One New Knowledge

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1 Introduction

Humans acquire knowledge, not just information. Knowledge is structured information that builds on raw data and facts. While information is well-defined, knowledge is less studied. Understanding how new knowledge integrates with existing knowledge is key to understanding how we learn and grow.

2 New Knowledge Integration

The human brain collects knowledge over time. Let S represent the set of all knowledge a person possesses. Each piece of knowledge is denoted as k_i, where $i = 0, 1, \ldots, n$, and n is the last knowledge acquired.

At any given moment, the set S can be expressed as:

$$S = k_0 + k_1 + \cdots + k_n = \sum_{i=0}^{n} k_i$$

When a new piece of knowledge k_{n+1} is introduced, it updates the set S. The updated set becomes:

$$S = S + k_{n+1}$$

Now, k_{n+1} is included in S. This signifies the growth of knowledge within the brain.

If adding k_{n+1} leads to new insights, this can be represented as:

$$\sum_{i=1}^{n} k_i + k_{n+1} = \sum_{i=2}^{m} k_{n+i}$$

Here, $\sum_{i=2}^{m} k_{n+i}$ represents the new knowledge derived from integrating k_{n+1} with the existing set S. This illustrates how new information can transform our understanding by creating new connections.

Each new knowledge piece has the potential to generate one or more insights. If the condition:

$$\sum_{i=1}^{n} k_i + k_{n+1} = \sum_{i=2}^{m} k_{n+i}$$

holds true 5% of the time, each new k_{n+1} leads to derived knowledge in a small but significant fraction of cases.

After acquiring 10,000 new pieces of knowledge, the set S will grow not only by direct addition but also by additional insights. This can be expressed as:

$$S = \sum_{i=1}^{10{,}000} k_{n+i} + \sum_{j=1}^{\infty} 0.05^j \cdot \sum_{i=1}^{10{,}000} k_{n+i+j}$$

The second term represents the knowledge derived from each new piece, with a 5% chance of generating one additional knowledge piece at each iteration. This shows how knowledge accumulation can lead to exponential growth in understanding.

To simplify, if each 5% event generates only one additional knowledge, we can write:

$$S = \sum_{i=1}^{10{,}000} k_{n+i} \cdot \left(1 + \frac{0.05}{1 - 0.05}\right)$$

where $\frac{0.05}{1-0.05} \approx 0.0526$ is the total contribution of derived knowledge. The formula becomes:

$$S \approx \sum_{i=1}^{10{,}000} k_{n+i} \cdot 1.0526$$

This captures both the direct addition of knowledge and the additional insights generated, assuming each 5% event leads to exactly one new knowledge.

3 Growth of S Over Time

The larger the set S becomes, and the more knowledge we have in familiar or interconnected topics, the more likely it is that the condition:

$$\sum_{i=1}^{n} k_i + k_{n+1} = \sum_{i=2}^{m} k_{n+i}$$

holds true. As this happens, the percentage of cases where new insights are generated increases, leading to more derived knowledge per new piece of information added. This highlights how expanding our base of knowledge, particularly in familiar areas, enhances the potential for future learning.