King Abdul-Aziz University
Faculty of Computing and Information Technology
Computer Science Department
Artificial Intelligence I – CPCS-331 | Fall 2023

Path Assistant At FCIT

Instructor: Ms. Noha Alnahdi

Hands in Date

October 22th, 2022

Project Team:

Name	ID	Section
Razan Arif Alamri		**B3A**
Shatha Khalid Binmahfouz		

Task Assignment

Tasks Performed for This Project:

- Gathering information about introduction.
- Writing introduction.
- Gathering information about Knowledge base.
- Writing Knowledge base.
- Writing techniques used to acquire knowledge from system.
- Create system flowchart.
- Code implementation.

Team Member's Contribution:

Team Member	Contribution
Razan Arif Alamri	**All tasks**
Shatha Khalid Binmahfouz	

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1. Introduction

1.1 Purpose of The Chosen Expert System

The purpose of our export system is to facilitate for students in the faculty of computing and information technology (FCIT) at King Abdulaziz University (KAU) to choose the right path of their university major either is Computer Science (CS), Information Technology (IT) or Information Systems (IS) by knowing their tendencies in the field of computers by asking the students multiple questions and choosing the right path of major that matches with their answers.

The performance will be less than expected due to not entering the appropriate path so the system will help students to choose the right path to avoid wasting time, effort, and thinking over much about choosing the right path.

1.2 Users of The System

- Students of FCIT
- Academic advisors

1.3 Expert(s) of The System

Determine the student’s path in FCIT based on their major and tendencies in the path of their department.

1.4 Resources

The official FCIT website includes a complete definition of the college's majors, study plans, and identification of study paths by communicating with the academic advisors in the college to identify the most important characteristics and requirements of each study path.

2. Program Implementation Idea

2.1 Knowledge Base: A List of Rules

1. If the student responds with the following answers:
    - Specialized in CS.
    - Interested in keeping up with technological advancements and new technologies.
    - Interested in analyzing data and predicting future information.
    - Have a good background in mathematics and algorithms.

Then the student path will be Intelligent Systems.

2. If the student responds with the following answers:
    - Specialized in CS.
    - Have Analytical skills (the ability to analyze complex data).
    - Knowledge of network protocols.
    - Knowledge of IoT (Internet Of Things).

Then the student path will be Computer Network.

3. If the student responds with the following answers:
    - Specialized in CS.
    - Knowledge of data structures and algorithms.
    - Have skills in Object-oriented programming (OOP) languages.
    - Interested in text editors (editors include: Visual Studio Code Sublime Text).

Then the student path will be Advanced Programming.

4. If the student responds with the following answers:
    - Specialized in IT.
    - Interested in web and mobile application development.
    - Have knowledge of database management system such as (My SQL and Oracle).
    - Have skills on Database Designing.

Then the student path will be Database.

5. If the student responds with the following answers:
    - Specialized in IT.
    - Knowledge of system design and implementation.
    - Interested in network support and administration.
    - Knowledge of database systems, website design and management.

Then the student path will be integrated Information Technology.

6. If the student responds with the following answers:
    - Specialized in IS.
    - Have the ability to analyze deep data by using (Models, diagrams, and Maps).
    - Knowledge of data collection and classification.
    - Have the ability to make quick and accurate decisions.

Then the student path will be Decision Support Systems.

7. If the student responds with the following answers:
    - Specialized in IS.
    - Have communication skills.
    - Interested in data processing.
    - Knowledge of Problem-solving and critical thinking.

Then the student path will be Development Of Electronic Systems.

2.2 Techniques Used to Acquire Knowledge From System

In this project we build the system using Backward Chaining technique by Python programming language. Backward chaining is a concept in artificial intelligence that involves backtracking from the endpoint or goal to steps that led to the endpoint.(5)

For example, in our system:

A- Sara is specialized in CS.
B- Sara has Analytical skills.
C- Sara has knowledge of network protocols.
D- Sara has knowledge of IoT (Internet Of Things).
E- If a student is CS and has (Analytical skills, knowledge of network protocols and knowledge of network protocols), the suggested path for him will be Computer Network.

Then F- Sara's suggested path Computer Network.

