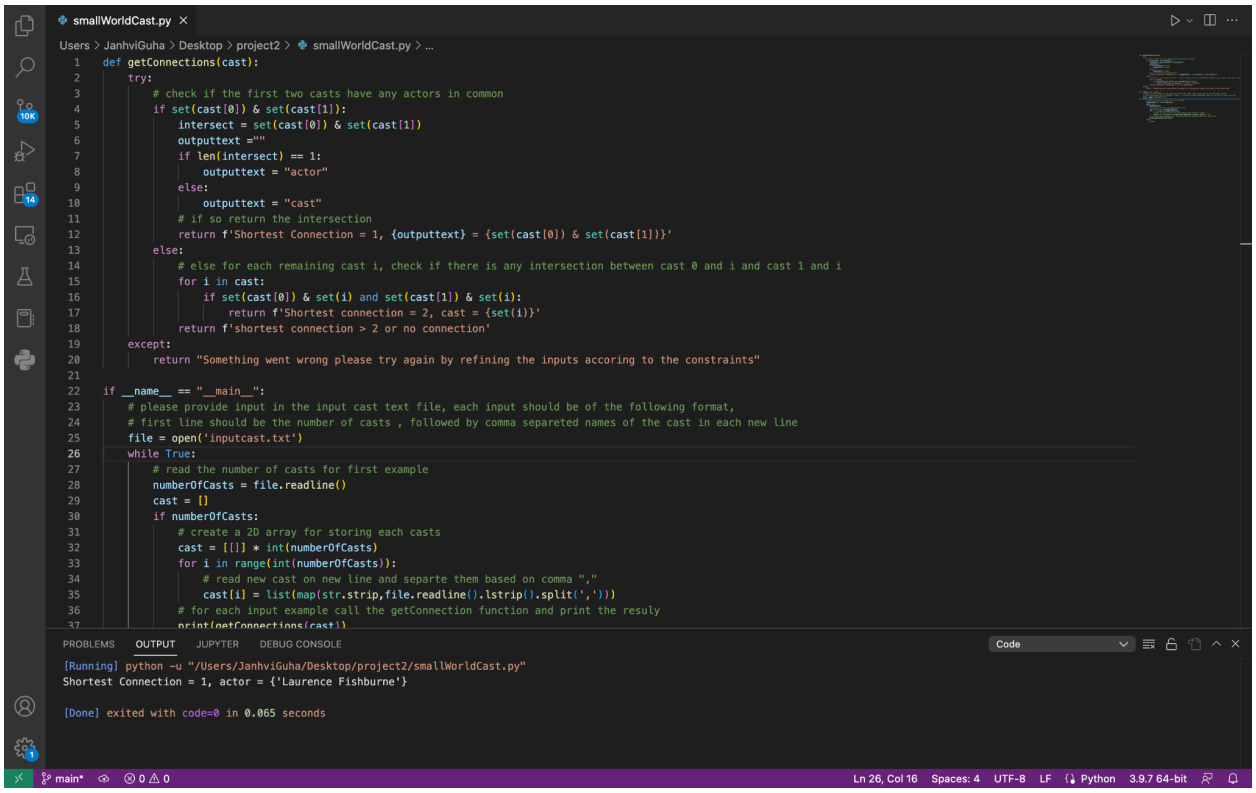
Test Cases

Case 1:

Input:

```
6
Carrie-Anne Moss, Gloria Foster, Hugo Weaving,Joe Pantoliano,Keanu Reeves, Laurence Fishburne, Marcus Chong
Andre Braugher, Beau Garrett, Chris Evans, Doug Jones, Ioan Gruffudd, Jessica Alba, Julian McMahon, Kerry Washington, Laurence Fishburne, Michael Chiklis
Ewan McGregor, Ian McDiarmid, Jake Lloyd, Liam Neeson, Natalie Portman
Geoffrey Rush,  Jack Davenport, Johnny Depp, Jonathan Pryce, Keira Knightley, Orlando Bloom
Angela Bassett, Chadwick Boseman, Danai Gurira, Daniel Kaluuya, Forest Whitaker, Letitia Wright, Lupita Nyong'o, Martin Freeman, Michael B. Jordan, Sterling K. Brown, Winston Duke
Andrew Borba, Anne Hathaway, Bill Irwin, Casey Affleck,  Collette Wolfe, David Oyelowo, Francis X. McCarthy, Jessica Chastain, John Lithgow, Matthew McConaughey, Michael Caine, Wes Bentley, William Devane
```

Output:

