Clear Thinking in an Uncertain World: Human Reasoning and its Foundations

Lecture 10

Eric Pacuit

Department of Philosophy
University of Maryland, College Park
pacuit.org
epacuit@umd.edu

November 4, 2013

Induction

Enumerative Induction
Given that all observed Fs are Gs, you infer that all Fs are Gs, or at least the next F is a G.

Inference to the best explanation
Holmes infers the best explanation for footprints, the absence of barking, the broken window: 'The butler wears size 10 shoes, is known to the dog, broke the window to make it look like a burglary...'

Scientific hypothetic induction
Scientists infer that Brownian motion is caused by the movement of invisible molecules.

Hume: Does positive inductive evidence support rational beliefs?

In the past, Fs have been followed by Gs (and never by non-Gs)

So, the present case of an F will be followed by a G

Hume: Does positive inductive evidence support rational beliefs?

In the past, Fs have been followed by Gs (and never by non-Gs)

UN: Nature is uniform (at least in regard to Fs followed by Gs).

So, the present case of an F will be followed by a G

Hume: Does positive inductive evidence support rational beliefs?

In the past, nature has been uniform (at least in regard to Fs followed by Gs)

The present case is an instance of that uniformity

So, the present case will be followed by a continuation of the uniformity (G will follow)

Hume: Does positive inductive evidence support rational beliefs?

In the past, nature has been uniform (at least in regard to Fs followed by Gs)

The present case is an instance of that uniformity

Nature is uniform (at lest in regard to the uniformity of Fs followed by Gs)

So, the present case will be followed by a continuation of the uniformity (G will follow)

While deductive logic must *classify* arguments as valid or not, inductive logic must *measure* the inductive strength of arguments.

Inductive logic *projects an observed regularity* into the future because it assigns high "inductive probability" to the argument.

Inductive logic *projects an observed regularity* into the future because it assigns high "inductive probability" to the argument.

Inductive argument: assign high probability to the argument

All observed emeralds have been green.

The next emerald to be observed will be green.

Counterinductive argument: assign high probability to the argument

All observed emeralds have been green.

The next emerald to be observed will not be green.

All observed X's have been Y's.

The next observed X will be a Y.

99% observed X's have been Y's.

The next observed X will be a Y.

Rule S

$$\frac{N \text{ percent of observed } X\text{'s have been } Y\text{'s.}}{\text{The next observed } X \text{ will be a } Y.}$$

is to be assigned inductive probability $N/100$.

Limitations of Rule S, I

Ten emeralds have been observed.

90% of the observed emeralds have been green

The next emerald to be observed will be green.

One million emeralds have been observed.

90% of the observed emeralds have been green

The next emerald to be observed will be green.

Limitations of Rule S, II

Every person who has taken drug X has exhibited no adverse side reactions

Drug X has only been administered to persons between 20 and 25 years of age whoa re in good health.

The next person to take drug X will have no adverse side reactions.

Every person who has taken drug X has exhibited no adverse side reactions

Drug X has been administered to persons all ages and varying degrees of health.

The next person to take drug X will have no adverse side reactions.

Limitations of Rule S: Projectible Regularities

100% of the observed samples of pure water
have had a freezing point of +32 degrees Fahrenheit

The next observed sample of pure water.
will have a freezing point of +32 degrees Fahrenheit.

100% of the observed economic depressions
have occurred at the same time as large sunspots.

The next observed economic depression
will occur at the same time as a large sunspot.

Grue

A certain thing, X, is said to be **grue** at a certain time t if and only if:

X is green at t *and* t is before the year 2100

-or-

X is blue at t *and* t is during or after the year 2100.

Bleen

A certain thing, X, is said to be **bleen** at a certain time t if and only if:

X is blue at t *and* t is before the year 2100

-or-

X is green at t *and* t is during or after the year 2100.

