Project Report

For

Deliverable 1

METRICSTICS

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Contents

1 Introduction

1.1 Scope

In the ever-evolving landscape of data-driven decision-making within the software industry, there exists a pressing need for advanced software tools that can effectively cater to the intricate demands of software measurement. In this initial deliverable, we embark on a journey to conceptualize and develop METRICSTICS, an innovative software solution poised to address these needs. METRICSTICS aims to harness the power of descriptive statistics to empower professionals to analyze and interpret datasets comprehensively. Within this report, we will explore the foundational stages of METRICSTICS' development, including the establishment of critical Goal-Question-Metric (GQM) principles and the creation of a use case model for the system.

1.2 Description

METRICSTICS is envisioned to offer a comprehensive suite of statistical calculations and analyses:

1. Mean Calculation: METRICSTICS will calculate the arithmetic mean, providing a measure of central tendency for datasets.

2. Median Calculation: The system will determine the median, whether for datasets with odd or even numbers of elements, offering a robust representation of data distribution.

3. Mode Identification: METRICSTICS will identify modes, revealing the most frequently occurring values in a dataset.

4. Data Range: It will ascertain the minimum and maximum values within a dataset.

5. Variability Assessment: The system will calculate the standard deviation and mean absolute deviation, enabling software professionals to understand data variability and dispersion.

2 PROBLEM 1: Goal-Question-Metric (GQM)

We've applied the GQM approach to set a clear goal for METRICSTICS. We've formulated 12 specific questions and identified corresponding metrics to measure progress and performance.

2.1 Goal

Ensure the accuracy, usability, and user satisfaction of METRICSTICS to accommodate a wide range of scenarios.

2.2 Questions and Metrics

1. **Question:** How well does METRICSTICS handle increasingly large datasets?
   Metric: Scalability Index, measuring METRICSTICS' performance as data size increases

2. **Question:** Is METRICSTICS able to identify multiple modes (o) when they exist in the dataset?
   Metric: Count of identified modes and a list of mode values

3. **Question:** Does METRICSTICS consistently compute the median (d) accurately, especially for datasets with even n values?
   Metric: Median Absolute Error (MedAE) for datasets with both odd and even n values

4. **Question:** Are users able to easily input their datasets into METRICSTICS?
   Metric: Time taken for users to input a dataset and any input errors reported

5. **Question:** Does METRICSTICS provide consistent results when analyzing real and artificial data generated by a random data generator?
   Metric: Comparative analysis of METRICSTICS results for real and generated datasets

6. **Question:** How intuitive is the process of obtaining descriptive statistics using METRICSTICS?
   Metric: User satisfaction ratings for the intuitiveness of the interface

7. **Question:** How effectively does METRICSTICS handle user data validation and error handling?
   Metric: Number of errors encountered during data input and how they are handled

8. **Question:** How well does METRICSTICS perform when data is provided in different formats (e.g., integers, floating-point numbers)?
   Metric: Accuracy of METRICSTICS across various data types

9. **Question:** Does METRICSTICS provide clear and understandable output of descriptive statistics?
   Metric: Readability Score for METRICSTICS. It can be assessed using the Flesch-Kincaid Grade Level

10. **Question:** Does METRICSTICS consistently calculate the mean absolute deviation (MAD) accurately?
    Metric: MAD Absolute Error (MADAE) for various datasets

11. **Question:** How consistent are the standard deviation (σ) calculations made by METRICSTICS across different datasets?
    Metric: Standard Deviation Variability (SDV) across a range of datasets

12. **Question:** How well does METRICSTICS handle datasets with extreme outliers?
    Metric: Robustness measure based on the impact of outliers on calculated statistics