2.3 System's Flowchart (Diagram)

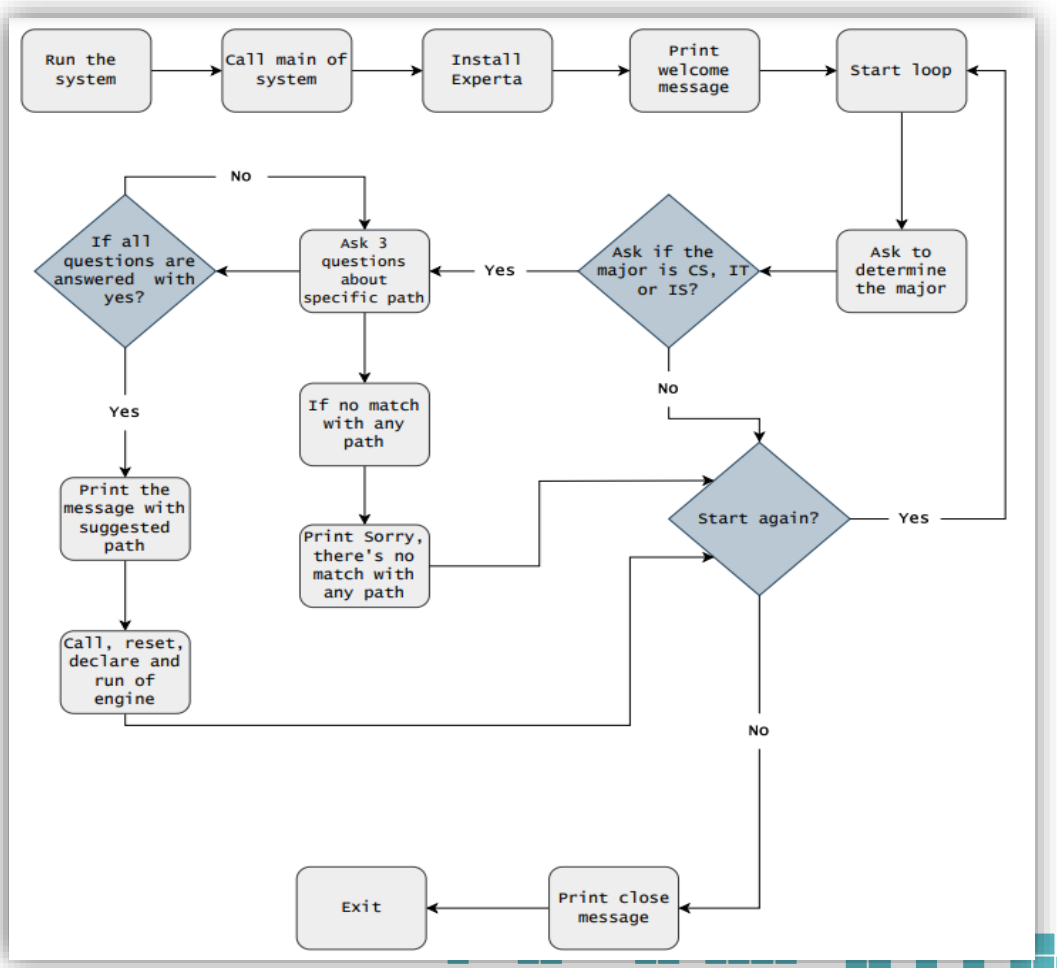

Figure 1: *System Flowchart*

3. References

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5. *Mbaabu, O. (2020, November 25). Forward and backward chaining in Artificial Intelligence. Section. Retrieved October 22, 2022, from https://www.section.io/engineering-education/forward-and-backward-chaining-in-ai/*

6. *Tools & Resources. University of South Carolina. (n.d.). Retrieved October 22, 2022, from https://sc.edu/study/majors_and_degrees/integrated_information_technology.php*

7. *It degrees & careers: How to work in it. LearnHowToBecome.org. (2022, July 17). Retrieved October 22, 2022, from https://www.learnhowtobecome.org/computer-careers/it/*

