# Expert system

**A report**
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## Abstract

In recent decades IT and computer systems have evolved rapidly in economic informatics field. The goal is to create user friendly information systems that respond promptly and accurately to requests. Informatics systems evolved into decision assisted systems, and such systems are converted, based on gained experience, in expert systems for creative problem solving that an organization is facing.

Expert systems are aimed at rebuilding human reasoning on the expertise obtained from experts, stores knowledge, establishes links between knowledge, have the knowledge and ability to perform human intellectual activities. From the informatics development point of view, expert systems are based on the principle of the knowledge separation from the treating program. Expert systems simulate the human experts reasoning on knowledge available to them, multiply the knowledge and explain their own lines of reasoning

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# Chapter one: project introduction

## 1.1 Introduction

An expert system is a computer program that is designed to solve complex problems and to provide decision-making ability like a human expert. It performs this by extracting knowledge from its knowledge base using the reasoning and inference rules according to the user queries. The expert system is a part of AI, and the first ES was developed in the year 1970, which was the first successful approach of artificial intelligence. It solves the most complex issue as an expert by extracting the knowledge stored in its knowledge base. The system helps in decision making for compsex problems sing both facts and heuristics like a human expert. It is called so because it contains the expert knowledge of a specific domain and can solve any complex problem of that particular domain. These systems are designed for a specific domain, such as medicine, science, etc. The performance of an expert system is based on the expert's knowledge stored in its knowledge base. The more knowledge stored in the KB, the more that system improves its performance. One of the common examples of an ES is a suggestion of spelling errors while typing in the Google search box.

### 1.2.1 User Interface

With the help of a user interface, the expert system interacts with the user, takes queries as an input in a readable format, and passes it to the inference engine. After getting the response from the inference engine, it displays the output to the user. In other words, it is an interface that helps a non-expert user to communicate with the expert system to find a solution.
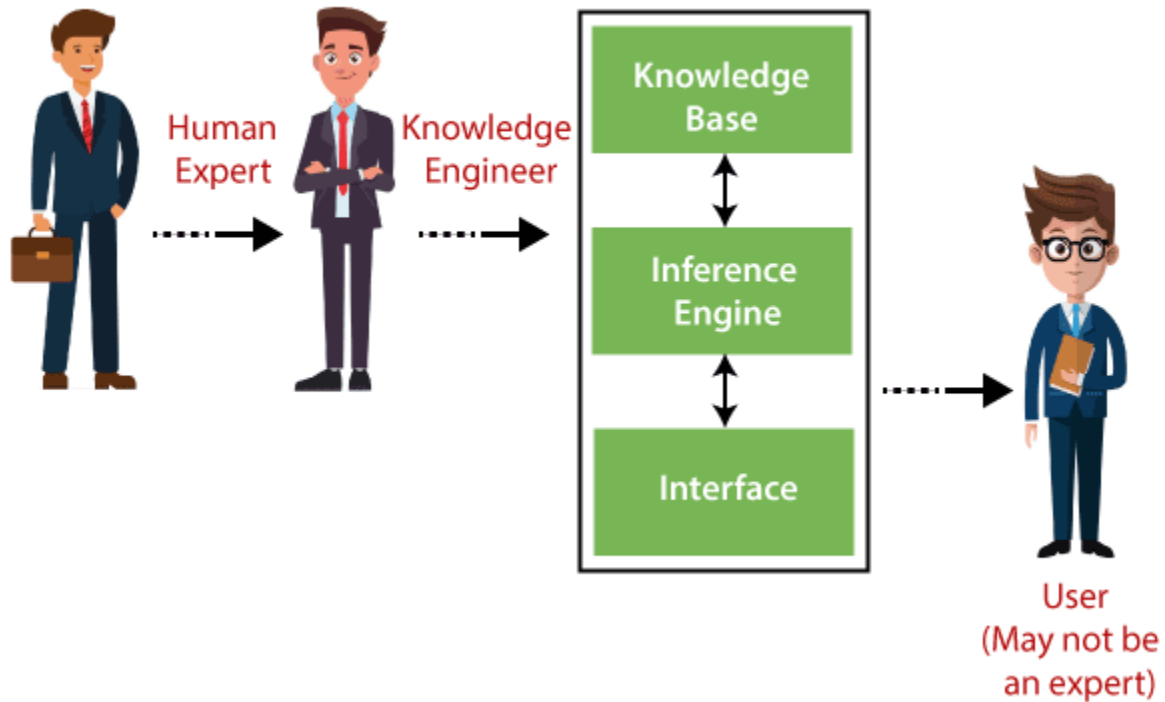
## 1.2.2 Inference Engine (Rules of Engine)

The inference engine is known as the brain of the expert system as it is the main processing unit of the system. It applies inference rules to the knowledge base to derive a conclusion or deduce new information. It helps in deriving an error-free solution of queries asked by the user.

With the help of an inference engine, the system extracts the knowledge from the knowledge base.

There are two types of inference engine:

**Deterministic Inference engine:** The conclusions drawn from this type of inference engine are assumed to be true. It is based on **facts** and **rules**.

**Probabilistic Inference engine:** This type of inference engine contains uncertainty in conclusions, and based on the probability.

Inference engine uses the below modes to derive the solutions:

**Forward Chaining:** It starts from the known facts and rules, and applies the inference rules to add their conclusion to the known facts.

**Backward Chaining:** It is a backward reasoning method that starts from the goal and works backward to prove the known facts.

## 1.2.3 Knowledge Base

The knowledgebase is a type of storage that stores knowledge acquired from the different experts of the particular domain. It is considered as big storage of knowledge. The more the knowledge base, the more precise will be the Expert System.

It is similar to a database that contains information and rules of a particular domain or subject.

One can also view the knowledge base as collections of objects and their attributes. Such as a Lion is an object and its attributes are it is a mammal, it is not a domestic animal, etc.

**Components of Knowledge Base**

**Factual Knowledge:** The knowledge which is based on facts and accepted by knowledge engineers comes under factual knowledge.

**Heuristic Knowledge:** This knowledge is based on practice, the ability to guess, evaluation, and experiences.

**Knowledge Representation:** It is used to formalize the knowledge stored in the knowledge base using the If-else rules.

**Knowledge Acquisitions:** It is the process of extracting, organizing, and structuring the domain knowledge, specifying the rules to acquire the knowledge from various experts, and store that knowledge into the knowledge base.

### 1.3.1Applications of Expert System

**In designing and manufacturing domain**
It can be broadly used for designing and manufacturing physical devices such as camera lenses and automobiles.

**In the knowledge domain**
These systems are primarily used for publishing the relevant knowledge to the users. The two popular ES used for this domain is an advisor and a tax advisor.

**In the finance domain**
In the finance industries, it is used to detect any type of possible fraud, suspicious activity, and advise bankers that if they should provide loans for business or not.

**In the diagnosis and troubleshooting of devices**
In medical diagnosis, the ES system is used, and it was the first area where these systems were used.

**Planning and Scheduling**
The expert systems can also be used for planning and scheduling some particular tasks for achieving the goal of that task.

# Chapter two: Background

## 2.1 Methodology

## 2.1.1 Introduction

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques. A methodology does not set out to provide solutions— it is therefore, not the same as a method. Instead, a methodology offers the theoretical underpinning for understanding which method, set of methods, or best practices can be applied to a specific case, for example, to calculate a specific result. It has been defined also as follows: "the analysis of the principles of methods, rules, and postulates employed by a discipline" "the systematic study of methods that are, can be, or have been applied within a discipline"; "the study or description of methods (University of Bergen –May 2014).

## 2.1.2 Why is needed?

If you are doing research, then you have a methodology even if you do not state it. The question is more about why you should write up your methodology in your research proposal and why you should write about it in any subsequent report once the research is completed.

In writing a research proposal you need a methodology to explain where you are coming from and why you want to do the research in a particular way. An assessing committee, a referee, a funding agency will all want to be assured that your research question is a good question that needs asking, that your approach will answer your question or address your hypothesis and that your approach will deliver the outcomes you seek. Explaining your methodology help's others know why you want to do your research in a particular way.

