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The Influence of John Locke's Primary and Secondary Qualities on Artificial Intelligence (AI) Systems

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ABSTRACT

This research examines the influence of Locke's primary and secondary attributes on artificial intelligence (AI) systems. It is also attempts to examine the underlying philosophy of Locke's primary and secondary qualities as they relate to ideas in AI. The ideas are perceived to be analogous in principle to those found in artificial intelligence. In his theory of knowledge regarding primary and secondary qualities, Locke maintains that all objects possess specific characteristics that can be classified into two groups: primary and secondary qualities. Primary qualities are inherent to the object, and they include aspects such as shape, size, and position. These characteristics are deemed objective according to Locke, as they are regarded similarly by all. In contrast, secondary qualities are the traits that the observer attributes to the object, including taste, colour, scent and texture. These qualities are subjective since individuals do not share identical preferences or olfactory senses. This study utilizes the qualitative method in the form of a review of existing literature to investigate the impact of Locke's primary and secondary qualities on AI systems. Starting with the function of empirical data and the differentiation between primary and secondary qualities, the study assesses how AI dependence on extensive datasets, machine learning techniques, and neural network architectures corresponds with Locke's secondary qualities. It further explores the knowledge-based status of AI produced inputs and outputs concerning reliability, trustworthiness, and biases present in training data. The paper argues that there exists a convergence between Locke's philosophy and the operation of AI.

Key Words: Primary Qualities, Secondary Qualities, AI Algorithms, Social Epistemology

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INTRODUCTION

Philosophers have deeply contemplated the essence, significance, and purpose of knowledge, as Locke asserted that human understanding and concepts derive from experience. The first of this is the sensation that we derive from the tangible world. The second is reflection that is gained through cognitive processes. Locke in his *An Essay Concerning Human Understanding* (1959) distinguishes between our understanding of fundamental attributes like solidity, extension, figure, motion, and rest, and our perception of secondary qualities such as color, taste, smell, heat and odor. He contends that the fundamental characteristics of matter exclude sensed attributes like colour, flavour, auditory perception, scent, and warmth, which exist solely as concepts or feelings within our consciousness. He maintains that secondary qualities are powers; they are not tangible entities that exist within bodies. They are imputed characteristics. Therefore, we do not have to thoroughly explore the circumstances in which they arise or cease to exist.

However, the paper examines the intersection between Locke's epistemology of primary and secondary qualities and AI concepts of datasets, machine learning techniques and neural networks. It argues that both disciplines examine epistemic connections, yet while artificial intelligence approaches this topic by analyzing the formal and computational attributes of systems claiming to represent some epistemic relation or other, Locke epistemology examines the topic from the viewpoint of comprehending the characteristics of epistemic connections based on their conceptual characteristics. The article also explores the epistemic validity of outputs produced by AI regarding their dependability, credibility, and bias in training data. This paper also addresses the wider philosophical consequences of AI epistemic position, adding to the current discussion regarding the essence of comprehension and awareness within the realm of technological progress as represented by AI.

Research Objectives

The objectives of this research are:

1. To understand the difference between Locke's primary and secondary qualities.
2. To examine the influence of Locke's primary and secondary qualities on AI systems.
3. To determine the importance of primary and secondary qualities in social epistemology.

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4. To navigate the complexities of knowledge in an increasingly AI dominating world.

Research Questions

The study sought to answer the following research questions:

1. What is the difference between Locke's primary and secondary attributes?
2. What is the influence of Locke's Primary and secondary qualities on AI systems?
3. What is the importance of primary and secondary qualities in social epistemology?
4. What are the possible ways to navigate the complexities of knowledge in an increasingly AI dominating world?

John Locke's Differentiation between Primary and Secondary Qualities

Locke's distinction of primary and secondary qualities is evident in his most significant work *An Essay Concerning Human Understanding* (1959). Locke was an empiricist who challenged Descartes' theory of innate ideas. For him, all knowledge originates from experience through sense-perception. The components of knowledge are the ideas. In his *An Essay Concerning Human Understanding,* Locke views concept as the term that most accurately represents the object of comprehension when an individual contemplates. He utilizes this to articulate whatever is intended by "image", "idea", "kind", or whatever it is that the mind can be utilized in contemplation. Locke's concepts originate from two foundations: sensory experience and introspection, and all understandings are restricted to ideas.

Primary qualities for Locke include extension, shape, quantity, and movement. Secondary characteristics are colours, such as white, violet, and green, flavor, scents, and sounds. The fundamental qualities generate the concepts of secondary qualities through their interaction with our sensory systems. Locke further notes that the concepts of primary qualities bear a likeness to the properties in the entities they depict, but this is not the case with secondary qualities. The concepts generated within us by secondary qualities bear no resemblance to them. There has been significant academic discussion surrounding Locke's differentiation between primary and secondary qualities. Locke characterizes primary qualities as those attributes that are essential, regardless of the condition of a body or any alterations it undergoes. These attributes are inherent to the body, regardless of whether the body is observable or not. Locke (1959) asserts that primary attributes are the characteristics that

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everyone possesses, and qualities thus regarded in bodies are initially those that are completely inseparable from the body, in whatever form it may take.

Locke sees primary qualities being general enough to apply to all substances. Locke employs the "grain-of-wheat argument" to identify the essential features a body must possess, while differentiating between bodies that can be perceived and those that cannot. The analogy also suggests that all bodies, regardless of their perceptibility, possess properties. If you take a kernel of wheat, separate it into segments, with each segment retaining its solidity, size, shape, and mobility, partition it once more, and it retains the same attributes, it can be divided until the segments are imperceptible, while still preserving each of those attributes (Locke, 1959, p.170).

Locke (1959) emphasizes that the characteristics he asserts as secondary qualities are indeed secondary qualities, regardless of whether they are explained through properties or alternative attributes. For Locke, secondary qualities should not be equated with properties, but rather viewed as characteristics which are dispositions in an ideal theory. He contends that we must understand bodies to engage through impulse when generating ideas within us. He also states that the next aspect to examine is how bodies create ideas in us, and this is evident through impulse, the sole method by which we can envision bodies functioning. Locke asserts that an essential condition for every credible theory of sensory perception is that there must be causal interaction among objects and human cognition must be articulated in relation to impulse. Locke seeks to clarify that in a theory of perception, attributes that give rise to notions of primary and secondary qualities need to be comprehended through primary qualities. He believes that not only colour and smells, but also other reasonable characteristics such as flavours and noises, are not real and must be recognized in relation to primary qualities from the explanatory viewpoint.

Locke insists that our daily perceptions of bodies primarily consist of secondary attributes that are not actual but merely represent power, with only a limited number of primary qualities, which exist in the objects themselves. He asserts that whatever the mind recognizes within itself, or what the direct focus of perception is, thought, or comprehension, that he refers to as an idea, and the ability to generate any idea in our minds he calls quality of the subject wherein

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that power is (Locke, 1959, p.169). He argues: "such characteristics which, in reality, exist only as abilities to generate different feelings within us through their attributes, such as size, shape, texture, and movement of the insensible parts as colors, sounds, tastes, and so forth, I refer to as secondary qualities" (Locke, 1959, p.170). It is evident that Locke seeks to challenge the common notion that sensible qualities exist in reality and that our perceptions of them are reflections.

The essence of Locke's differentiation between primary and secondary qualities is that concepts of attributes are solely resemblances and not ideas of sensible qualities. He sees corpuscularian properties as primary and genuine, with all other characteristics being subordinate. Locke clearly seeks to elucidate the connection between an idea and its substance. He argues that in order to better understand the essence of our thoughts and to make them comprehensible, it will be useful to differentiate them as they exist, either as ideas or perceptions possessed by everybody, in our thoughts, and since they are alterations of substances in the bodies that generate such sensations within us, we should not assume that they are precisely the pictures and likenesses of something intrinsic to the subject (Locke, 1959, p.158). Locke's differentiation is based on attributes that are genuine rather than on characteristics that are possessed by everybody.

Primary and Secondary Qualities in Relation to AI Algorithms

Locke (1959) argues that primary characteristics are inherent to objects; they cannot be separated from those objects. In contrast, secondary characteristics are tendencies to evoke perceptions within us. Locke asserts that secondary qualities are truly non-existent and that our common conceptions of objects comprise real primary qualities alongside non-real secondary qualities. For him, perceptible qualities are secondary characteristics and not real, and their concepts do not reflect reality, but rather tendencies that should be clarified through primary qualities in a description of objects and their attributes. AI, on the other hand, refers to the ability of machines and computer systems to carry out activities that usually demand human intelligence (Berebon & Eluke, 2024). These activities encompass learning, reasoning, problem-solving, perception, language comprehension, and decision-making. AI systems are capable of examining data, and recognize patterns. AI

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refers to the application of software and coding methods to illuminate the fundamental concepts of intelligence broadly, and human cognition specifically. (Boden, 1977, p.5). AI is a computational idea that enables a machine to reason and tackle intricate issues in a manner similar to human intelligence. For instance, we execute a task, err, and gain knowledge from our errors. Likewise, an AI works on a problem, makes some errors in addressing the issue and gains insights from the challenges in a self-adjusting way as a component of its self-development. Locke emphasizes the significance of empirical data and the function of the senses in gaining knowledge (Berebon, 2023). Conversely, AI systems frequently function on data that could be skewed or lacking, resulting in outcomes that fail to represent genuine comprehension (Schwartz, et al., 2022). This inconsistency emphasizes a possible epistemic divide between human understanding, based on sensory experience of fundamental and secondary attributes, and understanding, which is obtained through data handling. Given these factors, this research seeks to examine the impacts of Locke's primary and secondary attributes on AI. Locke, in his theory of knowledge, portrays the human mind as an empty slate at the start of life, asserting that we acquire knowledge via sensation and reflection. Sensation, in the external realm, relies on sensory data.

Conversely, through reflection, the mind alters, classifies, and evaluates sensory information into higher-request understanding. Contemporary AI technologies, particularly machine learning frameworks, align with Locke's idea of secondary qualities. For Locke, the initial ways of perceiving sight, feeling, hearing, tasting, and smelling serve as trustworthy sources of knowledge. The information gathered through these senses manifests as impressions in the mind, enriching it with concepts that represent the objects of knowledge. In pursuit of this idea, Locke suggested in *An Essay Concerning Human Understanding* (1959) that the sole understanding humans can possess is a posteriori, meaning, derived from experience. Locke is renowned for his belief that the human mind is a tabula rasa, a "blank slate," in Locke's own terms, white paper. Locke's (1959) concept of tabula rasa influences both the training methods and the overarching design principles and frameworks of AI systems. The quality of data with which an AI system is trained entirely dictates its effectiveness, for the

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effectiveness relies completely on information to "understand." This highlights Locke's focus on the significance of experience in forming knowledge. However, inferior quality data leads to defective AI, much like flawed experiences yield erroneous human beliefs. Locke's idea of the blank slate highlights the malleability of AI systems that can adopt bias from the data. For example, biased training datasets may result in biased AI outputs, raising epistemic concerns.

Locke (1959) argues that there are two origins of our concepts: sensation and reflection. In each instance, a difference is noted between simple and intricate concepts. The former cannot be analyzed and is divided into fundamental and secondary attributes. Fundamental attributes are crucial for the object in question to retain its identity. In the absence of certain fundamental qualities, an object would cease to be what it is. Secondary attributes are the sensory data we obtain from their fundamental qualities. For instance, an apple may be recognized in different shades, sizes, and textures, yet is still categorized as an apple. Thus, its fundamental qualities determine its identity. Complicated concepts merge with straightforward ones, and are categorized into substances, modes, and relationships. As per Locke, our understanding of objects is a perception of ideas that align or conflict with one another, which contrasts significantly with Descartes' pursuit of certainty (Casson, 2011). As a result, Locke acknowledges the five modes of sensation: sight, touch, sound, taste, and smell —as the genuine reliable source of knowledge, meaning the information that we receive through these senses conveys impressions on the intellect, nourishing the intellect with concepts that are the genuine subjects of understanding.

By Integrating Locke's epistemology of primary and secondary attributes with the realities of AI contests traditional structures and encourages a reassessment of the nature of knowledge in a world that is progressively influenced by AI agents. As we traverse this changing environment, it is essential to uphold a dedication to the core elements of human understanding, experience, contemplation, and epistemic responsibility, ensuring the integration of AI systems. The incorporation of knowledge generation enhances rather than reduces our comprehension of the world. In the end, this exploration not only adds to the philosophical conversation, but also acts as an appeal for meaningful involvement with the

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technologies that increasingly shape our existence. By focusing on the influence of Locke's primary and secondary qualities on AI systems, the study offers an epistemic structure that is frequently neglected in conversations regarding AI. This link is essential, as it promotes a more thorough exploration of the impact of primary and secondary attributes on AI intelligence systems.

The dependence on empirical evidence in both human understanding and AI operations establishes a parallel that warrants examination. The inquiry into how AI systems simulate human-like reasoning and learning processes is especially intriguing. The complexity of contemporary AI to handle large volumes of information and identify intricate patterns, increases the need for significant inquiries regarding the legitimacy of the information it generates. The study encourages thorough examination into whether AI can truly hold knowledge or if its results are simply advanced types of information lacking comprehension. By examining aspects of reliability, credibility, and bias, the research tackles the real-world consequences of AI in knowledge creation.

The paper extends the influence Locke's primary and secondary qualities on AI systems to the sphere of social epistemology. Locke's primary and secondary qualities are the characteristics that physical objects must have for them to be deemed as physical objects. According to Locke (1959), a snowball possessing the ability to evoke in us the concepts of white, cold, and round – it has the ability to generate those concepts within us, just as they exist in the snowball. He refers to these as qualities, and since they are sensations or perceptions in our interpretations, he refers to them as concepts.

Locke designates primary qualities as 'real qualities,' whereas he employs 'real quality' in a distinct manner when discussing secondary qualities: specifically, that secondary qualities are real in the aspect of possessing powers. This study extends the thought of Locke to the realm of social epistemology and defends the thesis that Locke's primary and secondary qualities are the attributes that tangible items need to have to be classified as physical entities. The paper further contends that these primary and secondary qualities can be utilized for successful product packaging and promotion.

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John Locke's Secondary Qualities and AI Systems' Trustworthiness

Locke (1959) asserts secondary qualities such as colour, flavour, fragrance, or heat, as attributed qualities. He holds the opinion that secondary qualities do not represent genuine entities that exist within objects. However, it is important to point out that it is inconceivable to express that an object possesses mass, form, and surface quality, yet lacks colour, sound, or flavour. We contend that secondary qualities are essential for something to be regarded as an object. If an item lacks secondary qualities, then it cannot be deemed an object, but should be regarded as something different. Locke's description of secondary qualities enables them to transmit specific information about their holder, specifically the ability to evoke certain feelings in us. For example, blue items, by simply being blue, possess the same capability concerning the evocation of color sensations. Locke (1959) argues that colours and scents may be comprehended as well as flavours and noises. Like perceptible characteristics, which whatever truths we mistakenly assign to them, they are in reality nothing within the objects themselves powers to produce various sensations within us, which rely on those fundamental attributes, namely, size, shape, surface quality, and movement of components. On the other hand, while an AI model processes an input into a corresponding output, the contents of that output are determined by a series of numerical parameters that make up the model's weights. However, an information item that is entered into a software programmed is referred to as output, while the information provided is considered as data. The crucial questions now are: What precisely is required for an AI system to be deemed as trustworthy? Is the algorithm functioning as anticipated? Does it treat us justly? Is it designed and utilized by individuals we trust or overseen by systems we hold faith in? Does it serve the greater good of humanity? Doesn't it deceive or coerce? Can we hold an AI accountable, and if we can, what would that involve? The ideas of trust and reliability are present everywhere in our everyday experiences. Issues emerge, nonetheless, when the trustee serves as a tool or, in the scenario involving AI, a computational algorithm. Trust is regarded as an attitude that illustrates the trustor's tendency to have confidence in the trustee. It signifies what renders a trustee "clearly deserving of trust" (Sutrop, 2019). Trust, on the other hand, is a more complex issue for a comprehensive understanding of trustworthy AI. Trust is a disposition related to the

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trustor's tendency to have faith in the trustee. Therefore, it necessitates not just a certain level of dependence on the trustee but also "an additional element" (Hawley, 2015, p.5). For example, an AI system is considered dependable because it usually develops correct beliefs, or its results can be trusted because we have achieved a level of transparency that justifies our confidence. Additionally, we interpret reliability as a framework of knowledge through which we can justifiably affirm that an AI system is trustworthy or produces scientifically sound results.

Trust in technology is not exactly identical. A device may malfunction, but it cannot let us down. In contrast with people, it does not have the ability to choose to honour or break our trust. Transparency is among the most esteemed approaches for validating our convictions that AI results are scientifically sound. Lipton (2018) characterizes transparency as the antithesis of obscure or black box algorithms. Nonetheless, opacity can manifest in various ways, including epistemic and methodological. Epistemic opacity pertains to the fundamental cognitive constraints of individuals in fully grasping and explaining the condition of a computational procedure (Humphreys, 2009, p.618). Methodological opacity relates to the programming techniques and approaches employed in creating AI systems, which are not always easily available to developers (Burrell, 2018). This issue emerges from the abstract characteristics of AI algorithms, which may not consistently correspond with the intricacies of the actual world they aim to represent or engage with (Humphreys, 2009, p.619). Whether a transformer AI model is processing text, images, audio clips, videos or another modality, it will translate the data into tokens. Tokens are tiny units of data that come from breaking down bigger chunks of information. AI models process tokens to learn the relationships between them and unlock capabilities, including prediction, generation and reasoning.

Locke, on the other hand, sees secondary qualities as our interpretation of the effects that primary qualities have on our perceptions and the ideas that come from these perceptions. This means that secondary qualities depend on primary qualities. Locke is of the opinion that because our senses are limited to a certain stratum of perception, we cannot with our naked eyes see the workings of atoms, nor the interplay of light particles and atoms in objects in the production of

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colour. However, we can see the results of those interactions, and when light reflects off an object, we can absorb that light with our eyes. When the same stimulus produces an idea in our minds, we intercept it as a colour such as red, green, and blue. This means that secondary qualities are contingent upon a perceiver to interpret the sensations produced by primary qualities. Primary qualities are the cause, secondary qualities are the effects, qualities which, in truth, are nothing in the objects themselves but powers to produce various sensations in us by their primary qualities, that is, bulk, figure, texture, and motion of their insensible parts, as colours, sounds, and tastes (Locke, 1959, p.170).

Locke (1959) asserts that secondary qualities are dispositions comprehended through the fundamental characteristics of the imperceptible components of substances. In the corpuscularian theory, dispositions or insensible parts are viewed as tiny fragments on the exterior of objects. The secondary attributes of being red are regarded as being equivalent to particular microphysical properties, minute particles that transfer motion to other microphysical particles, ultimately influencing our senses. Locke describes secondary qualities as abilities or tendencies understood through microphysical primary qualities. He mentions primary qualities 'as genuine quality', but when he addresses secondary qualities, he employs 'genuine quality' in an alternative meaning, specifically that secondary qualities are real in the context of being abilities. Secondary qualities are understood through dispositional characteristics and primary qualities are formed through inherent characteristics.

Locke believes that primary qualities are akin to physical objects, whereas ideas of secondary qualities are not. He considers primary qualities to be inherent to bodies, while secondary qualities are tendencies that evoke ideas within us. He further insists that primary qualities cannot be detached from bodies, in contrast to secondary qualities, which can be isolated from them. In his view, primary qualities serve as foundational qualities, whereas secondary qualities are dependent qualities, and primary qualities are actual qualities, whereas secondary qualities are ascribed qualities. Primary qualities reside in objects, while secondary qualities exist in the mind. From this, John Locke differentiates between ideas of qualities that truly reflect bodies and ideas of qualities that, at most, exist in bodies in a lesser or dependent manner. Locke consistently

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emphasizes that he is pinpointing the characteristics that are inherent to objects, regardless of whether these are perceived by the senses (Locke, 1959, p.174), as opposed to those which are dispositions to produce ideas in us and nothing in the objects themselves but rather powers or tendencies (Locke, 1959). The clearer interpretation here is that secondary qualities are tendencies or simple abilities, and these arise from fundamental primary qualities. For example, if a tomato evokes in us the perceptions we refer to as redness and sweetness, we can be certain there exists a capability to generate those perceptions in our minds, or else they cannot have been created by it. Abilities are characteristics because they are components of the essences of entities.

Locke (1959) asserts that fundamental characteristics cannot be separated from objects. This means that primary qualities are truly inherent in objects, as they are essential and indivisible, in contrast to secondary qualities, which can be altered through a rearrangement of more fundamental properties. Primary qualities serve as the foundation for all other capacities and actions of objects. The pivotal aspect here is the differentiation between fundamental and essential characteristics of objects, that is, the traits that are consistently found in them and the additional secondary traits which rely on and can be reduced to those primary traits. John Locke regards primary traits as elucidatory; he asserts that primary traits have certain shapes, certain sizes, and various degrees of motion. However, regarding secondary traits, John Locke does not hold the view that all substances inherently have some colour, taste, and sound. The truth of the matter is that there is more in the distinction than the issue of explanation.

When we observe a body from afar, it influences our senses. Bodies impact our sense organs through stimulus; hence, there exists an intermediary body between us and the observed bodies, although these intermediaries are unnoticeable and too minute to be detected. Similarly, powers or connections come to an end when one of the "relata" no longer exists, and this is the reason Locke states that if either of those elements is taken away or ceases to exist, the relation comes to an end, and the related denomination that follows it, while the others undergo no change whatsoever (Locke, 1959, p.428). Locke asserts that primary qualities represent something greater than just abilities since they are actual properties. Here, we comprehend Locke as indicating that the

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reality of qualities relies on their independence from observers. For instance, a quality A that resides within an object B is considered a genuine attribute of B, provided that A exists in B regardless of anyone's perception of A being part of B. If it follows that A's presence in B relies on an observer's perception of A being in B, A does not possess an inherent quality within B, even when A is situated in B. Therefore, shape is regarded as a genuine quality because shape is an attribute that exists within an object regardless of whether anyone perceives these objects as having shape (Ajayi, 2016, p.145).

As Locke states, the mass, quantity, shape, and movement of the components of fire or snow exist in them regardless of whether anyone's senses detect them, and so they can be referred to as actual quantities (Locke, 1959, p.174). What of smell and taste? Is there any proof that Locke considers these to be unreal? Certainly, there is. He states: remove the sensation of them: let the eyes be deprived of light and colours, the ears not perceive sounds, let the palate be unable to taste, and the nose unable to smell, and all colors, tastes, scents, and sounds, as distinct ideas, disappear and stop. Locke (1959) observes that if a quality is elucidative in a comparatively profound manner, then it pertains to a thing as it exists in itself. Locke believes that fundamental qualities are genuine attributes since they exist in objects themselves, regardless of our perception (Locke, 1959, p.178), and it is on their various alterations that the secondary qualities rely. Locke refers to primary qualities as genuine since they pertain to objects as they exist independently.

Inseparability of Primary and Secondary Qualities

Locke holds that it is by means of the fundamental properties of insensible elements that our perceptions of colours and scents are generated. John Locke's explanation of primary and secondary qualities also demonstrates their interdependence. For instance, he selects a piece of manna of a perceivable size and asserts that it can generate in us the perception of a round or square shape, and by relocating it from one position to another, the perception of motion. The concept of motion portrays it as it truly exists in moving manna: a circle or square is the same, whether in idea of being, within the mind or in the manna. Both movement and shape genuinely reside in the manna, regardless of our awareness of them, and in addition to manna, through the volume, form, feel, and movement of its

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elements, possess the ability to evoke feelings of illness and occasionally of sharp discomfort or constriction within us (Locke, 1959, p.175). Locke believes that we understand secondary qualities through primary qualities. The reality is that secondary qualities do not correspond to their existence in human consciousness, but they must be associated with primary qualities if they are understood not as concerning our perceptions but as the origins of perceptions. Locke (1959) opines that secondary qualities exist in a body similarly to how a disposition does, and not in the manner that a genuine quality does. Locke perceives pain as an ability to generate ideas that are a characteristic of physical bodies rather than mental states. However, in a world devoid of perception, there is no foundation to understand the characteristics of objects concerning mental representations, since there are no conscious beings to form ideas. On the contrary, the pain analogy demonstrates that secondary qualities are indeed characteristics of bodies. Locke asserts that secondary qualities are not actual entities that are present in substances, thus we are not required to thoroughly examine the circumstances that lead to their emergence or disappearance. Locke's rejection of the notion of secondary qualities as actual entities is insufficient for us to determine that no object can be justly be characterized as flavourful, vibrant, loud, fragrant, or heated.

The paper contends that physical objects have primary and secondary traits, present in both observable and unobservable instances. Locke selects the illustration of wheat, stating that if a shower of wheat is separated into two sections, it retains its structure, shape, and movement (Locke, 1959, p.169). What Locke is conveying in this context is that ground wheat is indeed flour, and since flour is a powder, the characteristics of its tiniest components are not easily discernible. Although we cannot detect the particles with our unaided vision, Locke believes that reason indicates their existence, and that primary qualities are tendencies.

The Advantages of Combining Primary and Secondary Qualities for the Producers

Primary and secondary qualities serve as a powerful form of communication for the producers. However, successfully reaching the complete target market for the majority of products is a challenging endeavour. Unlike advertising, which has a restricted audience, primary and secondary qualities of a product are aspects which all purchasers encounter and which possess significant potential to

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captivate the majority of the intended audience. This acts as an exceptionally potent and distinctive instrument in today's marketing landscape (Ajayi, 2016, p.178). Alongside their advantages regarding exposure, primary and secondary characteristics like shapes and colors tend to be more impactful than marketing, due to their immediate effect on how customers view and interact with the product. For items with minimal advertising backing, packaging assumes an essential role in even more important function as the primary means for conveying the brand positioning (Rudh, 2005, p.178). Front and back labels can affect the effectiveness of health assertions: they can also assist in examining how these labels impact an individual's interpretation of health claims.

Possessing complete information regarding a package is essential; it could serve as a more efficient reference point on the back panel when paired with a condensed claim on the front. Shoppers typically regard front-label details as a summary of a product's benefits or hazards. If consumers discovered intriguing or significant information that was inadequately detailed on the front of a product, they would be inclined to pursue further clarification regarding other sections of the packaging (Brain et al. 1999, pp.89-90). The key question at this point is: What amount of information on the front and back labels of a product is necessary to convincingly convey the health advantages or risks associated with it? A lack of information can cause consumers to get bewildered and make incorrect choices.

The significance of label information depends on its accessibility, intricacy, and pertinence of the information provided to consumers through packaging. Wansink (2003) investigated how the information on front and back labels affects consumers. In this case, product packaging was altered, making it unfamiliar to the audience. The participants consisted of 111 adults (63% female, average age of 21) from a prominent university community. The findings were generalized with the assistance of consumers (Wansink, 2003, p.306). The research framework utilized a 3x1 between-subjects design wherein three distinct nutrition label scenarios for the vegetable protein parties were implemented. The front label of the product was modified by incorporating a brief soy health assertion, an extended soy health assertion, or no assertion at all (control condition). A comprehensive soy health assertion along the typical nutritional

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information was presented on the rear panel in all three scenarios.

Three objective assertions were utilized to evaluate the influence of labelling on the believability of claims. This included assessing three statements: "individuals would gain advantages from consuming this product", "this product might lower the likelihood of heart disease", and "this should be paired with a diet low in saturated fats". One claim the current scientific consensus considers false is "this product can assist in offsetting unhealthy food" (Wansink, 2003, p.307). As anticipated, shoppers who noticed brief claims on the front of a package produced a higher volume of attribute-specific thoughts and fewer overall evaluative thoughts regarding the product compared to those observing an extended claim. Consumers exposed to brief health claims produced markedly fewer general evaluative reflections and an increased number of attribute-specific reflections compared to those who were shown lengthy health claims. (Wansink, 2003, p.308). Analyzing the number and type of cognitive response one produced while examining a package label aids us in more accurately determining if consumers are forming overall assessments or focusing on specific attribute-based observations. Although the three front label conditions produced a comparable number of thoughts, the character of these thoughts differed greatly. Overall, individuals viewing a more concise claim on a front label produced fewer broad thoughts and more thoughts focused on specific attributes compared to those in the longer claim condition or the control group.

From this analysis, it follows that those who see individuals who encounter brief health claims are likely to find them more convincing compared to those who are presented with longer claims or no health assertions. The findings indicate that pairing concise health claims on the front of a package with comprehensive health claims on the back encourages consumers to engage more thoroughly with and trust the claim. This outcome bolsters the advocates of shorter claims and labelling (Ajayi, 2016, p.179). The primary discovery that utilising both sides of a package enhances the credibility of health assertions is important for policymakers, consumers, and researchers.

While some contended that a more extensive and thorough health claim would be most precise, others believed that a more concise

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claim would be more impactful. If abbreviated health claims on the front label of a package seem to boost the credibility of claims, such assertions might also affect buying or consumption patterns. Certain labelling research concentrates solely on the claims found on one side of a label (Byrdbredbenner, 1994). Utilising only one side of the label seems to limit a producer's capacity to convey its health advantages to the consumers. Some consumers might quickly glance at the product label, while others may examine it more thoroughly if they prefer. Secondary attributes like colour can be utilized by manufacturers or energize efficient programmed coordinators to advertise their products, presenting colour as a beneficial aspect. Colour conveys that a lighting system might be beneficial and provide enhanced prospects for better home illumination. Varying colour presentation is frequently utilized as an obstacle to customers' acceptance of compact fluorescent lamps. Rea and Deng (2006) explored consumers' perceptions and understanding regarding colour and the selection of lamps for their households. Six focus group discussions were conducted across three cities in the United States: Sacramentos, Columbus, and Atlanta. Different versions of a suggested colour communication system were shown to the focus groups to evaluate consumer interest, understanding and recommended methods of instructing consumers.

The team was keen on utilizing this system for acquiring additional light sources. They solicited proposals from four market research companies that specialize in consumer lighting matters. Each focus group session lasted roughly 90 minutes (Rea & Deng, 2006, p.1-5). Each focus group adhered to a similar structure: (1) An introductory segment aimed at familiarizing the participants and easing their comfort levels; (2) A general conversation regarding "light bulbs," evaluating the participants' knowledge of lamp characteristics and their main considerations and actions when purchasing lamps; (3) An evaluation of their existing understanding of light bulb packaging and terminology; (4) A discussion about their awareness and understanding of color in relation to light bulbs; and (5) An evaluation of comprehensibility and usefulness of a color communication system would have on their purchasing behavior (Rea & Deng, 2006). Consumers used wattage as the key factor when choosing their light sources. Prior to the demonstration, there was minimal interest in color and no

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indication of a desire to convey color distinctions. However, right after the demonstration, all participants in the focus groups expressed astonishment at the variations, which they had previously overlooked. The demonstration instantly sparked interest in a color communication system and how color differences could effectively enhance their homes. After observing the demonstration of color distinctions, the participants responded to changes in a proposed color communication framework. There was agreement that the colour communication framework should be as straightforward as feasible, as this would allow producers to promote color selections as enhanced value propositions for buyer powers to produce various sensations within us, which are reliant on those fundamental attributes, namely, size, shape, feel, and movement of components.

Locke (1959) asserts that secondary qualities are dispositions comprehended through the fundamental characteristics of the imperceptible components of substances. The secondary traits of the colour red are understood to be equivalent to particular microphysical aspects of minute particles that transfer motion to other microphysical particles, ultimately influencing our perceptions. Primary qualities reside in objects, whereas secondary qualities are perceived in the mind. From this, John Locke differentiates between ideas of qualities that genuinely mirror substances and ideas of qualities that, at most, exist in substances in a more diminished or reliant manner. Locke consistently emphasizes that he is pinpointing the characteristics that pertain to objects, regardless of whether they are sensed by anyone (Locke, 1959, p.174). A more transparent interpretation here is that secondary qualities are tendencies or simple capabilities, which are causally linked to fundamental primary qualities. For example, if tomatoes evoke in us the perceptions we identify as redness and sweetness, we can be certain there exists a capacity to generate those perceptions in our minds, or else they could not have come from it. Powers are attributes because they are aspects of the essences of entities.

Locke (1959) asserts that fundamental attributes are intertwined with objects, and this means that primary qualities are genuinely present in objects because they are inherent and cannot be simplified; in contrast to secondary qualities, they cannot be eradicated through a rearrangement of more fundamental qualities. Primary qualities

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underlie all other attributes and actions of objects. The key aspect to note is the differentiation between innate and fundamental characteristics of entities, that is, the attributes that are inherent in them and the additional secondary attributes that are contingent upon, and can be reduced to those, primary attributes. John Locke perceives primary attributes as foundational; he argues that primary attributes have certain forms, certain dimensions, and various levels of movement. However, when it comes to secondary attributes, John Locke does not contend that all entities inherently have any colour, taste, and sound. The truth of the matter is that there is more in the distinction than the issue of explanatory.

When we observe a figure from afar, it influences our senses. Figures impact our sensory organs via impulses, which suggests there is a mediating body between us and the observed figures. However, these intermediaries are unnoticeable and too minute to be detected. Similarly, powers or relationships stop to exist when one of the "relata" no longer exists, and this is why Locke states that if either of those elements is taken away or no longer exists, the relation ceases, and the denomination consequent to it, though the other receive in itself no alteration at all (Locke, 1959, p.428). Locke asserts that primary qualities represent more than just simple powers since they are actual attributes. In this context, we interpret Locke to mean that the reality of qualities depends on their autonomy from observers. Consequently, shape is regarded as a genuine quality due to the reality that shape is a characteristic that exists in an object regardless of whether anyone perceives these objects as having shape (Ajayi, 2016, p.145). As Locke states: the mass, quantity, shape, and movement of the components of fire or snow truly exist within them, regardless of whether anyone can sense them or not, and thus they can be referred to as actual quantities (Locke, 1959, p.174). What about smell and taste? Is there any indication that Locke considers these to be unreal? There certainly is. He says remove the perception of them: allow neither the eyes to perceive light or hues, nor the ears to detect sounds, let the tongue not taste. Nor the nose to smell, and all colors, flavors, scents, and sounds, as they exist as specific ideas, disappear and come to an end. Locke (1959) observes that if a characteristic elucidates in a comparatively profound manner, then it is an inherent trait of an entity as it exists in itself. Locke believes that primary qualities are genuine qualities as they exist in the objects

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themselves, regardless of our perception (Locke, 1959, p.178).

Locke believes that secondary qualities are not actual substances found in objects, and therefore, we do not need to explore thoroughly the circumstances that lead to their emergence and go out of existence (Ajayi, 2016, p.146). To Locke, the true entities are fundamental qualities that lead to the conception of an idea, likely the concept of form in our thoughts, while secondary characteristics are abilities to assign ideas in our consciousness. Consequently, it implies that both primary and secondary characteristics serve as abilities to assign ideas in our minds. This indicates that the difference lies in the types of inherent attributes.

The Advantages of Linking Primary and Secondary Qualities for Consumers

The visual look of a product can affect how consumers assess and select products in various ways (Cresen & Shoormans, 2005). Secondary quality such as colour, for example, is among the most crucial visual signs to capture consumers' focus. Colours carry significance and, therefore, they are essential instruments in corporate advertising tactics. Colours can be linked with items across various dimensions. The deeper the colour's saturation, the stronger the perceived power of the object under evaluation. The impact of colour on judgment varies with the characteristics of an object. Colour serves as a potent and essential marketing instrument for developing brand identities. Hue represents the most fundamental layer of awareness and is utilized by participants to emphasize varying viewpoints and to convey choices (Madden & Roth, 2009). Hue is essential for fostering a constructive transformation in consumers. It has a significant impact on memory retrieval. It engages all the senses, rapidly delivering a message in a manner unmatched by other forms of communication. This is the reason individuals often purchase the item they can comprehend the quickest. The more vibrant a product's label is, the greater its impact will have on perception quality and willingness to pay (Ajayi, 2016, p.188). Because people cannot sample a food before purchasing it in a dinner or shop, they depend on cues, which they believe are linked to their sought-after advantages. For example, regarding the modification of the perception of the sugar content in a food item, an individual's belief about the food's sweetness and appeal may be altered. Following the consumption of the food, any positive

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discrepancy from previous expectations will lead to a more positive assessment. In a similar manner, any unfavourable comparison could lead to more adverse assessments.

In the case of wine glass characteristics, its shape can affect the flavour of the wine. The design of a wine glass can guide the wine's flow. Additional qualities, such as flavour, play a crucial role in the dining experience and represent a multifaceted human occurrence (Ajayi, 2016, p.176). Taste aims to clarify the characteristics and effects of personal variations in perception specifically, our taste receptors are programmed to inform us about the nutritional attributes of the foods we consume; for example, sweetness indicates ripeness, while sourness suggests fruit that is unripe, and saltiness points to the presence of salt and other minerals. It is crucial for businesses to offer information and guidance to customers to encourage them to buy and buy back their goods and services.

Mello and Richardo (2007) utilized findings from an experiment based on data from Spain to demonstrate that there exist significant preferences for certain combinations in labelling design. The two scholars focused on combinations of colour and form in labelling as the key factors to communicate quality indicators to consumers based on an experimental study carried out among Spanish students. Two distinct questionnaires were utilized. 28 participants were provided with the first questionnaire (colour choices according to form variations) and 34 participants received the second survey (shape preferences based on secondary quality or color variations). The initial survey emphasized thirteen forms (square, rectangle, parallelogram, trapezoid, diamond, rounded rectangle, octagon, pentagon, isosceles triangle, right triangle, circle, ellipse, and hexagon) along with ten color shades (black, blue, brown, gold, green, orange, purple, red, white, and yellow) (Mello and Ricardo, 2007). All thirteen forms were displayed in ten categories, one for each of the ten colours being examined. Within each of the ten colour categories, the thirteen forms shared the same hue. The forms were ordered randomly in each group to avoid any pattern reaction. Participants were requested to select their preferred shape from each of the ten color categories.

In the second survey, there existed thirteen categories, each featuring only one of the thirteen shapes utilized in the first survey, with each shape appearing ten times,

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corresponding to each of the ten colors employed in the first survey. Within each of the thirteen shape categories, the identical shape was showcased in ten distinct colours. Participants were requested to complete the survey after being presented with a real bottle of wine and informed that it was a red-wine bottle. Findings indicated no colour choice regardless of shape differences, and there were significant inclinations for specific pairings of secondary qualities (colour) and secondary quality (shape) in the design of wine labels. From the above, it is evident that a deeper insight into primary characteristics (shape) and secondary characteristics (colour) can enhance a winemaker's approach to marketing. Secondary quality such as colour indicates a product's characteristics, thus affecting impressions regarding its cost and caliber. The guidelines applied in evaluating health labels are similarly applicable when analyzing how warning labels of regulated substances like alcohol or tobacco affect various categories of consumers. Rotfeld (2003) asserts that the aim of merging shorter and longer claims on packaging is to promote adherence instead of merely offering processing ease. In certain instances, excessive information can inundate the consumers while insufficient information may lead them astray. This occurs as the same process that creates particular ideas about a product can also cause an individual to deduce varying degrees of urgency, and products are frequently purchased spontaneously, this urgency diminishes the thorough evaluation of packaged attributes.

METHODOLOGY

This research uses a qualitative approach and a survey of the literature to investigate how Locke's primary and secondary qualities influence AI's ability to produce new outputs that accurately reflect the characteristics of the input data when led by user instructions. It emphasizes how AI intelligence relies on imitating human intelligence and ability, much how Locke considers secondary qualities as traits that are offered. In terms of social epistemology, it also evaluates the benefits of establishing a connection with Locke's primary and secondary qualities about social epistemology.

John Locke's Secondary Qualities and AI Algorithm Prejudices

It is crucial to explore the influence of biases within AI systems, particularly concerning Locke's secondary qualities. The growing incorporation of AI into societal frameworks prompts inquiries regarding human-machine

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engagement. It is important to incorporate social epistemology to tackle the intricacies of AI-related knowledge inquiries, usually examined from a singular perspective. Nunes and Jannach (2017) and Adadi and Berrada (2018) advocate for a transparent AI explanation to assist AI-based decision-making. And to also examine the influence of biases on AI results and user engagement. Whenever we engage with an AI system to obtain responses to our inquiries, we are engaged in investigation. The word "investigation" in this context denotes the intricate process of collecting, evaluating, and analyzing information with the objective of establishing, overseeing, and modifying beliefs to obtain and disseminate accurate knowledge. Each individual introduces a range of cognitive biases when interfacing with AI systems. These biases can greatly influence the manner in which AI responses are interpreted and comprehended. For instance, if a user has a fundamental skepticism towards machine learning algorithms because of past unfavourable encounters or insufficient exposure to the technology, they may view explanations with doubt or a preconceived inclination against the findings produced by the AI systems. Epistemic filters can assist in recognizing these biases and comprehending how they may skew the user's understanding of the AI's justifications. Ajala (2018) observes that the fundamental similarity between algorithmic biases and human cognitive biases lies in the fact that both types of bias can arise from patterns of information processing that appear harmless. Research into the characteristics of these emergent biases in the field of machine learning highlight at least two challenges for software developers, frequently, machine learning applications utilize what are referred to as black box algorithms, meaning that it is challenging (and arguably unfeasible) for individuals to explain the reasoning behind a specific result. Additionally, biases in algorithms depend on proxy characteristics: attributes that appear harmless yet are correlated with socially-sensitive traits, acting as substitutes for those socially-sensitive traits. These two challenges are present in the realm of human thought as well, hiding the presence of biases and rendering it difficult to recognize, lessen, or assess biased.

Conclusion

There exists a connection between how we view primary and secondary qualities; which are the qualities we pay attention to when we observe an object. In a field where there are

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increased risks associated with the use or misuse of a product, primary and secondary qualities are relevant. In AI systems they serve as trustworthy knowledge sources. The epistemic filters model offers a sophisticated framework for understanding and improving the manner in which explanations are produced and evaluated in AI. It recognizes that addressing bias in AI necessitates addressing the human factors that influence how AI systems are perceived and used in addition to changing data or algorithms. The ideals and biases embedded in its algorithms are still upheld by artificial intelligence.

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