4. Appendix

4.1 Source Code

```
! pip install experta
from experta import *

# The Facts From Our Project
class Path_CS(Fact):
  """Info about the CS Path."""
  pass

class Path_IT(Fact):
  """Info about the IT Path."""
  pass

class Path_IS(Fact):
  """Info about the IS Path."""
  pass

# The Rule From Our Project
class PathKE(KnowledgeEngine):

  # The Ruls for CS major
  @Rule(AND(Path_CS(has=('keeping up with technological advancements & new technologies')), P
ath_CS(has=('analyzing data & predicting future information')), Path_CS(has=('good background
 in mathematics and algorithms'))))
  def suggested_Path1(self):
    print("\nThe suggested path for you is Intelligent Systems\n")

  @Rule(AND(Path_CS(has=('analyze complex data')), Path_CS(has=('Knowledge of network protoco
ls')), Path_CS(has=('Knowledge of IoT'))))
  def suggested_Path2(self):
    print("\nThe suggested path for you is Computer Network\n")

  @Rule(AND(Path_CS(has=('Data structures and algorithms')), Path_CS(has=('Object-
oriented programming (OOP) languages')), Path_CS(has=('Text editors'))))
  def suggested_Path3(self):
    print("\nThe suggested path for you is Advanced Programming\n")

  # The Ruls for It major
  @Rule(AND(Path_IT(has=('interested in web and mobile application development')), Path_IT(ha
s=('knowledge on database management')), Path_IT(has=('skills in Database Designing'))))
```

```
  def suggested_Path4(self):
    print("\nThe suggested path for you is Database\n")

  @Rule(AND(Path_IT(has=('knowledge of system design and implementation')), Path_IT(has=('int
erest in network support and administration')), Path_IT(has=('knowledge of database systems,
website design and management'))))
  def suggested_Path5(self):
    print("\nThe suggested path for you is Integrated IT\n")

  # The Ruls for IS major
  @Rule(AND(Path_IS(has=('the ability to make quick and accurate decisions')), Path_IS(has=('
knowledge of data collection and classification')), Path_IS(has=('the ability to make quick a
nd accurate decisions'))))
  def suggested_Path6(self):
    print("\nThe suggested path for you is Decision support systems\n")

  @Rule(AND(Path_IS(has=('communication skills')), Path_IS(has=('interested in data processin
g')), Path_IS(has=('the ability to make quick and accurate decisions'))))
  def suggested_Path7(self):
    print("\nThe suggested path for you is Development of electronic systems\n")

##############################################################################################

# Print Welcome massege
print("-----------------------------------------------------------------------------------------")
print("-------                  Welcome to Path Assistant At FCIT                    -------")
print("-----------------------------------------------------------------------------------------")

# Loop to run the program until the user stops it
Start = 'yes'


while Start == 'yes':
  major = input("\nWhat is your university major (CS / IT / IS)? ").lower()
  print("")
  #match major:
  if(major=="cs"):

    #case 'CS':
        # For Intelligent Systems Path
        Answer = input("Do you have interest in keeping up with technological advancements an
d new technologies (yes / no)? ").lower()
        if Answer == 'yes' :
          Answer = input("Do you have interest in analyzing data & predicting future informat
ion (yes / no)? ").lower()
```

```
          if Answer  == 'yes' :
             Answer = input("Do you have a good background in mathematics and algorithms (yes
 / no)? ").lower()
             if Answer == 'yes' :
               engine = PathKE()
               engine.reset()
               engine.declare(Path_CS(has='keeping up with technological advancements & new t
echnologies'), Path_CS(has='analyzing data & predicting future information'), Path_CS(has='go
od background in mathematics and algorithms'))
               engine.run()
               Start = input("Do you want to start again (yes / no)? ").lower()
               # If user want to start again
               if(Start == 'no'):
                 break
               elif(Start == 'yes'):
                 continue

        # For Computer Network Path
        Answer = input("Do you have analytical skills (the ability to analyze complex data) (
yes / no)? ").lower()
        if Answer == 'yes' :
          Answer = input("Do you have Knowledge of network protocols (yes / no)? ").lower()
          if Answer  == 'yes' :
             Answer = input("Do you have Knowledge of IoT (Internet Of Things) (yes / no)? ")
.lower()
             if Answer == 'yes' :
               engine = PathKE()
               engine.reset()
               engine.declare(Path_CS(has='analyze complex data'), Path_CS(has='Knowledge of
network protocols'), Path_CS(has='Knowledge of IoT'))
               engine.run()
               # If user want to start again
               Start = input("Do you want to start again (yes / no)? ").lower()
               if(Start == 'no'):
                 break
               elif(Start == 'yes'):
                 continue

        # For Advanced Programming Path
        Answer = input("Do you have knowledge of data structures and algorithms (yes / no)? "
).lower()
        if Answer == 'yes' :
          Answer = input("Do you have skills in Object-
oriented programming (OOP) languages (yes / no)? ").lower()
          if Answer  == 'yes' :
```

```
            Answer = input("Do you have interest in text editors (editors include: Visual St
udio Code Sublime Text) (yes / no)? ").lower()
            if Answer == 'yes' :
              engine = PathKE()
              engine.reset()
              engine.declare(Path_CS(has='Data structures and algorithms'), Path_CS(has='Obj
ect-oriented programming (OOP) languages'), Path_CS(has='Text editors'))
              engine.run()
              # If user want to start agin
              Start = input("Do you want to start again (yes / no)? ").lower()
              if(Start == 'no'):
                break
              elif(Start == 'yes'):
                continue

        # If no match with any path
        if Answer == 'no' :
