Logic is Not Universal: Dismantling the Illusion of Reason

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1 Abstract

This essay presents Programmed Conceptual Deconstruction (PCD), an algorithm developed by the author specifically to analyze the foundations of logic, along with the introduction of the concept of Conceptual Quarks (CQs), an original notion that identifies the basic units of knowledge. Using these tools and experimenting with a custom-built AI model, it is demonstrated that fundamental logical principles, such as the principle of identity or the principle of non-contradiction, are not absolute truths, but constructions that arise from the specific properties of our reality. This work is based on concepts created by the author and combines philosophy with technology precisely to reevaluate traditional perspectives of logic.

2 Introduction

This essay stems from a question I was asked some time ago: What type of knowledge do you prioritize, rational or empirical? This question left me thinking. While my automatic response in my head was to favor rational knowledge, the more I thought about it, the more doubts arose: What is the line that separates reason from the empirical? What exactly is reason? Is it universally valid?

It is likely that this initial automatic inclination toward reason was due to the fact that, since Ancient Greece, logic has been the foundation upon which we have built our understanding of the universe. It has also been considered for centuries as the standard of rational knowledge and is constantly praised by both science and philosophy. Even from a young age, we are taught to see it as absolute truth, and it is sometimes perceived as an almost unquestionable ideal.

However, this essay proposes the opposite: logic is not a universal truth but a product of our reality that could fail in a different context.

To explore this idea, I present two original concepts developed for this work: Programmed Conceptual Deconstruction (PCD) and Conceptual Quarks (CQs). PCD is specifically designed to dismantle logic into its most fundamental components. It is not only designed as a set of instructions but also comes with a program. PCD will allow us to generate extensive knowledge trees to visualize how logic is deconstructed into increasingly simpler notions, thereby revealing the fundamental principles of logic and their foundation in the sensory world.

PCD will not be the only tool I employ. I will also introduce another concept developed for this study: Conceptual Quarks (CQs), the most basic and fundamental unit of any notion, the building blocks upon which any tower of knowledge is constructed. By deconstructing logic using PCD, we will obtain its most fundamental notions, that is, its Conceptual Quarks, and in this way, we will understand what exactly lies at the core of logic and how this core is tied to the sensory.

To delve even deeper into the idea, I have designed three different experiments and created an artificial intelligence model called Vera. Vera has learned from scratch the three fundamental principles of logic and, also from scratch, to count and add, but in a particular way: it has learned without any supervision and solely through visual experience, precisely to prove that logic is merely a contingent construction rooted in sensory experience.

This experiment aims to demonstrate that neither logic nor fields that share the same Conceptual Quarks, such as mathematics, represent divine or universal knowledge. Rather, they are consequences of our sensory reality, principles that even a simple neural network, much less intelligent than any animal, can learn and generalize merely through visual experience, observing, just as humans and animals observe their environments, and without any help. For anyone interested in replicating the experiments or starting their own research, the code, datasets, and developed programs will be available in the appendix.

Rationalists like Descartes or Spinoza believed that logic was a universal and a priori truth, independent of context and the sensory world. Kant also regarded it as a universal and a priori framework necessary to organize experience. Even Hume, one of the leading empiricist authors, classified it as a relationship of ideas and valid independently of experience.

The aim of this essay is to question the universality of logic, its a priori status, and its supposed independence from experience. PCD, Conceptual Quarks, and Vera are just some of the tools and concepts I have created to illustrate this reality, but they are also an invitation to change the way we think about logic.

3 Programmed Conceptual Deconstruction and Conceptual Quarks: The Search for the Origin

Programmed Conceptual Deconstruction (PCD) is the tool we will use to understand the origins of logic. PCD allows the systematic deconstruction of any concept or field of knowledge into its most fundamental sub-concepts, which have been named as Conceptual Quarks.

You can imagine how PCD works by picturing a squirrel climbing an oak tree in search of acorns. The trunk of the oak represents the field of knowledge or concept to be analyzed for its most fundamental concepts (the acorns), and the algorithm's task is to traverse all the branches of the field of knowledge or concept, as if it were a tree, and find the most fundamental concepts for understanding that field or concept.

These most fundamental concepts collectively form the seeds of the oak, that is, the acorns, and in our case, the Conceptual Quarks. Each seed represents a unified set of these foundational elements, as if it was an oak embryo that, if planted, could give life to a new oak, just as Conceptual Quarks are the building blocks that give life to the concept or field that has been analyzed with PCD. They are the most fundamental components of the field or concept, and they are what we aim to find for logic.

In figure number one, you can see a simplified visual example where the original field of knowledge to be deconstructed is Ancient Greece, and the PCD finds in the "Philosophy" branch the Conceptual Quark of {Plato, The Republic}.

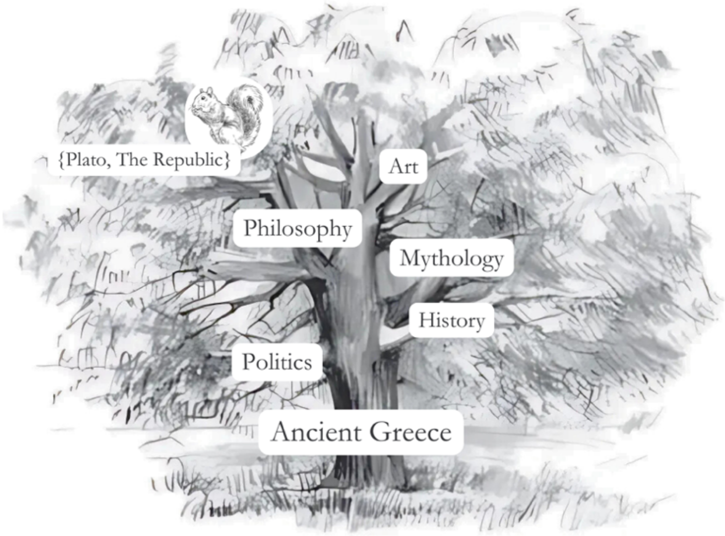

Figure 1: The PCD algorithm (the squirrel) finds a conceptual loop and classifies it as a Conceptual Quark.

