

Signal From Noise

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A SIGNAL IS ENERGY (electromagnetic, mechanical, acoustic, etc.) that contains meaningful data transmitted from one location to another, from a sender to a recipient. Noise is energy that accompanies a signal that dilutes or distracts from the comprehension of data by the recipient.

The “signal-to-noise” ratio is a core concept in basic science and engineering. It has formal mathematical definitions in these fields based on the energy output of the transmission divided by the energy output of the extraneous or random background. Signal-to-noise ratio is also used informally to refer to the relative amounts of useful to distracting data, such as concert music versus crowd sounds, or words on a book page stained by coffee blotches.

All living creatures maintain life through the process of disentangling signal from noise. Our biology is constructed to extract from the welter of incoming data that which can be used to help us survive and pass on our genes. We humans, with our unfathomably intricate brain,

analyze incoming data both from our senses as well as from thoughts themselves.

In medicine, the need to disentangle signal from noise is ever-present, particularly in puzzling cases. In taking a history are we absorbing the key facts the patient is sharing and setting aside extraneous ones? In analyzing laboratory and imaging results, are we catching the explanatory clues and dismissing the red herrings? Does a finding that falls outside of the boundaries of normal indicate a disease process or simply an example of benign variation? Does the data create a pattern of threat or reassurance? Will additional testing be helpful, distracting, or even harmful? Answering those questions involves a continuous process of assigning degrees of salience to some findings and irrelevance to others. The skill with which we do this separates mastery from blundering.

The accompanying poem applies this concept of signal-to-noise as a driver of neurogenesis, personal development, and societal progress. I hope you find in its rhyming stanzas both signal and entertainment.

We're born to this world of sensation
And slowly make sense of the chaos
The brain through selective creation
Constructs its own meanings and bias

How well does this process prepare us
Through gambits of prompts and deploys?
That depends how much error has spared us
If we learn to parse signal from noise

The inputs come ordered and random
A tsunami of diamonds and dross
Meaning and flak ride in tandem
Rarely do lines of sight cross

Yet out of this tower of Babel
We build both our weapons and toys
Whether life itself thrives or unravels
Distinguishes signal from noise

From chemosynaptic perfusion
Converted to logic and cues
The bundling of boundless profusion
Into patterns we know and can use

Reflections through houses of mirror
Conveying both hits and decoys
Conclusions that gradually grow clearer
In filtering signal from noise.

It's a startling fact of our being, that
The brain dwells in darkness and silence
The miraculous fact of our seeing, comes
Through trillions of pulsating islands

We build up a sense of the world
Through feedback, correction and poise
Enlightenment slowly unfurled
By partitioning signal from noise. **SDP**

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