CS 457 - Homework Assignment 1: Data Types

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Part 1

Time:

Data Type = I

Explanation = Time qualifies as an interval data type due to its quantitative nature with distinct intervals. However, it lacks a true zero point, as a time of 00:00:00 does not signify the complete absence of time.

Latitude:

Data Type = I

Explanation = Latitude is categorized as an interval data type because it involves quantitative measurements that support various mathematical operations. Nevertheless, a value of 0 does not indicate the nonexistence of latitude.

Longitude:

Data Type = I

Explanation = Similarly to latitude, longitude falls within the interval data type category because it represents quantitative measurements with mathematical operability. Nevertheless, a value of 0 does not imply the absence of longitude.

Depth:

Data Type = R

Explanation = Depth is classified as a ratio data type due to the presence of a true zero point. A depth of 0 implies the complete absence of depth, regardless of the unit of measurement.

mag:

Data Type = I

Explanation = Magnitude, denoting the quantitative measurement of an earthquake, is considered interval data because it lacks a true zero value. A magnitude of 0 does not signify the absence of the attribute.

magType:

Data Type = N

Explanation = Magnitude type is not a quantitative data type but rather falls into the nominal category. It serves as a qualitative descriptor used in calculating the preferred magnitude and can only be compared based on uniqueness and equality.

nst:

Data Type = R

Explanation = NST is categorized as a ratio data type due to its possession of a true zero value. A value of 0 indicates that no seismic stations were employed to determine the earthquake's location.

gap:

Data Type = R

Explanation = Gap is a quantitative data type featuring a true zero value. Since it measures gap in degrees, mathematical operations such as multiplication and division can yield meaningful insights.

dmin:

Data Type = R

Explanation = Dmin is classified as a ratio data type since it quantifies the horizontal distance from the epicenter to the nearest station in degrees. It should possess a true zero value, signifying zero distance or the absence of distance.

rms:

Data Type = R

Explanation = RMS travel time, measured in seconds, constitutes a quantitative data type with a true zero point. A value of zero holds significance and indicates the complete absence of travel time.

net:

Data Type = N

Explanation = Network identifiers, represented as string values, fall under the nominal data type. They serve exclusively for unique data contributor identification and are subject to equality comparisons only.

id:

Data Type = N

Reason = The identification attribute 'id' shares a similar rationale with 'net' and falls under the nominal data type. It is primarily used for checking equality among events.

updated:

Data Type = I

Reason = 'Updated' represents a time value and is classified as an interval data type. The reason for this classification aligns with that of 'Time,' as time data lacks a true zero point.

place:

Data Type = O

Reason = 'Place' is a string attribute providing a qualitative textual description of named geographic regions near an event. However, due to the structured nature of the GeoNames dataset, it can be logically ordered, hence the ordinal classification.

type:

Data Type = N

Reason = 'Type' is a qualitative data attribute that cannot be ordered. It is solely used to verify the equality of an event.

horizontalError:

Data Type = R

Reason = 'HorizontalError' measures distance in kilometers, and it should have a clear zero value indicating the absence of error.

depthError:

Data Type = R

Reason = Similar to 'horizontalError,' 'depthError' is categorized as a ratio data type due to its measurement of error in depth.

magError:

Data Type = R

Reason = 'MagError' shares the same rationale as 'horizontalError' and 'depthError' since it measures error and should have a clear zero value indicating no error.

magNst:

Data Type = R

Reason = 'MagNst' calculates the total number of seismic stations used to determine the magnitude of an earthquake. A value of zero implies the absence of any stations involved, aligning with the ratio data type.

status:

Data Type = N

Reason = 'Status' is used to indicate whether an event has been reviewed by a human or not. It solely involves checking for equality and does not involve any ordering.

locationSource:

Data Type = N

Reason = 'LocationSource' is a qualitative data attribute that can only be used to check for equality and not for any form of ordering.

magSource:

Data Type = N

Reason = Similar to 'locationSource,' 'magSource' falls into the nominal data type category and is used for equality checking.

Part 2

1. Datatype = I

Reason = As previously discussed, time consists of well-defined intervals and is a quantitative measure, yet it lacks an absolute zero point. The absence of time is not represented by a value of 00:00:00 AM.

2. Datatype = R

Reason = This data type is quantitative, capable of assuming a zero value, which can signify the absence of brightness.

3. Datatype = O

Reason = When humans measure something, it typically involves qualitative judgment rather than quantitative measurement. Ordering based on brightness levels is possible, but precise quantification is not.

4. Datatype = R

Reason = Angle measurement is quantitative and possesses a true zero value, indicating the absence of any angle between two references.

5. Datatype = O

Reason = This data type is qualitative, allowing for logical ordering, such as ranking items from best to worst, as in the case of Gold, Silver, and Bronze.

6. Datatype = R

Reason = It represents a measure of distance that inherently possesses a clear zero point.

7. Datatype = R

Reason = The number of patients is a quantitative measure with a true zero value, indicating the absence of patients.

8. Datatype = N

Reason = This datatype consists of strings used solely for the purpose of uniquely identifying books, lacking any inherent logical ordering. Consequently, only equality operations can be applied.

9. Datatype = O

Reason = Objects can be identified and ordered based on their characteristics, making this a qualitative data type.

10. Datatype = O

Reason = Military ranks can be logically ordered, reflecting a qualitative data type.

11. Datatype = R

Reason = Distance is inherently a ratio measurement, featuring a definitive true zero point.

12. Datatype = R

Reason = Density is a quantitative measure that can indeed possess a true zero value.

PART 3

1. N

(a) Gender: Gender values can be stored for the purpose of uniquely identifying or grouping students. It does not involve any inherent ordering, making 'N' the appropriate data type for gender roles.

(b) ID: Students can be assigned IDs, such as "xy0123," which do not possess a logical order but serve the purpose of uniquely identifying students.

(c) Major: Students from different majors can be distinguished and grouped, but there is no inherent logical ordering. Operations like identifying the mode or performing equality comparisons are applicable.

2. O

(a) Type of Scholarship: Students can be categorized, grouped, and even ranked or ordered based on the type of scholarship they have received, such as Yohsin, Excellence, or Merit.

(b) Grades: Grades can be logically ordered, and students can be grouped based on their grades in specific courses.

(c) Are students satisfied with the faculty at Habib?: This question falls into the 'O' category as there is no specific scale for quantification, but satisfaction levels can be ordered, and statistical analyses such as calculating the median can be applied to it.

3. I

(a) DOB: Date of Birth provides quantitative data with well-defined intervals but lacks a true zero value, as a date cannot have a zero value.

(b) GPA: A value of zero in this context does not signify the absence of something, making it an interval data type.

(c) Attendance Times in Courses: This is another example of quantitative data involving time. As previously discussed, time does not possess a true zero, so it is categorized as 'I.'

4. R

(a) Scholarship Value: This data can have a true zero value. A student with zero scholarship implies the absence of any scholarship.

(b) Student Employment Rate: Similarly, this data type can have a true zero value, indicating that the student is not employed and does not earn any income.

(c) Distance a student lives from the Campus: This measurement can theoretically be zero, making it a ratio data type.