Similarly, in figure number two, you can see another visual example of how a PCD application looks, but this time through the program developed for this study by the author. As you can observe, the initial field of knowledge, which in this case is Mathematics, is located at the center of the graph, and the algorithm has automatically subdivided it into different levels of representative sub-concepts and less complex fields within mathematics.

The farther a concept or field of knowledge is from the center of the diagram, the greater the reduction of the initial complexity. The algorithm's goal is to find the most fundamental and indivisible concepts of the analyzed field or concept. In figure 1, for example, at the second level of depth, we have concepts such as linear algebra, probability, or differential calculus, and at the fifth level, concepts including a hypersphere, an angle or a gradient.

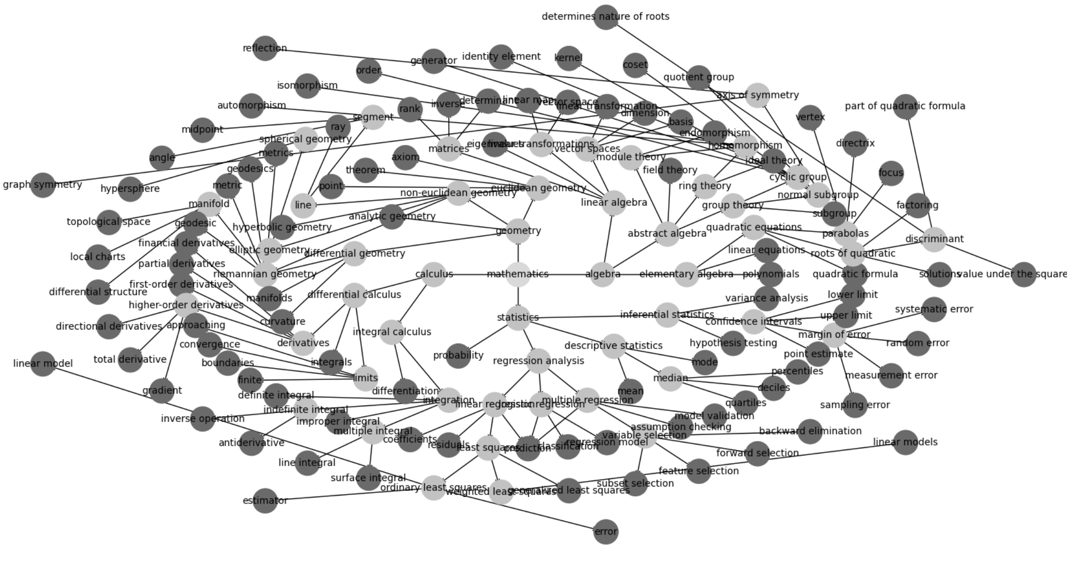

Figure 2: Application of PCD with the program to Mathematics (amplitude limit of 4 and depth limit of 6; the Conceptual Quarks are found when applied without a depth limit, as we will see later. This is merely an illustrative example to facilitate the understanding of the deconstruction process).

On the other hand, Conceptual Quarks (CQs) are the most fundamental sub-concepts of any concept or field of knowledge, and they are determined when PCD classifies a concept as a CQ because it cannot deconstruct it into more sub-concepts relevant to the original field of knowledge or concept, or because it encounters a conceptual loop and cannot proceed further along a branch.

Just as quarks make up larger subatomic particles like protons and neutrons, which in turn make up atomic nuclei, which make up atoms, and these make up molecules, which constitute most of what we know, you can think of Conceptual Quarks as the quarks of the conceptual world. They are the most fundamental concepts for any notion.

Since the detailed instructions for applying the Programmed Conceptual Deconstruction algorithm span two full pages, I will include them directly in the appendix of this document within the PCD GitHub repository, where I also provide open-source access to the program.

Programmed Conceptual Deconstruction will be essential in the study of the origins of logic: What are the most fundamental concepts of the field? What is the first thing that must occur for logic to be possible? What do Conceptual Quarks reveal about the universal validity of logic? All these questions will be answered.

3.1 Determining the Foundations of Logic

Logic is a field that builds on itself. Its most advanced concepts are deduced from its most basic principles, so we need only analyze its most basic concepts to get our answers. You can imagine logic as a brick tower, building on its base, and like any other tower, it would not stand upright without its base, so the base will be the first thing we analyze.

We will review the main principles of logic, such as the principle of identity, the principle of non-contradiction, and the principle of the excluded middle, among others. Not only will we extract their Conceptual Quarks, but later we will also teach them to Vera, the artificial intelligence used in this essay, using only experience.

