Establishing Rigorous Scientific Foundations: The Rationale Behind the Creation of Componentology & Neuronology

In software engineering, the term *component* is used to describe various types of abstract constructs—each of which is, in fact, a fictitious entity lacking any objective physical or structural reality. This leads to imprecise, subjective, and ambiguous descriptions, as well as explanations and concepts that are inherently untestable or unfalsifiable. Consequently, *Component-Based Software Engineering (CBSE)*—as defined, widely accepted, and practiced—relies on one or more types of these so-called components, none of which have a scientifically grounded or objectively verifiable basis. This foundational flaw undermines the validity of conventional CBSE methodologies and contributes to persistent challenges in achieving true modularity, reusability, and reliability in software development. *Componentology* was conceived to address this critical gap.

Similarly, in the field of Artificial Intelligence—particularly in the design of artificial neural networks (ANNs)—the term *neuron* is used metaphorically to describe abstract of fictitious computational units. These so-called neurons, and by extension the networks they form, are loosely inspired by biological neurons but bear no structural or functional resemblance to real neural systems. Despite borrowing terminology from neuroscience, ANNs are purely mathematical constructs, not grounded in the precise scientific realities of brain architecture or cognitive mechanisms. While they can be effective in specific computational tasks, they lack a rigorous foundation in neuroscience and fail to reflect the true principles underlying cognition or intelligence. As such, referring to them as "neural" is arguably a misnomer—and building Artificial General Intelligence

(AGI) upon these metaphors, risks entrenching foundational misconceptions. This is precisely where the hard science of *Neuronology* becomes indispensable.

Unlike current AI paradigms that rely on untestable, imprecise metaphorical approximations and abstract constructs based on fictitious entities, *Neuronology* seeks to uncover and formalize the actual principles, mechanisms, and architectures underlying real cognition—both biological and artificial. It operates as a rigorous scientific discipline, aiming to establish an empirically grounded framework for understanding intelligence from testable first principles.

Rather than merely struggling to emulate biological neurons based on a superficial understanding, *Neuronology* focuses on uncovering the functional truths that govern intelligent behaviour and the formation of knowledge. By moving beyond metaphors and toward scientifically verifiable constructs, Neuronology offers a path to overcome the inherent limitations of current AI models and provides a foundational framework for the development of true AGI.

In both software engineering and artificial intelligence, key concepts such as *components* and *neurons* are often based on abstract, metaphorical constructs that are subjective, untestable, and unfalsifiable—rather than scientifically grounded, valid, and testable realities. This reliance on vague and unverifiable concepts undermines the effectiveness of *CBSE* and *ANNs*, fostering persistent misconceptions and dogma that lead to significant limitations. These include difficulties in achieving true modularity, scalability, quality, and a genuine understanding of the underlying mechanisms of real intelligence and cognition.

Componentology addresses these critical gaps by defining real, structurally and functionally verifiable software components. Likewise, *Neuronology* seeks

to establish a rigorous, empirical foundation for understanding cognition and intelligence—moving beyond metaphors to uncover the actual principles that govern intelligent behaviour. Together, these disciplines aim to replace subjective approximations with scientifically valid constructs, offering a more robust and reliable path toward building dependable software systems and achieving AGI.

In both software engineering and artificial intelligence, key concepts such as *components* and *neurons* have historically been rooted in abstract, fictitious, or metaphorical constructs rather than scientific reality. These constructs cannot be rigorously tested, validated, or falsified, as they lack a concrete basis in observable phenomena or scientifically measurable properties. Continued reliance on such fictitious entities—and on derivative models that progressively diverge from reality as the initial errors compound over time—has significantly constrained the evolution, reliability, and effectiveness of both fields.

Componentology and Neuronology were conceived to address foundational flaws by replacing vague or subjective abstractions with rigorously defined, empirically verifiable, and precise scientific insights. Componentology has successfully exposed numerous deeply entrenched misconceptions and long-standing dogma surrounding fictitious entities labelled as components within software engineering—a process that has proven corrective and transformative.

A similar impact can be expected from Neuronology as it challenges long-standing metaphors built on fictitious entities in the field of artificial intelligence. Componentology has already exceeded expectations in redefining the foundations of software engineering, and I firmly believe that Neuronology holds comparable potential to revolutionize areas such as the pursuit of AGI and the development of advanced neural interfaces—grounded in proven scientific methods.