

Procesamiento de datos en R y estadística para Ciencias Sociales

Clase 3. Repaso nivel de medición

¿Cuál es el primer paso para una investigación?

- Plantear una pregunta correctamente
 - ¿Cuál es el ingreso medio de cada una de las clases sociales en Argentina? ¿Cuál es la percepción de la situación económica?
 - ¿Cuánto es el tiempo promedio de cursada de les estudiantes de grado del IDAES?
 - ¿Cuál es el efecto sobre la deserción estudiantil de la virtualidad?

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 - ¿Cuáles son las variables de esta pregunta?

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¿Cuál es la **percepción de la situación económica**?
 - Operacionalización
 - ¿Cuáles son las variables de esta pregunta?
 - ¿Qué características tienen esas variables?

¿Cuál es el primer paso para una investigación?

- Nivel de medición: busca definir la naturaleza de la información que una variable tiene en sus valores

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On the Theory of Scales of Measurement

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FOR SEVEN YEARS A COMMITTEE of the British Association for the Advancement of Science debated the problem of measurement. Appointed in 1932 to represent Section A (Mathematical and Physical Sciences) and Section J (Psychology), the committee was instructed to consider and report upon the possibility of "quantitative estimates of sensory events"—meaning simply: Is it possible to measure human sensation? Deliberation led only to disagreement, mainly about what is meant by the term measurement. An interim report in 1938 found one member complaining that his colleagues "came out by that same door as they went in," and in order to have another try at agreement, the committee begged to be continued for another year.

For its final report (1940) the committee chose a common bone for its contentions, directing its arguments at a concrete example of a sensory scale. This was the Sone scale of loudness (S. S. Stevens and H. Davis. *Hearing*. New York: Wiley, 1938), which purports to measure the subjective magnitude of an auditory sensation against a scale having the formal properties of other basic scales, such as those used to measure length and weight. Again the 19 members of the committee came out by the routes they entered, and their views ranged widely between two extremes. One member submitted "that any law purporting to express a quantitative relation between sensation intensity and stimulus intensity is not merely false but is in fact meaningless unless and until a meaning can be given to the concept of addition as applied to sensation" (Final Report, p. 245).

It is plain from this and from other statements by the committee that the real issue is the meaning of measurement. This, to be sure, is a semantic issue, but one susceptible of orderly discussion. Perhaps agreement can better be achieved if we recognize that measurement exists in a variety of forms and that scales of measurement fall into certain definite classes. These classes are determined both by the empirical operations invoked in the process of "measuring" and

by the formal (mathematical) properties of the scales. Furthermore—and this is of great concern to several of the sciences—the statistical manipulations that can legitimately be applied to empirical data depend upon the type of scale against which the data are ordered.

A CLASSIFICATION OF SCALES OF MEASUREMENT

Paraphrasing N. R. Campbell (Final Report, p. 340), we may say that measurement, in the broadest sense, is defined as the assignment of numerals to objects or events according to rules. The fact that numerals can be assigned under different rules leads to different kinds of scales and different kinds of measurement. The problem then becomes that of making explicit (a) the various rules for the assignment of numerals, (b) the mathematical properties (or group structure) of the resulting scales, and (c) the statistical operations applicable to measurements made with each type of scale.

Scales are possible in the first place only because there is a certain isomorphism between what we can do with the aspects of objects and the properties of the numeral series. In dealing with the aspects of objects we invoke empirical operations for determining equality (classifying), for rank-ordering, and for determining when differences and when ratios between the aspects of objects are equal. The conventional series of numerals yields to analogous operations: We can identify the members of a numeral series and classify them. We know their order as given by convention. We can determine equal differences, as $8 - 6 = 4 - 2$, and equal ratios, as $8/4 = 6/3$. The isomorphism between these properties of the numeral series and certain empirical operations which we perform with objects permits the use of the series as a model to represent aspects of the empirical world.

The type of scale achieved depends upon the character of the basic empirical operations performed. These operations are limited ordinarily by the nature of the thing being scaled and by our choice of procedures, but, once selected, the operations determine

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TABLE 1

Scale	Basic Empirical Operations	Mathematical Group Structure	Permissible Statistics (invariantive)
NOMINAL	Determination of equality	<i>Permutation group</i> $x' = f(x)$ $f(x)$ means any one-to-one substitution	Number of cases Mode Contingency correlation
ORDINAL	Determination of greater or less	<i>Isotonic group</i> $x' = f(x)$ $f(x)$ means any monotonic increasing function	Median Percentiles
INTERVAL	Determination of equality of intervals or differences	<i>General linear group</i> $x' = ax + b$	Mean Standard deviation Rank-order correlation Product-moment correlation
RATIO	Determination of equality of ratios	<i>Similarity group</i> $x' = ax$	Coefficient of variation

Nivel de medición de una variable

Nivel de medición	Identificación La capacidad de ser heterogéneo y exhaustivo	Orden La capacidad de ser ordenado de manera empírica	Unidad de medida constante Se conoce la distancia exacta entre cada categoría	Cero absoluto El valor cero significa la ausencia del valor, en cualquier escala en que se traduzca
Nominal				
Ordinal				
Intervalo				
Razón				

Nivel de medición de una variable

Cualitativas

Cuantitativas

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Nivel de medición de una variable

	Operación	Métricas
Nominal	Clasificación	Frecuencias, moda
Ordinal	Ordenamiento	Mediana, cuantiles
Cuantitativas	Medida de distancias	Medias, cuantiles

Vamos al Notebook