Principle of Identity: A = A

Principle of Non-Contradiction: ¬(A ^ ¬A)

Principle of the Excluded Middle: A v ¬A

Disjunctive Syllogism: If A v B, then ¬A → B

Conjunction: If A and B are true, then A ^ B

Hypothetical Deduction: If A → B and B → C, then A → C

Modus Ponens: If A → B and A is true, then B is also true

Modus Tollens: If A → B and ¬B is true, then ¬A is also true

Figure 3: Principles of logic to be analysed

In the definition of all the principles, we find some repeated concepts, such as 'true', 'be', or 'equal', and it is these concepts to which we will apply a PCD of maximum depth in order to find their Conceptual Quarks.

For maximum precision, we will prioritize the manual application of the algorithm, following its instructions. Since this application spans seven written pages, I'll make it available through the appendix, inside the PCD GitHub repository. Here, I will present the complete result of the manual application alongside a visualization from the program, which is shown in Figure 4. This visualization is more generalized and intended solely as a guide. The darkest nodes represent Conceptual Quarks.

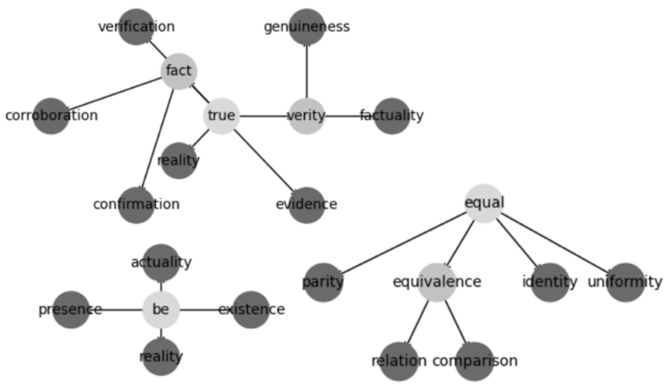

Figure 4: PCD applied in software on 'equal', 'be' and 'true'.

The manual application of PCD, upon which this analysis will be based, is interesting because when PCD is applied to 'be', we discover during the deconstruction process both 'true' and 'equal', which are also deconstructed.

When deconstructing a concept, the algorithm relies on the official definition for that concept, from which it extracts only terms that are relevant and of lesser conceptual complexity. The Conceptual Quarks found when applying PCD to the aforementioned principles are as follows:

CQ = = [{Exist_1.2.1, Real_2.3.2 ,Exist_3.5.3}, Object_4.5.4, Object_4.6.6, [{Exist_3.1.1 ,Real_4.1.1 ,Exist_5.1.1},{ Exist_3.3.2 , Real_4.3.3 ,Exist_5.4.3}, Object_6.1.2, Object_6.3.5, {Quantity_5.7.6 ,Measure_6.5.7 ,Quantity_7.3.5}, {Measure_6.5.7 ,Unit_7.4.5 ,Measure_8.4.4},{Quantity_5.7.6 ,Measure_6.5.7 ,Unit_7.4.5, Quantity_8.3.4}{Quantity_7.1.2 ,Measure_8.1.1 ,Quantity_9.2.1}, {Quantity_7.2.4 ,Measure_8.2.2 ,Quantity_9.4.2},{Quantity_7.1.2 ,Measure_8.1.1 ,Unit_9.1.1 ,Quantity_10.1.1} , {Measure_8.1.1 ,Unit_9.1.1 ,Measure_10.2.1} ,{Quantity_7.2.4 , Measure_8.2.2 ,Unit_9.3.2,Quantity_10.3.3},{Measure_8.2.2 ,Unit_9.3.2 ,Measure_10.4.3}]

In the results, many concepts and loops can be observed repeatedly, so if we simplify, we are left with the following Conceptual Quarks as the outcome:

CQ [{Exist,Real}, Object, {Quantity,Measure,Unit}]

The first CQ found, {Exist, Real}, indicates the condition that one must exist in order to 'be,' just as something must exist at least as a proposition for it to be 'true,' and for two things to be 'equal,' they must also exist, at least at a conceptual level.

Next in the list we find the concept of Object, which has the following definition: "Anything that can be the subject of knowledge or sensitivity on the part of the subject, including the subject itself."
So something must be an "Object" first in order to 'be', or to be 'true', or to be 'equal' to something, for the same reason for which something must exist at least as a concept to 'be,' or to be 'true', or to be 'equal' to something, as indicated by the previous CQ.

Finally, we have the second conceptual loop {Quantity, Measure, Unit}, related to the attributes of everything that can 'be' and 'is' an object. Interestingly, this last CQ can also be obtained by applying PCD in depth to mathematics.

As we can observe, the Conceptual Quarks of the most basic principles of logic are grounded in what **exists** and is **real**, in what is an **object**, and in what is **measurable**. This allows us to affirm that the building blocks upon which the tower of logic is founded are part of the sensory realm.

This directly contradicts rationalists like Descartes and Kant, who believed that logical structures are inherent to human reason and not dependent on the external world. It also contradicts Hume, who considered that logic was on a "safer" and more stable level than the notion of causality and that it was free from empirical dependence. PCD suggests that even logic is based on principles derived from sensory reality, refuting both the *a priori* notion of rationalists and the lack of questioning by empiricists toward their logical structures.

Now that PCD has helped us understand the foundations of logic, the next section will be dedicated to verifying the findings obtained through PCD. We will verify the algorithm's results by teaching an artificial intelligence the three principles of logic, namely identity, non-contradiction, and the excluded middle, solely through experience and sensory input.

4 Recreating the Principles of Logic Solely Through Experience

The objective of this section is to verify the findings from PCD and determine if the principles of logic are grounded in sensory reality. I have created a scenario, a room with a single object, which is a cube. Inside this room, there is an artificial intelligence named Vera. Vera is spherical in shape and has a script that makes it explore the room randomly. Vera has the ability to see and process visual information. Essentially, it will visually explore the room for a while.

The purpose of the experiment is to study whether Vera, solely by exploring the room, can arrive at the principles of identity, non-contradiction, and the excluded middle through pure experience, as suggested by the CQs we found in the previous section via PCD: [{Exist, Real}, Object, {Quantity, Measure, Unit}].

Vera will move randomly around the room, capturing what it sees at each moment, which has resulted in a dataset of 4448 images, which will be available along with the code to train the AI model through a link in the appendix for anyone who wishes to experiment with it.

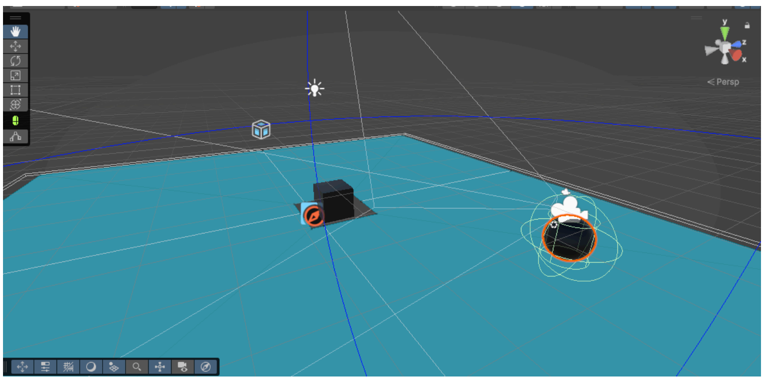

Figure 5: Experiment scenario, with the cube in the center, and Vera on the right.

Vera has within it a neural network capable of processing images, which is a convolutional autoencoder. Its neural network essentially extracts relevant features from the images while reducing dimensionality, resulting in a compressed image. Then it attempts to reconstruct the original image from the compressed version and the features it learned from the original image.

The process is like wanting to send an image to a friend, but the image is too large to send. So, you decide to describe the image to them so they can imagine it. You tell them about the most important features, like the mountains in the background, the trees on the sides, and the river in the center, which summarizes the image and provides enough information for your friend to picture the landscape in their mind. Then your friend, upon hearing this, tries to reconstruct how the image would look within their mind.

This is what Vera is constantly doing with itself in this experiment, fulfilling both roles. Also, the process is unsupervised, meaning Vera learns entirely on its own without human intervention.

Once the exploration and learning phase is complete, after thoroughly exploring the room and processing everything it has seen with its neural network, Vera created a representation, which can be seen in Figure 6.

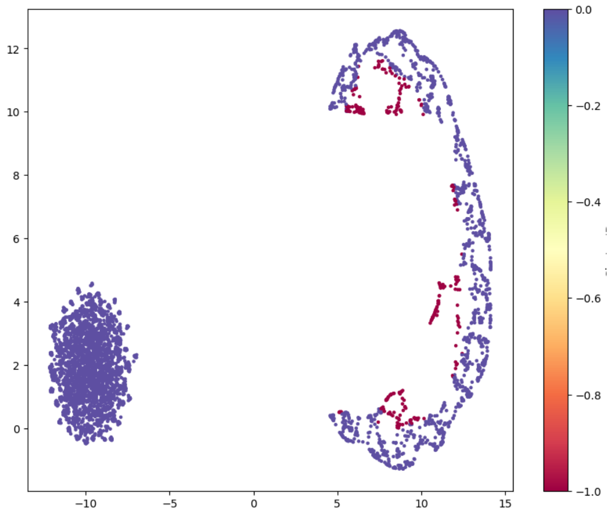

Figure 6: Clusters obtained by Vera.

In the graph, we can observe two main clusters: one with an elliptical shape in the lower-left area and another with a horseshoe shape in the right area. The left cluster represents the moments when Vera was not looking at the cube in the center of the room, and the right cluster represents what Vera understands as the cube located in the center of the room, which it has observed from every possible angle.

What do these results mean? These results are significant because we can observe the three principles of logic present in them. Let us briefly recap what these principles are.

- **Principle of Identity**: A proposition is equal to itself. This means that if a proposition is true, then it is true: A = A.
- **Principle of Non-Contradiction**: A proposition cannot be both true and false at the same time. It is not possible for A and ¬A to be true simultaneously.
- **Principle of the Excluded Middle**: A proposition must be either true or false; there is no third option. For every proposition A, A is either true, or it is not true.

We can see that Vera applies the **Principle of Identity** because we observe two distinct clusters: one in which the cube 'is' and another in which the cube 'is not'. This means that Vera recognizes the existence of the cube and that whenever it has seen the cube, it has equated it to itself, and therefore it has placed it in the cube cluster, thus applying the Principle of Identity.

This can be observed more visually in Figure 7, where Vera indicates where it places everything it sees within its neural net. In the figure, we can see how whenever the cube appears, Vera equates it to itself and recognizes its identity by assigning it to the right cluster.

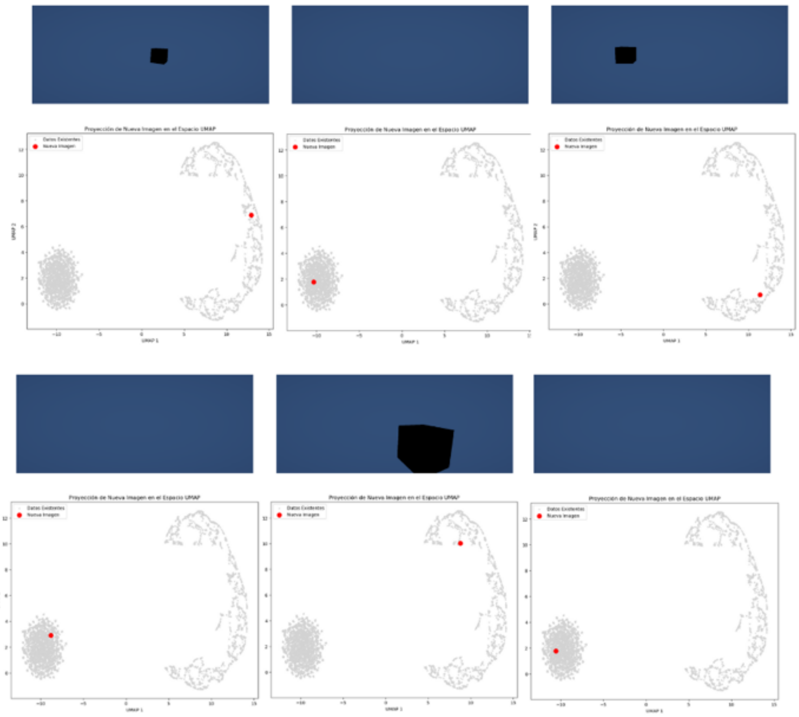

Figure 7: Different moments captured by Vera and their placement.

We can also see how Vera applies the **Principle of Non-Contradiction**. For Vera, there is no such thing as the cube both being and not being at the same time; it either 'is' in the right cluster, or it 'is not' in the left cluster. Furthermore, regardless of the angle or distance from which Vera observes the cube, it always recognizes it. The cube never stops being the cube for Vera, which is why it consistently applies the Principle of Non-Contradiction.

Finally, Vera also applies the **Principle of the Excluded Middle** because the cube is either present, or it is not present, there is no third option.

Some will think: but what if it reflects logic in the representation only because we humans have created neural networks with logic? This is proven not to be the case in section 6, in which, presenting Vera with a quantum reality, she applies in her representation a logic which breaks with our classical logic, which means neural nets like Vera's only reflect the underlying logic of the context to which it is exposed, being in this case, a reflection of our classic logic.

These results directly refute what Leibniz argued, which was that the principles of identity, non-contradiction, and the excluded middle were universal and eternal truths, independent of experience and part of a logical order preceding the world. This experiment suggests the opposite, namely that these principles are grounded in empirical interaction with the environment.

Aristotle laid the foundation for these principles in his formal logic, considering them universal truths applicable to all beings in any context. However, Vera's learning demonstrates that these principles are only valid in contexts where objects maintain coherent and observable properties, which is not necessarily the case in other physical or conceptual realities (we will delve into this in more detail in Section 6).

How is it possible that Vera is applying the three principles upon which logic is based after only exploring a room with a cube for a short time?

The answer is simple: Vera is not thinking, nor is it consciously applying the principles of logic. Vera has only visualized and learned everything about a room, and the fact that it is applying the three principles of logic in its data representation simply reflects that learning logic is a byproduct of learning about a reality where coherent and observable properties are maintained, such as in ordinary human experience, which is how we learned logic.

But Vera is an AI, some may argue that the process in animals and humans is different and that we arrive at logic without relying on sensory input at any point.

I'll give an example of many on why Vera's results can be infered for animals and humans. When a child is learning to walk, they might fall a few times, and require multiple attempts before successfully learning how to walk. However, in their mind, unconsciously, the ground will always be the surface on which they can support themselves to walk. What does this mean? Inside the child's mind, unconsciously, the ground remains the ground; it does not transform into a car or anything else. This understanding reflects the **Principle of Identity**, A = A.

For a child, when they walk on the ground, they are being supported by it, so the ground 'is'. For example, when they are being carried, they are not walking on the ground, so the ground 'is not'. But never both at the same time. It is not possible for the ground to be and not be simultaneously, which reflects the **Principle of Non-Contradiction**.

Furthermore, the child is either on the ground or not on the ground. They might be on a chair or in an adult's arms, but they are either on the ground or not, which also reflects the **Principle of the Excluded Middle**.

This is just one of many examples of how, from the moment we are conscious, we unconsciously learn, just like Vera, the principles of logic, and the source is our sensory reality.

Even living organisms are structured around the principles of logic. No living being throughout its evolution has expected, for instance, the energy molecule ATP to break the principles of logic and transform into something random, thereby violating the Principle of Identity.

For cells and even for bacteria, there is no scenario in which ATP both exists and does not exist at the same time. Either there is ATP, or there is not, reflecting the Principle of Non-Contradiction, and there is no need for a human level cognitive ability to understand this because it is in the same sensory reality that these principles are grounded and that, consequently, structures living beings in a logical way through evolution.

As suggested by PCD and the experiment, logic and its principles are grounded in and subordinated to our reality, we did not invent it nor arrive at it "a priori," as rationalists argued. We have been learning it unconsciously from the moment we had the ability to perceive information, just like Vera.

Not only that, but our body, our brain, everything is structured around these same principles. It is no coincidence that it is this same reality that sustains both our vital structure and the logic we employ.

