CS 457 - Homework Assignment 1: Data Types

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Question 1: List each attribute (column) given in the dataset, choose its analytical data type (NOIR type) and explain why you consider this type.

<u>Solution:</u>

Time: Interval; we can perform add/sub, the difference between the values is consistent, it can be ordered as well.

Latitude: Interval; It's a measurable variable, additive and ordinal properties can be performed, doesn't have a true zero value.

Longitude: Interval; It's a measurable variable, additive and ordinal properties applies and doesn't have a true zero value.

Depth: Interval; It's a measurable variable, additive and Ordinal properties aca be performed, it doesn't have a true zero point.

Mag: Ratio; we can perform multiplicative as well as interval properties to it. Can perform multiply, divide, add, and subtract, distinctiveness and ordinal. It has a true zero value.

magType: Nominal; Is just type, and we can't really perform ordering over it nor we can perform add/sub etc.

nst: Ratio; We can perform add, sub, comparison, order and multiplicative properties, has a true zero value.

gap: Ratio; We can perform add, sub, comparison, order and multiplicative properties.

dmin: Ratio; Is not between equal intervals, and we can perform add, sub, comparison, order and multiplicative properties.

rms: Ratio; Is not between equal intervals, and we can perform add, sub, comparison, order and multiplicative properties.

Net: Nominal; Ordering it won't give anything important (even if it is applied), so only comparison is possible on this data.

id: Nominal; Ordering it won't give anything important (even if it is applied), so only comparison is possible on this data. Unique label.

Updated: Interval; It's time. Has consistent and meaningful intervals between them and it can be ordered as well. We can perform arithmetic operations on them and it does not have a true zero.

Place: Nominal; Just gives a direction with magnitude, can't be ordered or categorized. Only comparison is possible.

Type: Nominal; we can only compare if it's earthquake or not, no other operations can be done.

Horizontal Error: Ratio; The values have meaningful intervals between them. We can perform arithmetic operations on them. It has a true zero-value.

Depth Error: Ratio; It's not about between equal intervals. Multiplicative and interval properties are satisfied (or can be applied).

Mag Error: Ratio; It's not about between equal intervals. Multiplicative and interval properties are satisfied (or can be applied).

Mag Nst: Ratio; It is the number of seismic stations that contributed data for the calculation of an earthquake's magnitude. We can order these values and apply arithmetic operations on them. It has a true zero which means that the count is zero.

Status: Nominal; Can only be compared.

Location Source: Nominal; A categorical label, only distinctiveness property applies to it.

magSource: Nominal; Only distinctiveness property applies to it.

Question 2: Pick analytical data type (NOIR type) for each of the items below and explain why you consider this type.

Solution:

1. Time with possible values AM or PM: Nominal, because of AM/PM. Is a label it can't be ordered, we can't perform multiplicative and additive properties either.

2. Brightness as measured by a light meter: Ratio; because it must be precise as measured by a device, not between fixed intervals.

3. **Brightness as measured by people's judgments:** Ordinal; since it's a human judgement, it can't be precise, but obviously has to be in numbers (discrete), and numbers can be ordered.

 4. **Angles as measured in degrees between 0° and 360°:** Ratio; It's continuous, quantitative, has a true zero value.

5. Bronze, Silver and Gold medals as awarded at the Olympics: Ordinal, can be ordered (discrete), compared, but no arithmetic operations can be performed.

 6. **Height above sea level:** Interval**,** sea-level has ranges and height is a measurable variable.

7. Number of patients in a hospital: Ratio, discrete, it has true zero value which will indicate that there are no patients.

8. ISBN numbers for books. (Look up the format on the Web): Nominal, you can't order/categorize it because labels are meaningless for ordering. Can't perform arithmetic operations on them either.

9. Ability to pass light in terms of the following values: opaque, translucent, transparent: Ordinal; Can be ordered, and compared with one another. No arithmetic operations can be performed.

10. Military rank: Ordinal; Military rans are labels so can be ordered, and compared with one another. No arithmetic operations can be performed.

11. Distance from the center of HU campus: Ratio; we can perform all the arithmetic operations on distance, and it can be ordered in ascending or descending order as well.

12. Density of a substance in grams per cubic centimeter: Ratio; density in grams can be ordered in ascending or descending order, we can perform all the arithmetic operations on them too.

Question 3: Assume you are doing a study of Habib University students' academic and demographic characteristics and storing this information as a dataset. Identify total of 12 attributes (3N, 3O, 3I, and 3R) and explain why you think is the correct data type.

Solution:

Attributes	Data Type	Explanation
Name	Nominal	Names are nominal data type because they can only be compared and no arithmetic operations can be performed on them neither they can produce anything meaningful when ordered.
Student ID (i.e ub07100)	Nominal	Student Ids are just a unique labels to identify students in case they have similar names. They are often randomly generated with the names initial so they can't be ordered and no arithmetic operations can be performed on them.
Major (CS, CE, CnD)	Nominal	Major initials are just labels to identify group students under one umbrella term. They can't be ordered nor can any arithmetic operations be performed.
Letter Grade (A, A+, B)	Ordinal	Ordering can be performed on letter grades from A+, A to E or F and vice versa and they can be compared as well, but no arithmetic operations can be performed.
University Year (Freshman, Sophomore, Junior, Senior)	Ordinal	We can order students according to their years at university from Freshmen to Senior and vice versa, but no arithmetic operations can be performed.
Level of course (i.e; 400, 300, 200, 100)	Ordinal	We can order through level of course from 400 to 100 and vice versa. Arithmetic operations can't be performed on them.
Course enrollment time	Interval	It has a meaningful order, lacks zero and has fixe/specific between values.
Date Of Birth	Interval	The difference between their times is consistent and uniform. You can add/subtract them and it doesn't have a zero value.
Weight	Interval	Zero Kgs doesn't mean anything. We can perform arithmetic operations to it and the difference between intervals values is consistent and uniform.
CGPA (i.e 3.7)	Ratio	We can order it, can perform arithmetic operations on it too. Can't go lower than 0, so has a true zero value.
Individual scores in Exam	Ratio	We can order it, can perform arithmetic operations on it too.

		Can't go lower than 0, so has a true zero value.
Number of Credits per semester	Ratio	Can't go lower than 0 credits, so it has a true zero value. We can perform arithmetic operations i.e.; such as total credits taken in two semesters 18 +17 = 35 CH.