          print("\nSorry, there's no match with any path")
          # If user want to start again
          Start = input("Do you want to start again (yes / no)? ").lower()
          if(Start == 'no'):
            break
          elif(Start == 'yes'):
            continue

        print("")

#=============================================================================================
  elif(major=="it"):
    #case 'IT':

        # For Database Path
        Answer = input("Do you have an interest in web and mobile application development (ye
s / no)? ").lower()
        if Answer == 'yes' :
          Answer = input("Do you have knowledge on database management system such as (My SQL
, Oracle and Microsoft Access) (yes / no)? ").lower()
          if Answer  == 'yes' :
            Answer = input("Do you have skills in Database Designing (yes / no)? ").lower()
            if Answer == 'yes' :
              engine = PathKE()
              engine.reset()
              engine.declare(Path_IT(has='interested in web and mobile application developme
nt'), Path_IT(has='knowledge on database management'), Path_IT(has='skills in Database Design
ing'))
```

```
                engine.run()
                # If user want to start again
                Start = input("Do you want to start again (yes / no)? ").lower()
                if(Start == 'no'):
                  break
                elif(Start == 'yes'):
                  continue

        # For Integrated IT Path
        Answer = input("Do you have knowledge of system design and implementation (yes / no)?
 ").lower()
        if Answer == 'yes' :
          Answer = input("Do you have an interest in network support and administration (yes
/ no)? ").lower()
          if Answer  == 'yes' :
             Answer = input("Do you have knowledge of database systems, website design and ma
nagement (yes / no)? ").lower()
             if Answer == 'yes' :
               engine = PathKE()
               engine.reset()
               engine.declare(Path_IT(has='knowledge of system design and implementation'), P
ath_IT(has='interest in network support and administration'), Path_IT(has='knowledge of datab
ase systems, website design and management'))
               engine.run()
               # If user want to start again
               Start = input("Do you want to start again (yes / no)? ").lower()
               if(Start == 'no'):
                 break
               elif(Start == 'yes'):
                 continue

        # If no match with any path
        if Answer == 'no' :
           print("\nSorry, there's no match with any path")
           # If user want to start again
           Start = input("Do you want to start again (yes / no)? ").lower()
           if(Start == 'no'):
             break
           elif(Start == 'yes'):
             continue

        print("")


#=============================================================================================
```

```
  elif(major=="is"):
    #case 'IS':

        # For Decision support systems Path
        Answer = input("Do you have the ability to analyze deep data by using (Models, diagra
ms, and Maps) (yes / no)? ").lower()
        if Answer == 'yes' :
          Answer = input("Do you have Knowledge of data collection and classification (yes /
no)? ").lower()
          if Answer  == 'yes' :
             Answer = input("Do you have the ability to make quick and accurate decisions (ye
s / no)? ").lower()
             if Answer == 'yes' :
               engine = PathKE()
               engine.reset()
               engine.declare(Path_IS(has='the ability to make quick and accurate decisions')
, Path_IS(has='knowledge of data collection and classification'), Path_IS(has='the ability to
 make quick and accurate decisions'))
               engine.run()
               # If user want to start again
               Start = input("Do you want to start again (yes / no)? ").lower()
               if(Start == 'no'):
                 break
               elif(Start == 'yes'):
                 continue

        # For Development of electronic systems Path
        Answer = input("Do you have communication skills (yes / no)? ").lower()
        if Answer == 'yes' :
          Answer = input("Do you have an interest in data processing (yes / no)? ").lower()
          if Answer  == 'yes' :
             Answer = input("Do you have the ability to make quick and accurate decisions (ye
s / no)? ").lower()
             if Answer == 'yes' :
               engine = PathKE()
               engine.reset()
               engine.declare(Path_IS(has='communication skills'), Path_IS(has='interested in
 data processing'), Path_IS(has='the ability to make quick and accurate decisions'))
               engine.run()
               # If user want to start again
               Start = input("Do you want to start again (yes / no)? ").lower()
               if(Start == 'no'):
                 break
               elif(Start == 'yes'):
                 continue
```

```
        # If no match with any path
        if Answer == 'no' :
           print("\nSorry, there's no match with any path")
           # If user want to start again
           Start = input("Do you want to start again (yes / no)? ").lower()
           if(Start == 'no'):
             break
           elif(Start == 'yes'):
             continue

        print("")

#=============================================================================================
  else:
    #case default:

        print("Sorry, our system does not support this major")
        # If user want to start again
        Start = input("Do you want to start again (yes / no)? ").lower()
        if(Start == 'no'):
          break
        elif(Start == 'yes'):
          continue

####################################

####################################

# Print Close massege
print("\n-------------------------------------------------------------------------------------
")
print("-------              Thank You For Using Our System, Good Bye                 -------")
print("-------------------------------------------------------------------------------------")
```

4.2 Screenshots Of System

```
--------------------------------------------------------------------------------
-------                  Welcome to Path Assistant At FCIT                  -------
--------------------------------------------------------------------------------

What is your university major (CS / IT / IS)? CS

Do you have interest in keeping up with technological advancements and new technologies (yes / no)? yes
Do you have interest in analyzing data & predicting future information (yes / no)? yes
Do you have a good background in mathematics and algorithms (yes / no)? yes

The suggested path for you is Intelligent Systems

Do you want to start again (yes / no)? no

--------------------------------------------------------------------------------
-------              Thank You For Using Our System, Good Bye              -------
--------------------------------------------------------------------------------
```

Figure 2: *Screenshot of output 1*

```
--------------------------------------------------------------------------------
-------                  Welcome to Path Assistant At FCIT                  -------
--------------------------------------------------------------------------------

What is your university major (CS / IT / IS)? CT

Sorry, our system does not support this major
Do you want to start again (yes / no)? yes

What is your university major (CS / IT / IS)? Ai

Sorry, our system does not support this major
Do you want to start again (yes / no)? yes

What is your university major (CS / IT / IS)? IT

Do you have an interest in web and mobile application development (yes / no)? no
Do you have knowledge of system design and implementation (yes / no)? yes
Do you have an interest in network support and administration (yes / no)? yes
Do you have knowledge of database systems, website design and management (yes / no)? yes

The suggested path for you is Integrated IT

Do you want to start again (yes / no)? no

--------------------------------------------------------------------------------
-------              Thank You For Using Our System, Good Bye              -------
--------------------------------------------------------------------------------
```

Figure 3: *Screenshot of output 2*

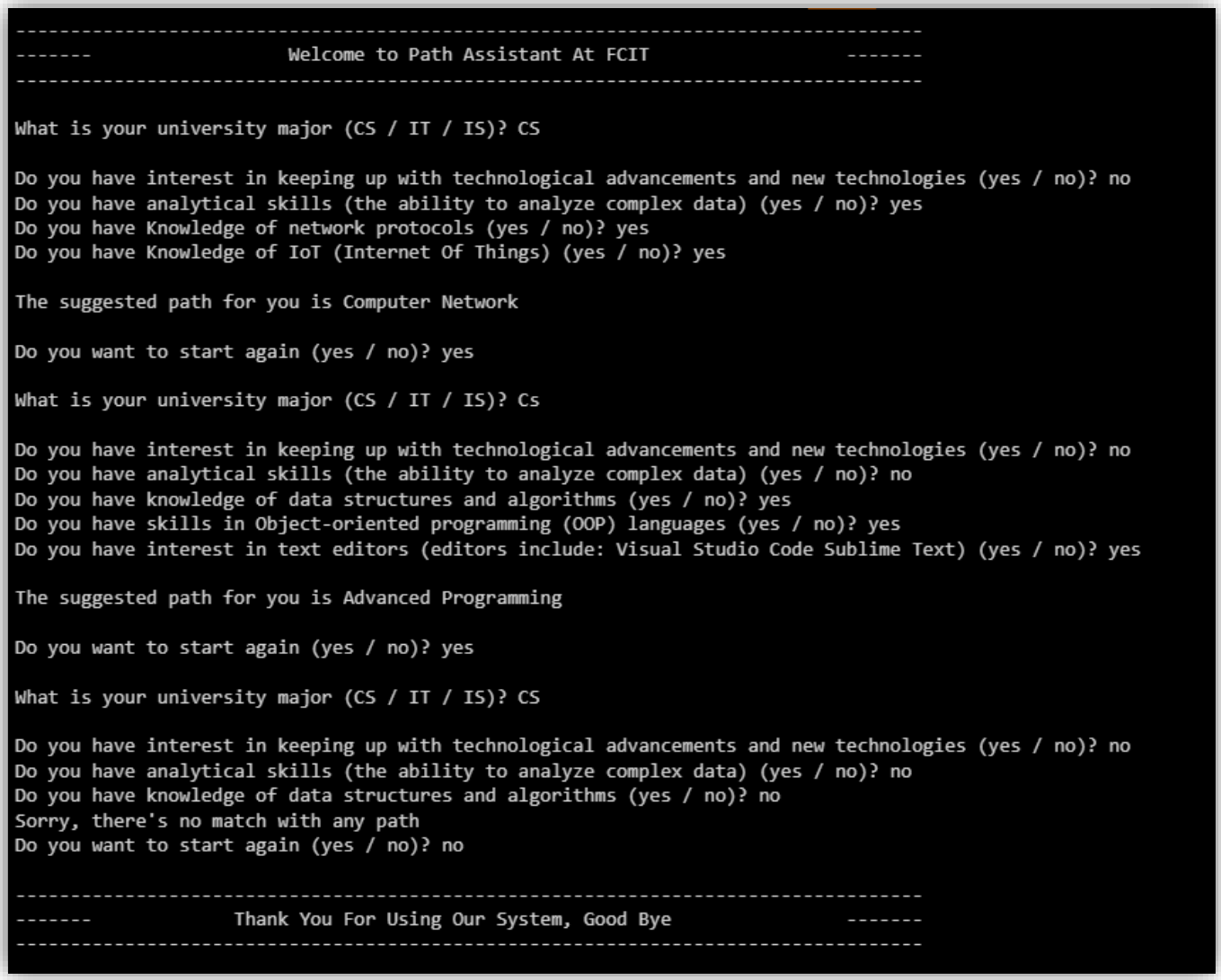

Figure 4: *Screenshot of output 3*

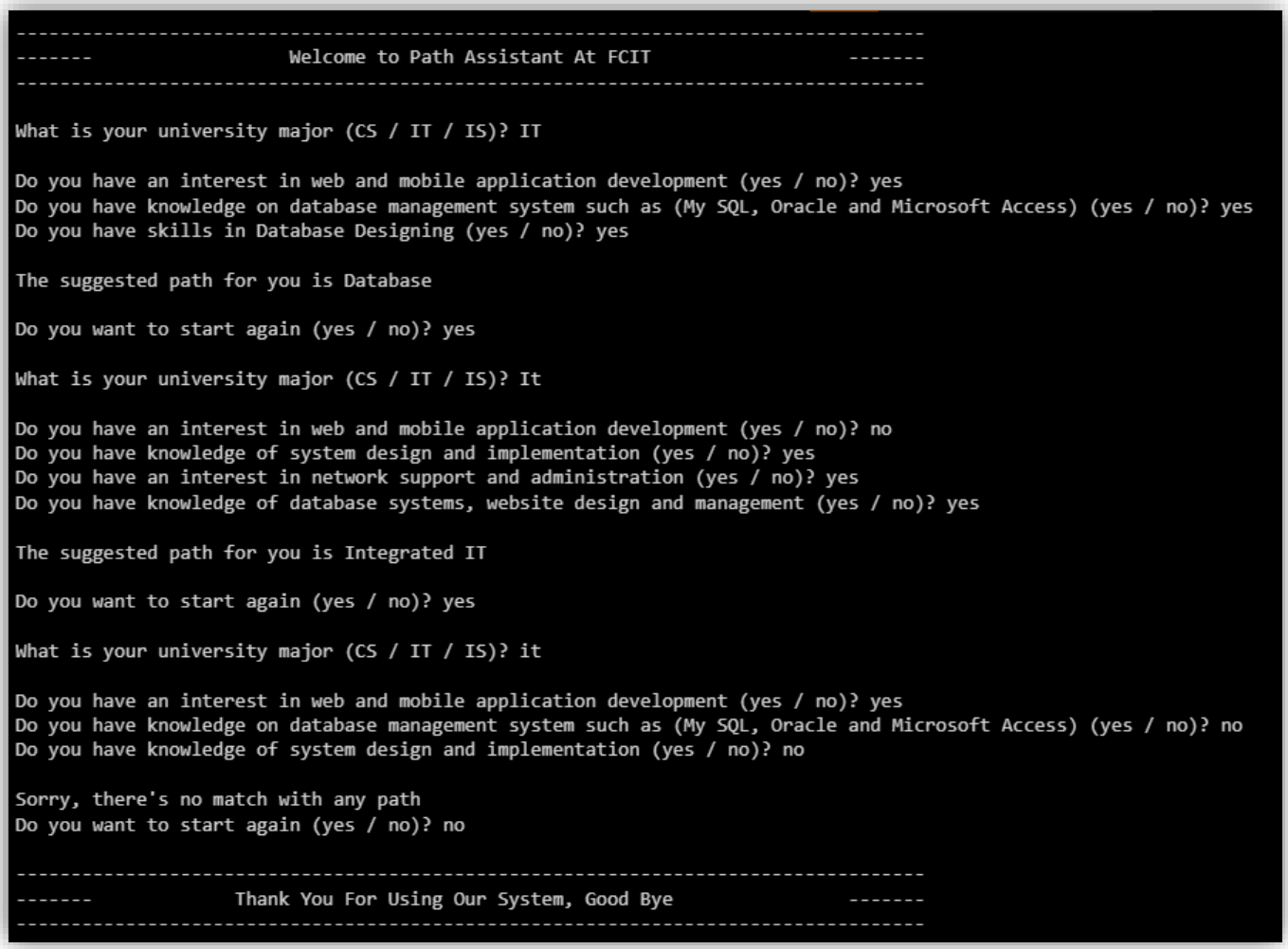

Figure 5: *Screenshot of output 4*

```
--------------------------------------------------------------------------------
-------                  Welcome to Path Assistant At FCIT                  -------
--------------------------------------------------------------------------------

What is your university major (CS / IT / IS)? IS

Do you have the ability to analyze deep data by using (Models, diagrams, and Maps) (yes / no)? yes
Do you have Knowledge of data collection and classification (yes / no)? yes
Do you have the ability to make quick and accurate decisions (yes / no)? yes

The suggested path for you is Decision support systems

Do you want to start again (yes / no)? yes

What is your university major (CS / IT / IS)? is

Do you have the ability to analyze deep data by using (Models, diagrams, and Maps) (yes / no)? no
Do you have communication skills (yes / no)? yes
Do you have an interest in data processing (yes / no)? yes
Do you have the ability to make quick and accurate decisions (yes / no)? yes

The suggested path for you is Development of electronic systems

Do you want to start again (yes / no)? yes

What is your university major (CS / IT / IS)? Is

Do you have the ability to analyze deep data by using (Models, diagrams, and Maps) (yes / no)? no
Do you have communication skills (yes / no)? yes
Do you have an interest in data processing (yes / no)? yes
Do you have the ability to make quick and accurate decisions (yes / no)? no

Sorry, there's no match with any path
Do you want to start again (yes / no)? no

--------------------------------------------------------------------------------
-------             Thank You For Using Our System, Good Bye               -------
--------------------------------------------------------------------------------
```

Figure 6: *Screenshot of output 5*