3 PROBLEM 2: Use Case Model

3.1 UML Use case Diagram

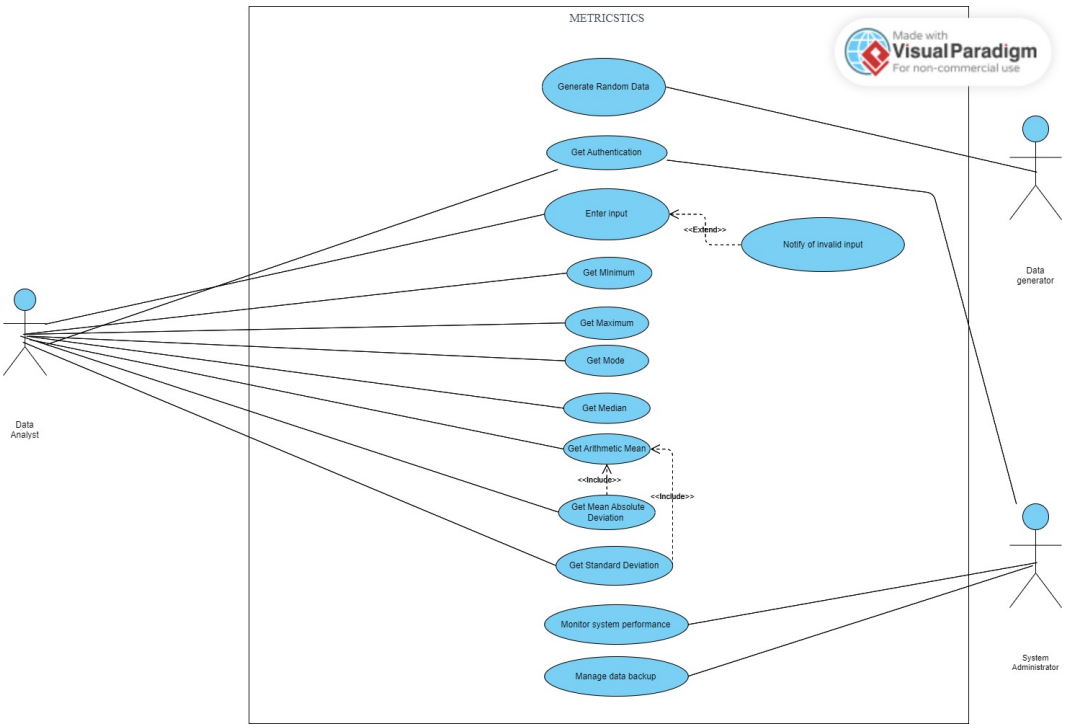

Figure 1:
UML Use Case Diagram of METRICSTICS

3.2 Actor and Use Case Descriptions

- **Actors:**
  - **Data Generator:** The Data Generator represents a system responsible for generating artificial and randomised datasets used for testing and evaluation within the METRICSTICS system.

- **Data Analyst:** The Data Analyst actor represents users who input data, analyze it, and perform various statistical calculations to quantitatively describe a collection of data using METRICSTICS.
- **System Administrator:** The System Administrator actor is responsible for overseeing and managing the overall system performance and maintenance tasks within METRICSTICS.

- **Use Casses:**

System	METRICSTICS
Identifier	UC-1
Name	Generate Random Data
Pre-conditions	User launches the system
Post-conditions	Artificial dataset is fed to the system for analysis
Trigger	User selects the "Generate Random Data" option
Normal Scenario	The system generates an artificial dataset
Exceptional Scenario	None
Related Actor	Data Generator
Related Use Case	None

System	METRICSTICS
Identifier	UC-2
Name	Get Authentication
Pre-conditions	User opens the METRICSTICS application
Post-conditions	User is successfully authenticated
Trigger	User launches the system
Normal Scenario	– User enters their credentials – The system verifies the credentials – If the credentials are valid, the user is granted access
Exceptional Scenario	The system displays an error message
Related Actor	– Data Analyst – Data Administrator
Related Use Case	Notify of invalid input

System	METRICSTICS
Identifier	UC-3
Name	Enter Input
Pre-conditions	User launches the system and logs in
Post-conditions	Data is successfully input, and statistics are calculated
Trigger	User selects the "Enter Input" option
Normal Scenario	– User inputs a dataset – The system validates and processes the input – Descriptive statistics are calculated
Exceptional Scenario	The system notifies the Data Analyst of the invalid input
Related Actor	Data Analyst
Related Use Case	Notify of invalid input