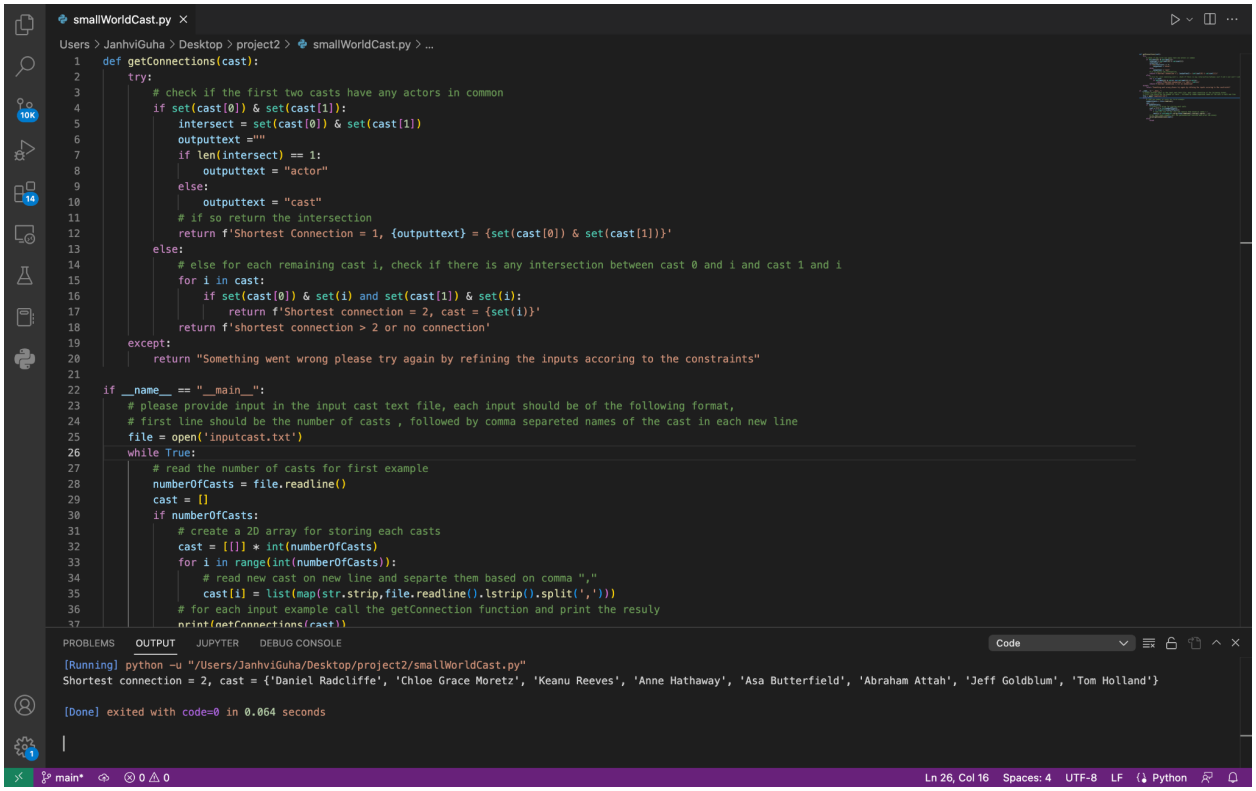


Case 2:

Input:

```
7
Carrie-Anne Moss, Gloria Foster, Hugo Weaving, Joe Pantoliano,Keanu Reeves, Laurence Fishburne,
Marcus Chong
Andrew Borba, Anne Hathaway, Bill Irwin, Casey Affleck,  Collette Wolfe, David Oyelowo, Francis X.
McCarthy, Jessica Chastain, John Lithgow, Matthew McConaughey, Michael Caine, Wes Bentley, William
Devane
Geoffrey Rush,  Jack Davenport, Johnny Depp, Jonathan Pryce, Keira Knightley, Orlando Bloom
Angela Bassett, Chadwick Boseman, Danai Gurira, Daniel Kaluuya, Forest Whitaker, Letitia Wright,
Lupita Nyongo, Martin Freeman, Michael B. Jordan, Sterling K. Brown, Winston Duke
Abraham Attah, Asa Butterfield,Anne Hathaway, Chloe Grace Moretz, Daniel Radcliffe, Jeff Goldblum,
Keanu Reeves, Tom Holland
Andre Braugher, Beau Garrett, Chris Evans, Doug Jones, Ioan Gruffudd, Jessica Alba, Julian McMahon,
Kerry Washington, Laurence Fishburne, Michael Chiklis
Ewan McGregor, Ian McDiarmid, Jake Lloyd, Liam Neeson, Natalie Portman
```

Output:



Case 3:

Input:

```
7
Ewan McGregor, Ian McDiarmid, Jake Lloyd, Liam Neeson, Natalie Portman
Andrew Borba, Anne Hathaway, Bill Irwin, Casey Affleck,  Collette Wolfe, David Oyelowo, Francis X. McCarthy, Jessica Chastain, John Lithgow, Matthew McConaughey, Michael Caine, Wes Bentley, William Devane
Geoffrey Rush,  Jack Davenport, Johnny Depp, Jonathan Pryce, Keira Knightley, Orlando Bloom
Angela Bassett, Chadwick Boseman, Danai Gurira, Daniel Kaluuya, Forest Whitaker, Letitia Wright, Lupita Nyongo, Martin Freeman, Michael B. Jordan, Sterling K. Brown, Winston Duke
Abraham Attah, Asa Butterfield,Anne Hathaway, Chloe Grace Moretz, Daniel Radcliffe, Jeff Goldblum, Keanu Reeves, Tom Holland
Andre Braugher, Beau Garrett, Chris Evans, Doug Jones, Ioan Gruffudd, Jessica Alba, Julian McMahon, Kerry Washington, Laurence Fishburne, Michael Chiklis
Carrie-Anne Moss, Gloria Foster, Hugo Weaving, Joe Pantoliano,Keanu Reeves, Laurence Fishburne, Marcus Chong
```

Output: