Isfahan University of Technology

Department of Electrical and Computer Engineering

Assignment 1

Information Technology Fundamentals
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Due Date: April 04, 2023, 11:59 PM

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PLEASE PAY ATTENTION:

1. **All assignments must be completed in this specific LaTeXtemplate**. Submitting your assignment in any other format or template, will not be graded.

2. **This is an individual assignment.** It is okay to discuss your ideas with others, but **your work should be created independently and manually.** Any copying, whether online or offline, is strictly prohibited. All submissions will be checked for integrity and originality using a variety of plagiarism detection tools, and I reserve the right to assign a -100 grade for any violations of policy.

3. I understand that life can be unpredictable, but please plan to do your work in the nick of time! To give you extra motivation, **you'll receive a 25% bonus point if you submit your assignment before the new year!** So aim to turn it in early!

4. Questions 1 to 4 require you to provide detailed answers and justifications with your sense of creativity. Please make sure to **support your opinions with appropriate evidence and explanations.**

5. In questions 5 to 7, you need to utilize the **Python programming language** with the numpy, pandas, and sklearn libraries to answer the questions. It is recommended that you use the Jupyter notebook environment for writing your code. Each question has several sub-questions, for which you need to **provide a brief explanation (if required), a mandatory screenshot of your results, and of course, your code snippets for that particular part of the question**. Each of these components will determine your score for that section.

6. You have to upload all of your works to the Quera platform, so join the class's Quera webpage ASAP (the password is the name of our telegram group!) To receive a grade, upload your completed assignment as a single PDF to the PDF section on Quera, convert the "assignment1.tex" file to a .txt file and upload it to the theoretical section, save your practical question codes in a single .py file and upload it to the practical section, and **ensure that you've uploaded all three files correctly in their appropriate location.**

7. Just a quick reminder to please follow these policies, as they're here to help make sure everyone is treated fairly and respectfully. **Thanks for your dedication!**

«Feel free to contact me in case of any question. Good luck with your assignment!»

Question 1 (10 pts)

You know that information and technology are distinct concepts that combine to form the concept of information technology.

1. What are the definitions and distinctions of information technology, and how do they fit together to form IT?

2. Provide an example that demonstrates this distinction and supports your previous answer conceptually.

3. Mention some of the ways that information technology has had a significant impact on the modern market and how it's contributed to the success of organizations worldwide.

Answer:

Question 2 (50 pts)

Assume you are starting your new business:

1. Provide a detailed and creative description of your company, including its name, the product or service it provides, its target market, the types of employees required, and the resources needed.

2. Identify the customers, possible suppliers, and stakeholders involved in the business.

3. Analyze the potential impacts of implementing a CRM, SCM, and ERP system in this business in detail.

4. Explain how these systems can improve efficiency, productivity, and customer satisfaction based on the example provided.

5. Create a graph or chart to illustrate the relationships between these systems in the analysis (like what was provided in the lecture notes).

Make sure to cover all the elements of your business that were questioned while also being creative. Each entity, correlation, and your impeccable description of each, as well as the quality and correctness of your graph, will be considered, so give it your best shot!

Answer:

Question 3 (25 pts)

Walmart uses several information systems to manage its supply chain, including an advanced logistics system that tracks the movement of goods from suppliers to stores and an inventory management system that monitors product availability. By ensuring that products are always in stock and available for purchase, they have been able to achieve high levels of efficiency, reduce costs, and improve customer satisfaction through the use of information systems.

It's your turn now!

1. Describe a specific company that has successfully implemented information systems in its supply chain. (You may use the company from your previous question to guide your description.)

2. Explain how information systems increase customer satisfaction, decrease costs, and improve decision-making processes through supply chain management.

3. Provide a technical and conceptual overview of the benefits of information systems in the supply chain management of this company.

Answer:

Question 4 (15 pts)

On slide number 36, you learned about six different aspects of an ERP system; now:

1. Provide at least six distinct examples of real-world companies, platforms, or applications in Iran or outside Iran that have functionalities similar to the six aspects. (Attach the URL of your chosen companies' websites to their names in your text.)

2. How do these companies, platforms, and applications use these functionalities to support their business operations?

Answer:

Question 5 (20 pts)

The Iris dataset contains information about three types of Iris flowers and includes the following characteristics:

- Sepal length

- Sepal width

- Petal length

- Petal width

Load the Iris dataset from the sklearn library first. Now calculate the following measures for column 1 of this dataset:

1. Mean

2. Median

3. Mode

4. The first quartile (Q1)

5. The third quartile (Q3)

6. Normalize the data in this column using the min-max normalization method.

Answer: Codes should be addressed, answers should be explained, and a conclusion should be given.

1. ...

2. ...

Question 6 *(50 pts)*

In this exercise, you will use Python to work with a dataset to perform data cleaning and preprocessing tasks, such as replacing missing values with the mean and exploring alternative strategies for dealing with missing data.

1. Download the dataset that is provided with the exercise.

2. Open the dataset using the pandas library.

3. Obtain a summary of the statistical measures of this dataset using the describe() function.

4. In this dataset, a value of zero represents missing data. In this step, display the number of zero values in columns 1 to 5.

5. Replace the zero values with NaN in columns 1 to 5.

6. Repeat step 4 using the isnull() function.

7. Show the first ten rows of the dataset.

8. Create a copy of columns 1 to 5 of the original dataset. Remove records with missing values. Display the shape of the dataset before and after this change.

9. Create another copy of columns 1 to 5 of the original dataset. Replace missing values with the mean value of the dataset. Display the number of missing values in each column using the isnull() function.

10. Create another copy of columns 1 to 5 of the original dataset. Replace missing values with the mean value of each column using the SimpleImputer function from the sklearn library. Finally, display the number of missing values in each column using the isnull() function.

11. What are other strategies for replacing missing values? Display the output of each method.

Answer: Each step must include a screenshot, a code snippet and its explanation, or a data file.

1. ...

2. ...

Question 7 (30 pts)

Boxplots are useful tools for identifying outliers in a dataset. In this context, we will look at how to use Python boxplots to detect outliers in the Iris dataset.

1. Load the Iris dataset using Python and create a dataframe from it. The columns of the dataframe, from left to right, are named as follows:

   - sepal_length
   - sepal_width
   - petal_length
   - petal_width

2. Generate a boxplot for the petal_length field of the Iris dataset using the matplotlib library.

3. Execute the describe() function on the values of the petal_length field and display the output.

4. Remove any outliers from the petal_length field.

Answer: Each step must include a screenshot, a code snippet and its explanation, or a data file.

1. …

2. …