It helps others know that you know what you are doing. It gives confidence to funding agencies that you are not going to waste their money. If your methodology is new, innovative or just plain different then you have to write more of a justification so that others will understand what you are trying to do and why it is important to do it this new way. Kaupapa Māori research has needed explanation because it has been new and different and others who are assessing the proposal need to be informed so that they can make a decision.

In writing about your research when you have completed the project you need an explanation of your methodology so that others can understand the significance of what you have done and make sense of how it all worked.

The methodology piece says why you did what you did. It also enables you to write about what you did not do and why, and about the weaknesses or limitations of your project as well as its strengths. Every research has a limitation of some sort and it is perfectly acceptable to identify the weaknesses of your own study.

### 2.1.3 Types of methodology

There are two types of methodology: Research Methodology and Software Development Methodology.

### 2.1.4 Research methodology

Research methodology is the specific procedures or techniques used to identify, select, process, and analyze information about a topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability.

### 2.1.5 Software Development Methodology

A software development methodology or system development methodology in software engineering is a framework that is used to structure, plan, and control the process of developing an information system. There are the following methodologies: Agile Software Development. And Rapid Application Development (RAD).

### 2.1.6 What have been chosen?

In this system deep learning methodology development has been used, because this system is face detection and recognition, and deep learning is most used type,  so other developers will understood in this methodology how to the system, estimate possible cost, assess risk.

# Chapter Three

# Project Design  and Implementation

## 3.1 Project Design

In this chapter discusses is about the project design and we understanding the design of the inter face which is implemented  and how to use the application.

## 3.1.1 Introduction

Artificially intelligent expert system created in Java. This system  contained id of the student , name of department which divided some department of the college  and let us to enter the grade of student  and provided as a Result  Id of student which marked and  the whole lecture hall which can take by any grades of any department  can be provided boolean logic expressions that will make us its learning base. It will use its learning base to devide  the departments hall  of queries provided. It will also provide information as  the whole departments which hall should  take and let us to know all of the hall can taked.

## 3.1.2 project requirement

Compiler Version:
javac 1.8.0_20

To execute program correctly:

1. Compile java file using java command
2. Then run java command with the input file as the first command line argument

## 3.2.1 INPUT AND OUTPUT

Please enter your Student Number:
**INPUT**:1
Please enter your Major:
**INPUT**:CS
Please enter a number representing year of study you are in (example third year enter '3'):
**INPUT**:2
**OUTPUT:**
Student: 1 should take: COSC2006 , COSC2007 , COSC2406

## 3.2.2 INPUT AND OUTPUT

Please enter your Student Number:

**INPUT**:3

Please enter your Major AS capitalize char:
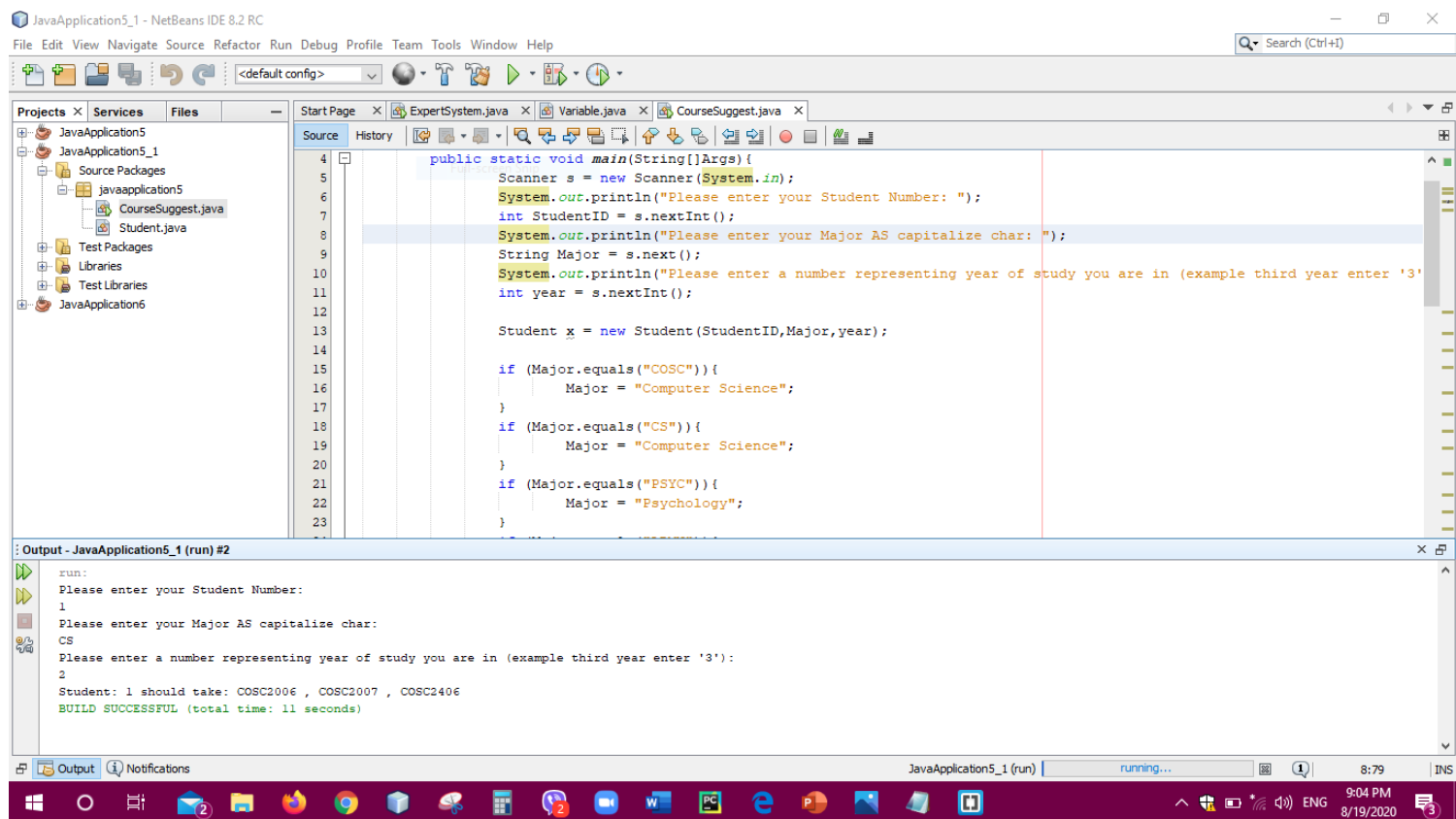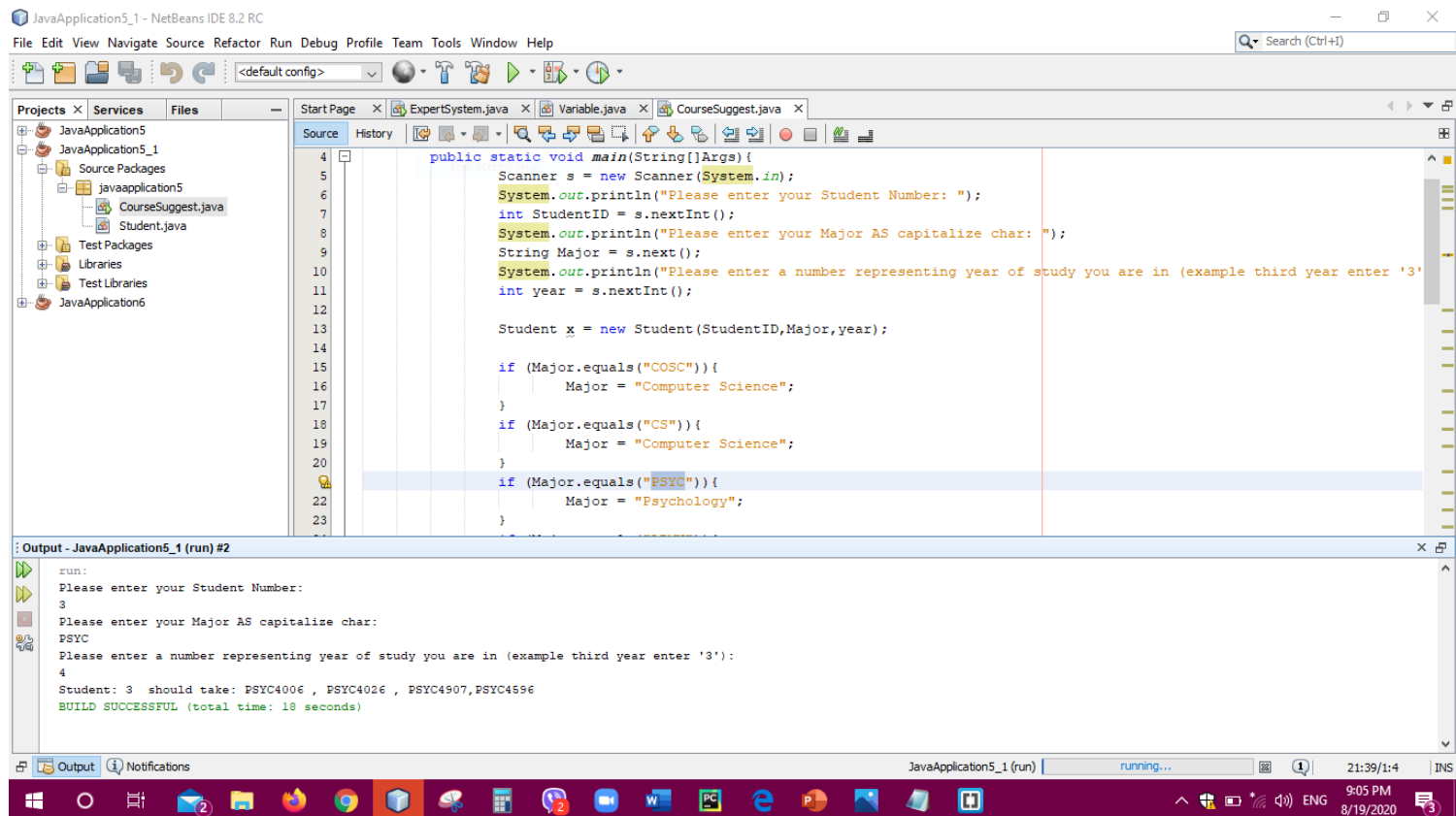
**INPUT**:PSYC