Green

A certain thing, X, is said to be **green** at a certain time t if and only if:

X is grue at t *and* t is before the year 2100

-or-

X is bleen at t *and* t is during or after the year 2100.

Blue

A certain thing, X, is said to be **blue** at a certain time t if and only if:

X is bleen at t *and* t is before the year 2100

-or-

X is grue at t *and* t is during or after the year 2100.

A Problem

100% of the times that emeralds have been observed they have been green.

The next time an emerald is observed it will be green.

100% of the times that emeralds have been observed they have been "grue".

The next time an emerald is observed it will be "grue".

1. Whether we find change or not in a certain situation may depend on the linguistic machinery we use to describe that situation.
2. What regularities we find in a sequence of occurrences may depend on the linguistic machinery used to describe that sequence.
3. We may find two regularities in a sequence of occurrences, one projectible and one unprojectible such that the predictions that arise form projecting both are in conflict.

Claim. For any prediction whatsoever, we can find a regularity whose projective licenses that prediction.

Example 1

Suppose you are presented with four boxes, each labeled "Excelsior!" In the first box you discover a green insect; in the second, a yellow ball of wax, in the third, a purple feather. You are now told that the fourth box contains a mask and are asked to predict its color.

"*snarf*": A snarf is something presented to you in a box labeled "Excelsior!" and is either an insect, a ball of was, a feather, or a mask.

You have observed three snarfs and are about to observe a fourth.

Example 1

X is said to be a "**murkle**" when:
X is an insect *and* X is green

-or-

X is a ball of wax *and* X is yellow

-or-

X is a feather *and* X is purple

-or-

X is some other type of thing *and* X is red.

Example 1

X is said to be a "**murkle**" when:
X is an insect *and* X is green

-or-

X is a ball of wax *and* X is yellow

-or-

X is a feather *and* X is purple

-or-

X is some other type of thing *and* X is red.