But logic is not limited to its three fundamental principles, so to continue the analysis of the validity and origin of logic, in the next section, we will determine whether another of the most fundamental Conceptual Quarks for logic, {Quantity, Measure, Unit}, can also be recreated solely through experience. This CQ is fundamental not only to logic but also to disciplines that rely on logic, such as mathematics or physics.

5 Arithmetic, Logic Derived from Experience

In this section, we will focus on determining whether another of the most fundamental CQs of logic ({Quantity, Measure, Unit}) can be learned solely through experience. We will test whether Vera can arrive at these notions solely through experience.

To do this, we will attempt to teach Vera to recognize units and distinguish between different quantities. Our goal is to teach Vera to count from 1 to 10 and to perform addition.

This time, Vera will not be in a room but will instead be shown a series of images depicting different quantities of squares. In Figure 8, you can see three examples of the style of images that Vera will observe. In total, the dataset consists of 1,000 images. I will use a neural network architecture similar to the one in the previous section, an autoencoder. You can find both the dataset and the architecture in its corresponding GitHub repository linked in the appendix.

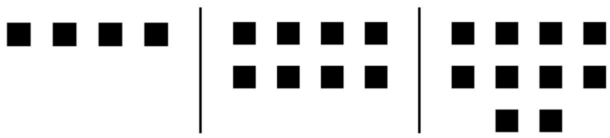

Figure 8: Examples of the dataset.

After showing Vera all the images, Vera groups them into 10 different clusters, one for each independent quantity visualized. In Figure 9, the 10 different clusters can be observed.

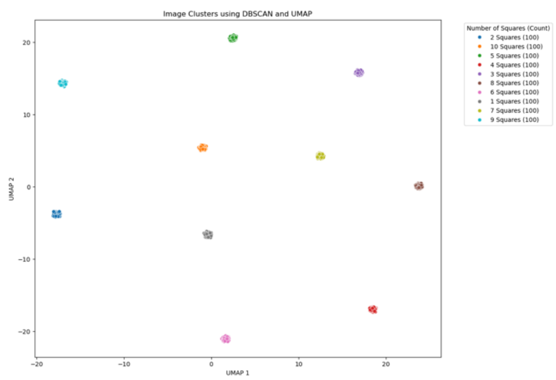

Figure 9: Vera’s 10 clusters.

This means that Vera has learned to differentiate between the 10 quantities of different units, or, as we colloquially say, to count. The ability to differentiate between different quantities of units is not only one of the foundations of logic but also of certain fields that use logic, such as mathematics, and it has grasped the concept solely through pure sensory experience.

But we will not stop here, as we will also verify how Vera is capable of generalizing the learned concept of quantity and performing the arithmetic operation of addition solely through experience, further emphasizing how logic is grounded in our sensory reality.

To do this, I developed an application that can automatically generate images with different geometric shapes and combine them in various ways to visually simulate arithmetic operations. The application can visually simulate operations such as addition, subtraction, multiplication, or division. However, I believe addition is the most justifiably visual operation, so it will be the arithmetic operation we will test.

For this, Vera will be exposed to a shape it has never seen before, a circle, to verify whether it has truly understood the concept of unit and if it can generalize it. For this example, the application will generate two images, one with two squares and another with two circles. It will combine both images as if it were an addition and present the resulting image to Vera to see what quantity of units it identifies.

In Figure 10, on the left, you can see the image that Vera will observe, and on the right, the graph from Figure 9, showing which cluster Vera assigns this image to, i.e. the quantity of units it recognizes.

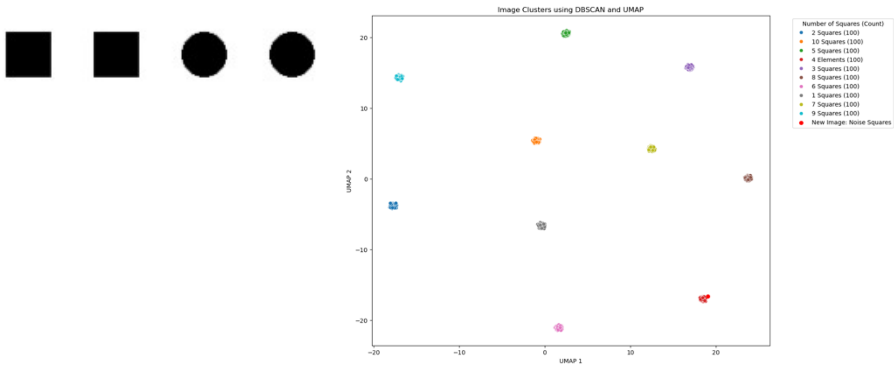

Figure 10: Input and result, marked by the red circle.

As we can see in the graph on the right, Vera has assigned the image to the bottom right cluster, which indicates four units. In other words, it has successfully generalized both the concepts of quantity and unit to the circles and it has counted four units.

Again, Vera does not have the ability to think, nor capabilities comparable to any living being, yet we see that, solely through experience, it has demonstrated an understanding of a fundamental CQ of logic, upon which disciplines considered rational by many, such as mathematics, are also based.

In the previous section, we saw how it understood the CQs ({Exist, Real}, Object) through its understanding of the three principles of logic. In this section, we observe how it is also capable of understanding the remaining CQ we had to examine, by learning concepts such as unit, quantity, and even addition solely through experience.

Vera's ability to learn the concepts of unit and quantity solely through sensory experience contradicts the ideas of Frege and Whitehead. Frege believed that logic and fields that used logic, such as mathematics, were independent of experience and had a purely objective character. However, we have just seen how a neural network much simpler than the one of any animal or human can grasp the fundamentals of these through pure experience, which is, in fact, how we do it ourselves.

Whitehead, although he believed that logic was a tool for understanding real processes, he thought that mathematics was prior to and superior to any physical framework. These findings suggest the opposite: basic mathematical concepts, such as addition, are derived from structured sensory experience, not from a Platonic world of pre-existing ideas or universal abstractions independent of context.

The main flaw in the Platonic argument about logic is that it is only after discovering logic as something subordinate and dependent on experience that one can imagine logic as something that exists in a Platonic world.

Another issue is that, for example, quantum logic can also exist in a domain independent of the sensory, just as an alternative logical system could exist where adding two units does not equal to two units, and this system could validate itself in such a hypothetical conceptual reality. However, the fact that something exists in someone's mind at a conceptual level beyond the sensory and validates itself in such realm is very different from it being universally valid in reality, and this applies to logic.

For example, classical logic has principles that are invalid at the quantum level, just as neither classical logic nor quantum logic would be valid in a context where the principle of identity is broken, such as within the singularity of a black hole. This means that it is reality that determines the validity of logic and it is also its origin, as we have seen in these experiments.

In the next section, we will explore this question by examining what would happen to the validity of logic in contexts different from the everyday human context, considering two examples: the quantum world and a reality where the principle of identity does not hold, whether within the singularity of a black hole or in a hypothetical context.

6 The Non-Universality of Logic

One does not have to go very far to see that there are real contexts in which the logic based on our everyday human reality does not work, such as in quantum reality or possibly in the singularity of a black hole, as indicated by the information loss paradox. In these environments, multiple principles of classical logic do not hold, just as there could be environments in alternate universes or dimensions where the logic we use to try to understand our observable universe is also not valid at all.

That is, it is at the moment when the context changes that logic loses its validity and with it our ability to understand that context logically.

This means that the validity of a logical system depends on the context in which that logical system is posed, which means there cannot be a truly universal logical system as long as there are multiple contexts.

It would be wrong to think that there could be a universal logical system that could manage in a logical and truthful way all the logical systems that arise from all the different universal contexts at the same time, because this would presuppose that all those contexts present the same reality that originates the same logical system, and that, therefore, they are logically compatible, however, by definition, this is not the case, since the proposition presupposes different contexts which would mean they would not share the fundamentals that would make both be able to share the same logical system. All of this would be like trying to fit together two Lego pieces that have incompatible studs.

The moment there are different contexts, or even the possibility that such different contexts exist, the possibility of a logical system being universally true is lost, as is the case with our logic.

To emphasize the point that every logical system arises from a concrete empirical framework, we will take Vera on a trip to the quantum world and expose it to quantum reality in order to compare the logic it discovers in this reality with the classical logic that Vera applied in Section 4.

In this scenario, we will simulate quantum superposition, which implies that an object can exist in multiple states or positions at the same time. The cube will thus exist in two positions at the same time, as shown in Figure 11.

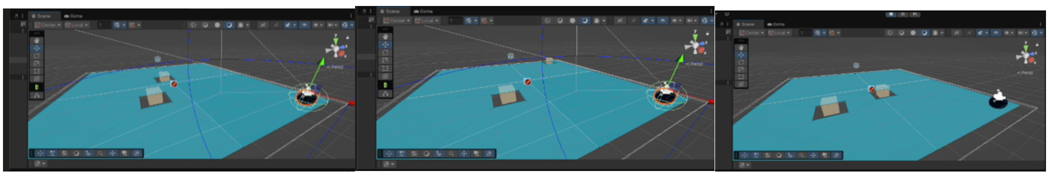

Figure 11: Vera observing the quantum superposition of the cube.

The quantum world is dangerous, so this time Vera will not have the ability to move and will merely act as an observer. The neural network with which Vera will learn about this reality is exactly the same as the one it used to learn in Section 4.

After starting the simulation and spending some time inside this pseudo-quantum reality, Vera captures 2726 different images of it, which will also be available via link in the appendix.

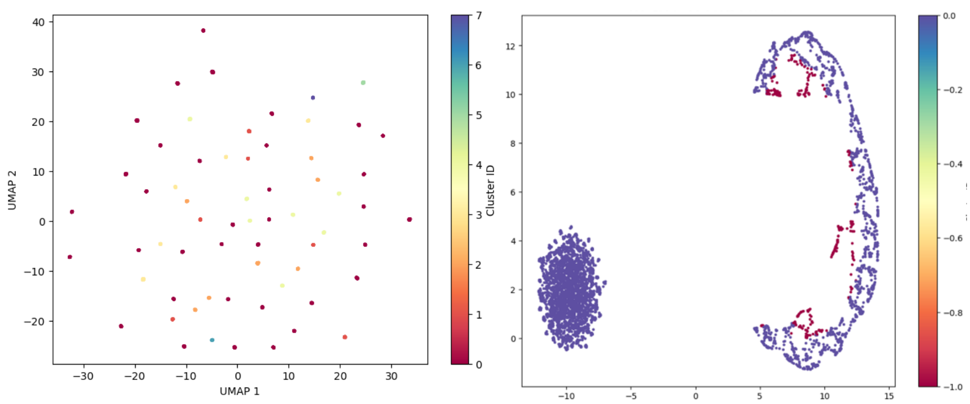

Figure 12: Perception of the cube in quantum reality (left) and in everyday reality (right).