Please enter a number representing year of study you are in (example third year enter '3'):

**INPUT**:4

**OUTPUT:**

Student: 3  should take: PSYC4006 , PSYC4026 , PSYC4907,PSYC4596

# Chapter four

## 4.1 Conclusion

The great impact of find fault identification and  diagnosis system is getting bigger in our day to day entire the Campus   and cannot be denied can not be someone who can find the hall of Lecture's which should be taking . Its performance has shown some of  its usefulness and made lives easier and less wasting time  for its Visitors  who entered the colleges department . This also can serve as an aid to human expert in a situation where  human involved has to cover many things of there.

# Reference

- https://www.javatpoint.com/expert-systems-in-artificial-intelligence
- https://www.researchgate.net/publication/327802385_A_Rule_Based_Expert_System_for_Vehicle_Fault_Diagnosis#:~:text=An%20expert%20car%20failure%20diagnosis,expert%20to%20resolve%20car%20problems.
- https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_expert_systems.htm

```
code project class first
package javaapplication5;
import java.util.Scanner;
public class CourseSuggest {
        public static void main(String[]Args){
        Scanner s = new Scanner(System.in);
                System.out.println("Please enter your Student Number: ");
                int StudentID = s.nextInt();
                System.out.println("Please enter your Major AS capitalize char: ");
                String Major = s.next();
                System.out.println("Please enter a number representing year of study you are in (example third year enter '3'):
");
                int year = s.nextInt();

                Student x = new Student(StudentID,Major,year);

                if (Major.equals("COSC")){
                        Major = "Computer Science";
                }
                if (Major.equals("CS")){
                        Major = "Computer Science";
                }
                if (Major.equals("PSYC")){
                        Major = "Psychology";
                }
                if (Major.equals("ADMN")){
                        Major = "Business";
                }
                if (Major.equals("JURI")){
                        Major = "Law";
                }


                if (Major.equals("Computer Science")&& year == 1){

                        System.out.print("Student: "+StudentID+" should take: COSC1046 , COSC1047 , MATH1056");
                }

                else if (Major.equals("Computer Science")&& year == 2){

                        System.out.print("Student: "+StudentID+" should take: COSC2006 , COSC2007 , COSC2406");
                }

                else if (Major.equals("Computer Science")&& year == 3){

                        System.out.print("Student: "+StudentID+" should take: COSC3106 , COSC3127 , COSC3407 ,
COSC3117");
                }
                else if (Major.equals("Computer Science")&& year == 4){

                        System.out.print("Student: "+StudentID+"  should take: COSC4806 , COSC4106 , COSC4436");
                }
```

```java
            else if (Major.equals("Psychology")&& year == 1){

                    System.out.print("Student: "+StudentID+" should take: PSYC1106 , PSYC1107 ");
            }

            else if (Major.equals("Psychology")&& year == 2){

                    System.out.print("Student: "+StudentID+" should take: PSYC2127 , PSYC2346 , PSYC2606,
PSYC2756 , PSYC2956");
            }

            else if (Major.equals("Psychology")&& year == 3){

                    System.out.print("Student: "+StudentID+" should take: PSYC3106 , PSYC3286 ,
PSYC3606,PSYC3506");
            }
            else if (Major.equals("Psychology")&& year == 4){

                    System.out.print("Student: "+StudentID+"  should take: PSYC4006 , PSYC4026 ,
PSYC4907,PSYC4596");
            }


            else if (Major.equals("Business")&& year == 1){

                    System.out.print("Student: "+StudentID+" should take: ADMN1016 , ADMN1126 , ADMN1127 ,
ADMN1206,ADMN1207");
            }

            else if (Major.equals("Business")&& year == 2){

                    System.out.print("Student: "+StudentID+" should take: ADMN2106 , ADMN2506 , ADMN2107,
ADMMN2406 , ADMN2556");
            }

            else if (Major.equals("Business")&& year == 3){

                    System.out.print("Student: "+StudentID+" should take: ADMN3106 , ADMN3116 , ADMN3136 ,
ADMN3126 ");
            }
            else if (Major.equals("Business")&& year == 4){

                    System.out.print("Student: "+StudentID+" "+" should take: ADMN4046 , ADMN4376 ,
ADMN4386,ADMN4837");


            }
      else if (Major.equals("Law")&& year == 1){

                    System.out.print("Student: "+StudentID+" should take: JURI1106 , JURI1107 , JURI2306 ");
            }

            else if (Major.equals("Law")&& year == 2){
```

```java
                          System.out.print("Student: "+StudentID+" should take: JURI2107 , JURI2106 , JURI2136, JURI2996
");
                }

            else if (Major.equals("Law")&& year == 3){

                          System.out.print("Student: "+StudentID+" should take: JURI3906 , JURI3907 , JURI3107 ,JURI3216
, JURI3526 , JURI3606");
                }
            else if (Major.equals("Law")&& year == 4){

                          System.out.print("Student: "+StudentID+"  should take: JURI4726 , JURI4816 ,JURI4826 ,JURI4836
, JURI4846");
                }

            else {
            System.out.print("There was an error in one of the inputs , Please try again!");
                }
        System.out.println("");
}

}
```

```java
code project class second
import java.util.Scanner;
public class Student {
        int StudentID;
        String Major;
        int year;
        Student(){

        }

        Student(int StudentID , String Major , int year ){
                this.StudentID = StudentID;
                this.Major = Major;
                this.year = year;

        }
        public int getStudentID(){
                return StudentID;
        }
        public String getMajor(){
                return Major;
        }
        public int getyear(){
                return year;
        }
        public void setMajor(String Major){
```

```
        this.Major = Major;
    }

}
```