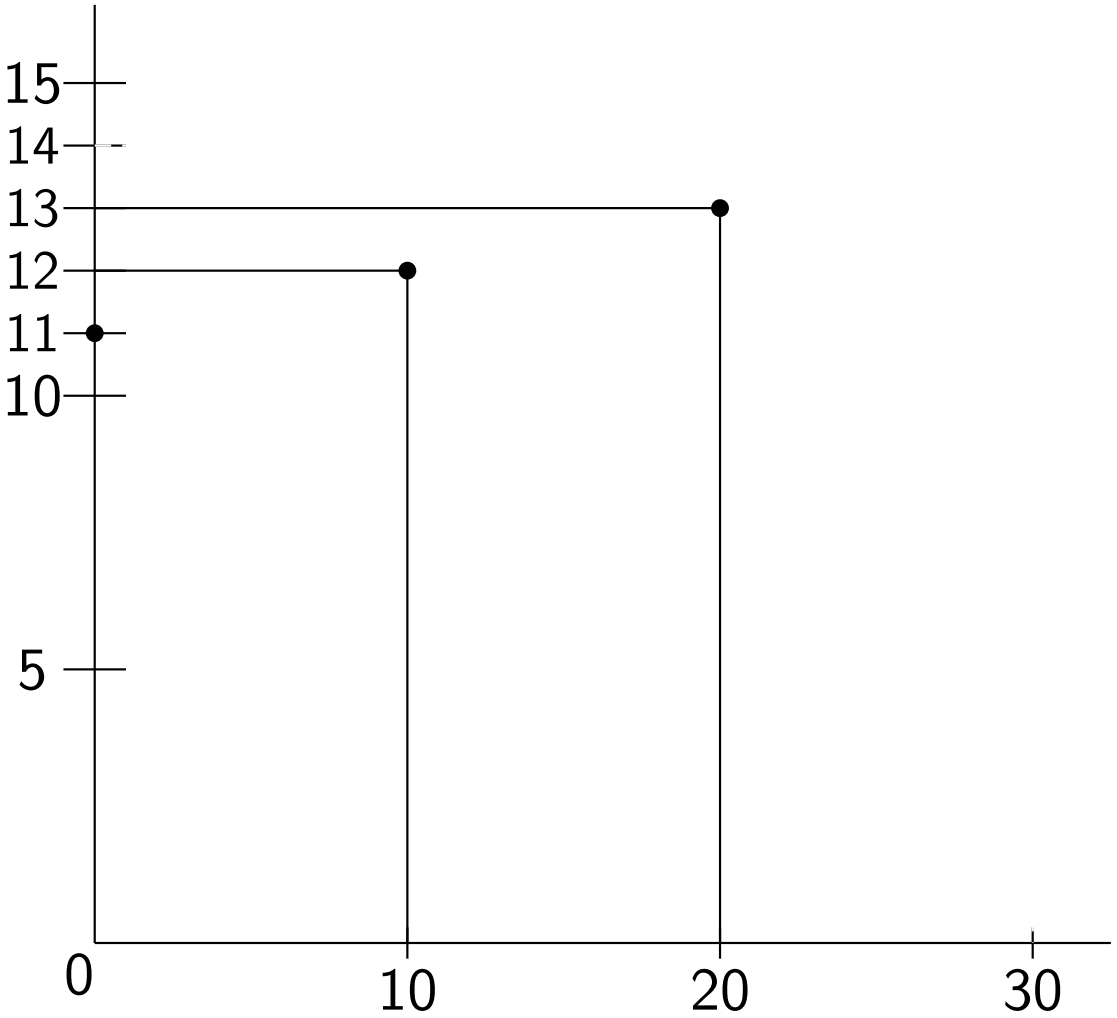
All observed snarfs have been murkle

The next snarf to be observed will be murkle

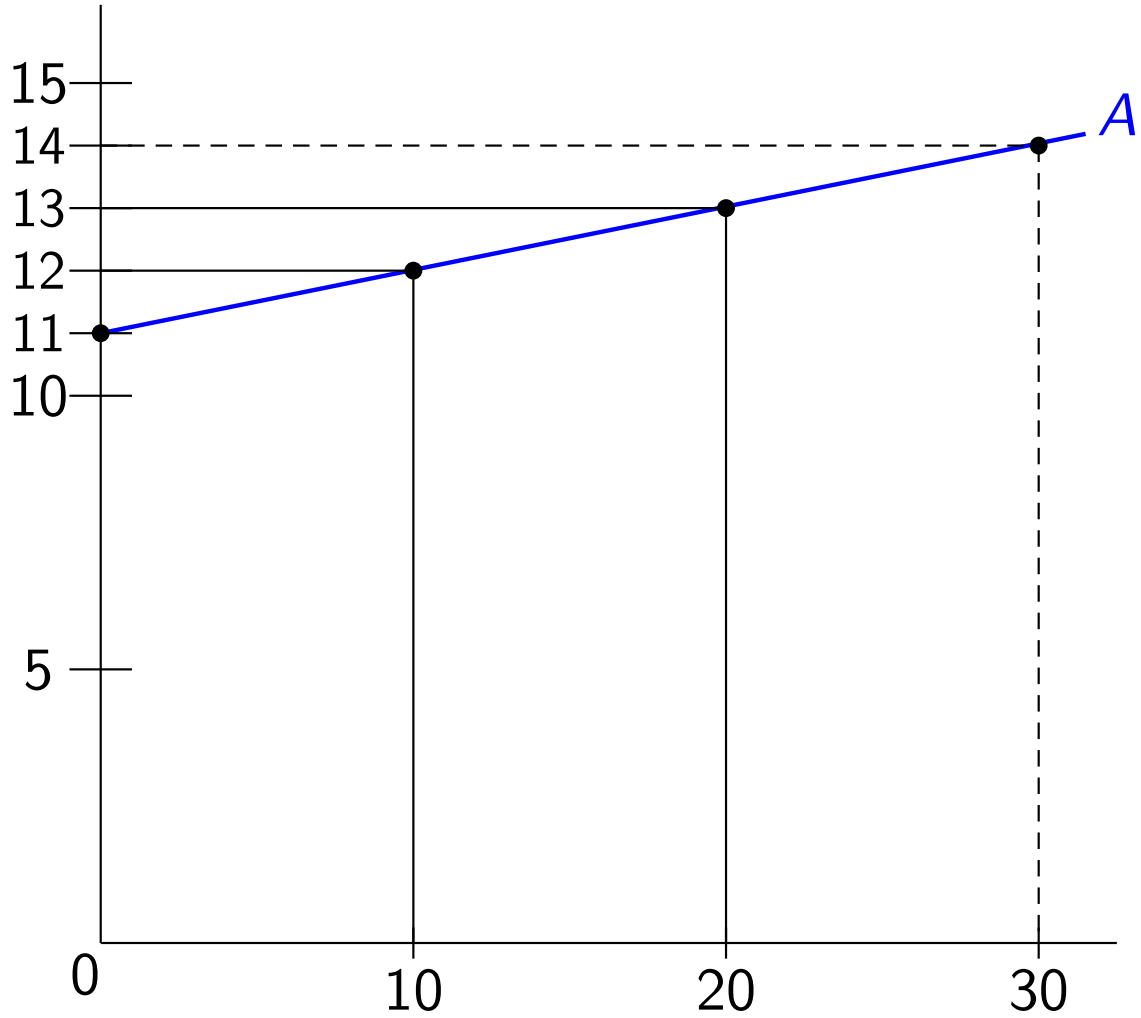
Example 2

Suppose that a certain small country takes a census every 10 years and has taken three so far. The population was 11 million at the time of the first census, 12 million at the second census and 13 million at the third.