System	METRICSTICS
Identifier	UC-4
Name	Get Minimum
Pre-conditions	User logs in and enters data
Post-conditions	Minimum value of the dataset is returned
Trigger	User selects the "Get Statistics" option
Normal Scenario	– User inputs a dataset – The system calculates and returns the minimum value
Exceptional Scenario	None
Related Actor	Data Analyst
Related Use Case	None

System	METRICSTICS
Identifier	UC-5
Name	Get Maximum
Pre-conditions	User logs in and enters data
Post-conditions	Maximum value of the dataset is returned
Trigger	User selects the "Get Statistics" option
Normal Scenario	– User inputs a dataset – The system calculates and returns the maximum value
Exceptional Scenario	None
Related Actor	Data Analyst
Related Use Case	None

System	METRICSTICS
Identifier	UC-6
Name	Get Mode
Pre-conditions	User logs in and enters data
Post-conditions	Mode (most frequent value) of the dataset is returned
Trigger	User selects the "Get Statistics" option
Normal Scenario	– User inputs a dataset – The system calculates and returns the mode
Exceptional Scenario	None
Related Actor	Data Analyst
Related Use Case	None

System	METRICSTICS
Identifier	UC-7
Name	Get Median
Pre-conditions	User logs in and enters data
Post-conditions	Median value of the dataset is returned
Trigger	User selects the "Get Statistics" option
Normal Scenario	– User inputs a dataset – The system calculates and returns the median
Exceptional Scenario	None
Related Actor	Data Analyst
Related Use Case	None

System	METRICSTICS
Identifier	UC-8
Name	Get Arithmetic Mean
Pre-conditions	User logs in and enters data
Post-conditions	Arithmetic Mean (average) of the dataset is returned
Trigger	User selects the "Get Statistics" option
Normal Scenario	– User inputs a dataset – The system calculates and returns the Arithmetic Mean
Exceptional Scenario	None
Related Actor	Data Analyst
Related Use Case	– Mean Absolute Deviation – Get Standard Deviation

System	METRICSTICS
Identifier	UC-9
Name	Get Mean Absolute Deviation
Pre-conditions	User logs in and enters data
Post-conditions	Mean absolute deviation of the dataset is returned
Trigger	User selects the "Get Statistics" option
Normal Scenario	– User inputs a dataset – The system calculates and returns the Mean Absolute Deviation
Exceptional Scenario	None
Related Actor	Data Analyst
Related Use Case	Get Arithmetic Mean

System	METRICSTICS
Identifier	UC-10
Name	Get Standard Deviation
Pre-conditions	User logs in and enters data
Post-conditions	Standard Deviation of the dataset is returned
Trigger	User selects the "Get Statistics" option
Normal Scenario	– User inputs a dataset – The system calculates and returns the Standard Deviation
Exceptional Scenario	None
Related Actor	Data Analyst
Related Use Case	Get Arithmetic Mean

System	METRICSTICS
Identifier	UC-11
Name	Monitor System Performance
Pre-conditions	System Administrator launches the system
Post-conditions	System performance metrics are monitored
Trigger	System Administrator selects the "View System Performance" option
Normal Scenario	System Administrator monitors system performance metrics in real-time
Exceptional Scenario	None
Related Actor	System Administrator
Related Use Case	None

System	METRICSTICS
Identifier	UC-12
Name	Manage Data Backup
Pre-conditions	System Administrator launches the system
Post-conditions	Data backup procedures are initiated and completed
Trigger	System Administrator selects the "Manage Data Backup" option
Normal Scenario	System Administrator initiates data backup and completes it
Exceptional Scenario	None
Related Actor	System Administrator
Related Use Case	None

4 Version Control

You can access the GitHub repository at:
https://github.com/theOGCodeWitcher/SOEN-6611-METRICSTICS

5 References

https://users.encs.concordia.ca/ kamthan/courses/soen-6611
https://www.visual-paradigm.com/
https://chat.openai.com/