By processing the images obtained from the cube within this quantum reality, we obtain the graph visible on the left side of Figure 13. It is apparent from the graph that the principles of classical logic as we know them are not fulfilled.

In the right-hand graph, in which Vera was in our everyday reality, no matter what angle it was at or how far away, Vera always recognized the cube and placed it in the right-hand cluster.

On the other hand, in the left graph, the cube 'is' and 'is not' at the same time, because at a given time in a given position, Vera places it inside a cluster, indicating the existence of the cube. However, at another time, in another position, and still in view, Vera places the cube in a different cluster. This means that, on the one hand, the cube exists, as Vera places it in a cluster associated with the cube, but at the same time, it does not exist, as Vera does not place it in the other clusters that also represent the same cube.

This completely breaks the principle of non-contradiction in logic, which states that something cannot 'be' and 'not be' at the same time—a principle that was perfectly respected in Section 4. So, what has changed?

What has changed is not Vera's neural network, since it is exactly the same as in Section 4. Nor has the cube itself changed. What has changed is the reality in which Vera and the cube are present, which in this case is the quantum reality, causing the quantum superposition of the cube. This implies an intrinsic logic which is different from that of our everyday reality, as it is reflected in Vera's representation of this reality.

That is, if we posit a reality, such as the quantum reality in this case, that alters the Conceptual Quarks of logic, such as [{Exist, Real}, Object, {Quantity, Measure, Unit}], then the logic ceases to be fulfilled and ceases to function, that is, it ceases to be true, as we have just demonstrated with this experiment in a quantum pseudo-reality.

This corroborates the findings made with Programmed Conceptual Deconstruction, which stipulate that logic is grounded in the sensory reality we inhabit. It also corroborates the findings from Sections 4 and 5, where we saw that we did not invent logic but discovered it within the fabric of our everyday reality.

It also corroborates the statement that no logic is truly universal, meaning that each logical system is true only within the context that allows it. However, the quantum realm is not the only context where parts of logic are not fulfilled. There are contexts within our reality where neither classical nor quantum logic applies, such as it may be in the singularity of a black hole.

This is known as the information loss paradox, which suggests that physical information can disappear permanently in a black hole, allowing numerous physical states to become the same state. This would contradict quantum mechanics, as quantum mechanics imply that information is necessary.

Within the singularity of a black hole, it is assumed that the principle of identity would be broken due to the loss of information, as everything ceases to exist. In such a case, neither our logic nor quantum logic would work. Both quantum reality and singularities are examples we know of, but there could also exist other realities, universes, or dimensions where there are multiple contexts in which our logic and the different versions of logic we know of are not valid.

7 Conclusion

Through tools such as Programmed Conceptual Deconstruction (PCD) we have been able to determine which Conceptual Quarks underlie logic, these being two conceptual loops and an individual concept: [{Exist, Real}, Object, {Quantity, Measure, Unit}].

It has been through experimentation with Vera and the different simulated realities, added to the line of thought we have followed during the essay that we have also been able to determine that logic is not of human invention, but is a discovery that dwells subordinated in the context that is human everyday reality.

The logic with which we think is not only subordinated to the human daily reality, but it is not universal, as we have been able to see by comparing it with certain real contexts different from the human daily one, such as the quantum world, or the hypothetical singularity of a black hole, but its non-universality is not limited only to these contexts, as it would also apply in any alternate context that does not allow the CQs of our logical system, such as a reality without a concept of unit or object.

This analysis not only contradicts the positions of rationalists such as Descartes, Spinoza or Leibniz, who defended logic as an eternal truth independent of the sensory world, but also questions the transcendental framework of Kant, who believed that logic was a priori and universal, necessary to organize experience. Even Hume, one of the most recognized empiricists, left logic mostly untouched, since he considered it a relation of ideas outside the scope of the empirical. Frege and Whitehead also tried to abstract logic and mathematics to an objective and independent domain, and other philosophers such as Plotinus or Wittgestein linked logic to a higher reality or to the immutable structure of human thought.

This essay distances itself from all these perspectives by showing that logic is neither eternal, nor universal, nor transcendental, but a contingent construction dependent on the physical context in which it is discovered. Instead of seeing logic as something absolute, it should be seen as a discovery linked to the properties of our sensory reality, whose validity dissolves in alternate contexts. This is an invitation to abandon the search for universal truths and to adapt a more contextual approach.

8 Glossary of Terms

Conceptual Quark: the most fundamental sub concepts and conceptual loops of any concept or field of knowledge. Conceptual Quarks are obtained by applying Programmed Conceptual Deconstruction to any concept.

Programmed Conceptual Deconstruction: term that describes the algorithm created by the author for this study as a tool to analyze the origins of logic. Programmed Conceptual Deconstruction allows to systematically deconstruct any unit of knowledge into its most fundamental sub-concepts and conceptual loops, that is, into Conceptual Quarks.

Conceptual Loop: concepts or instances that refer to themselves in a circular fashion.

Conceptual Closure Algorithm: an algorithm part of Programmed Conceptual Deconstruction that checks for the existence of conceptual loops.

9 Appendix

PCD: https://github.com/codermtk/PCD.git

Section 4 Experiment: https://github.com/codermtk/Section-4-Experiment

Section 5 Experiment: https://github.com/codermtk/Section-5-Experiment

Section 6 Experiment: https://github.com/codermtk/Section-6-Experiment