Example 2



Example 2

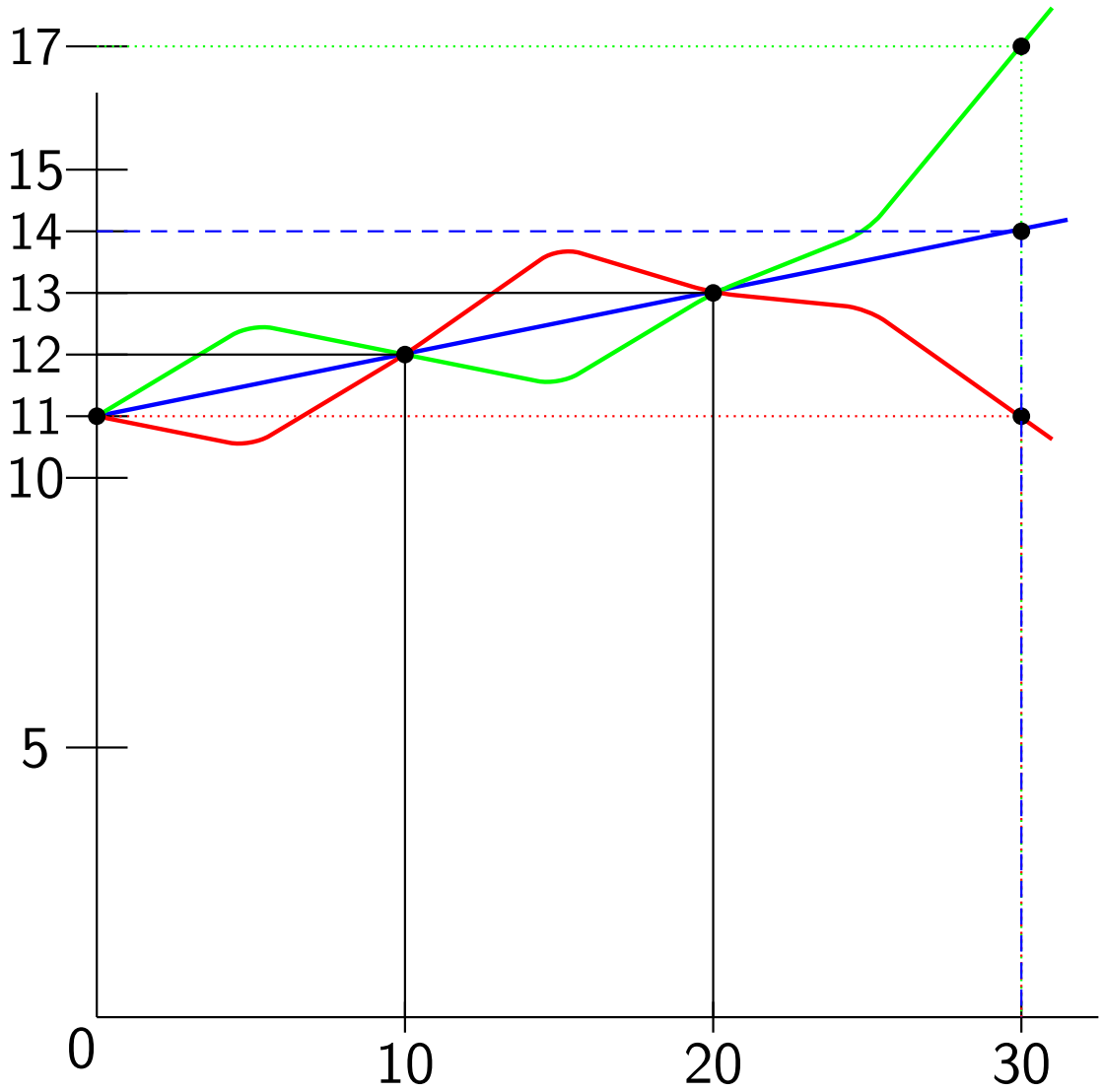


Example 2

All points representing census so far taken have fallen on line A.

The point representing the next census to be taken will fall on line A.

Example 2



Example 3

1. $1, 2, 3, 4, 5, \ldots$
2. $2, 4, 6, 8, 10, \ldots$
3. $1, 3, 5, 7, 9, \ldots$

Example 3

For every given member of series (3)
the kth member of that series was $2k - 1$.

For the next member of the series (3)
the kth member will be $2k - 1$.

Example 3

For every given member of series (1) the kth member of that series was k.

For the next member of the series (1) the kth member will be k.

Example 3

For every given member of series (1) the kth member of that series was k.

For the next member of the series (1) the kth member will be k.

For every given member of series (1) the kth member of that series was $(k-1)(k-2)(k-3)(k-4)(k-5)+k$.

For the next member of the series (1) the kth member will be $(k-1)(k-2)(k-3)(k-4)(k-5)+k$.

Thus, the next element of the sequence will be 126!

...the statement that scientific inductive logic presuppose the uniformity of nature is equally pointless unless we are able to say *in what respects* nature is presupposed to be uniform. For ti is self-contradictory to say that nature is uniform in all respects, and trivial to say it is uniform in some respects.

In the Goodman Paradox, the gem expert, who spoke our ordinary language, assumed nature to be uniform with respect to blueness or greenness of emeralds. Since observed emeralds had always been green, and since he was assuming that nature is uniform and that the future would resemble the past in this respect, He predicted the emerald would remain green.

The gem expert who spoke the grue-bleen language assumed nature to be uniform with respect to the grueness or bleenness of emeralds. Since observed emeralds had always been grue and since he was assuming that nature is uniform and that the future would resemble the past *in this respect*, he predicted the emerald would remain grue.

It is self-contradictory to say that nature is uniform in all respects.

To say that nature is uniform in some respects is to say that it exhibits some patterns, that there are some regularities in nature taken as a whole (in both the observed and unobserved parts of nature). But as we have seen....in any sequence of observations, no matter how chaotic the data may seem, there are always regularities.