# The Self and Consciousness Through the Lens of Quantum Cognition

Joshua Heaton

# The Problem: Self?

## Self-Concept

Ideas about the self- who we are

Includes experiences, character traits, values, roles in society, expectations on the self in future

## Consciousness

We are not just the idea of a person but a thinking thing

We perceive objects and thoughts, react with more thoughts, feelings, or actions

Make decisions etc

# A Review

We consider the finite dimensional Hilbert space $\mathbb{C}^n$

A conceptual state $p$ can either be pure which gives a unit vector $x_p \in \mathbb{C}^n$

Or a density state, which gives a self-adjoint linear operator $\rho_p$ s.t. $Tr(\rho_p) = 1$

Properties and Contexts are given by orthogonal projection maps $P$

We define these as follows

# More Review

For some property $a \in \mathcal{L}$ we find its weight by $v(p,a) = x_p P_a x_p$ if p is a pure state and $v(p,a) = Tr(\rho_p P_a)$ if a density state.

Similarly for a context $e \in M$, we have the projector $P_e$ which changes the state from p to q by

$$x_q = \frac{P_e x_p}{\sqrt{x_p P_e x_p}} \quad \text{Or} \quad \rho_q = \frac{P_e \rho_p P_e}{Tr(\rho_p P_e)}$$

With respective probabilities

$$\mu(q,e,p) = x_p P_e x_p \quad \& \quad \mu(q,e,p) = Tr(\rho_p P_e)$$

# Self-concept

From the quantum modeling of concepts we have a way to describe views of the self- it is a concept

The self its own base state of the concept- properties essential to a person's self-hood

Affected by contexts- social settings i.e. in school, at work, with friends, with family; future i.e. hopes, expectations; comparison i.e. to past self, to future self, to ideal self, to others (self-esteem)

These states of the self-concept give information on how we see ourselves and expect ourselves to perform in new situations

# Self-concept: Depression (A side note)

We could model effects of depression by a second set of contexts

Normally have a set $e_1, e_2, \ldots, e_n$, in a common brain, instead have $f_1, f_2, \ldots, f_n$

Correspond to differently formed neuronal connections that result in negative views in more common situations

So for $E_1$, $F_1$ normal and depressed versions of context “future prospects in life” we get a neutral to positive outlook (at least reasonable) in state $x_q$ and a negative one in state $x_r$

# Self-concept: Depression (A side note)

Such that

$$x_q = \frac{P_{e_1} x_p}{\sqrt{x_p P_{e_1} x_p}} \quad , \quad x_r = \frac{P_{f_1} x_p}{\sqrt{x_p P_{f_1} x_p}} \quad \text{and} \quad \sqrt{x_p P_{f_1} x_p} \geq \sqrt{x_p P_{e_1} x_p}$$

So we model depressed signals in the brain by different interpretations of contexts and their effects. We could work the other way with a different base state $x_{p'}$ for a generally negative self-view. This is complicated because for the most part it excludes the potentially positive state, requiring more contexts

# Consciousness

One of the most difficult things to understand and especially model is the concept of consciousness; specifically it is awareness

The awareness of consciousness is not singular (while maybe not focused we can be aware of many things at once), not centered (there is no physical location to the experience of consciousness), things must appear in consciousness not exist (you are not constantly aware of the song you heard or decision you made yesterday)

We can model the things that are perceived themselves

# Consciousness

We have begun this already: concepts are ideas, like thoughts that appear in consciousness

A model could consist of a fundamental base concept and state: “Something Noticed”

Call this concept $C$ for consciousness

We can have context $e_1$, something was heard, $e_2$, something was seen,

$e_3$, something was thought, $e_{27}$, something felt pleasing

# Consciousness

Then the conjunction (formed by a tensor product ) of the effects of $e_1 \otimes e_{27}$ on the base state $\hat{x}_c$, would collapse the concept something noticed under the context that it was heard and felt pleasing into “a good song” or “nature sounds” potentially depending on the person experiencing it

Then we describe the states of consciousness similarly to concepts, and contexts are seen as basic feedback or information, not necessarily conscious thought

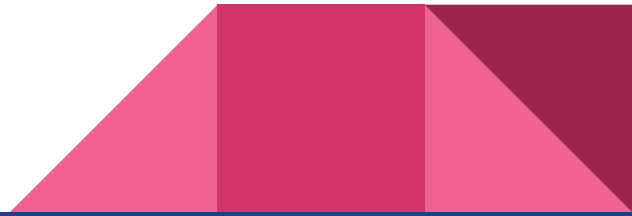
Further levels of thought can be created by applying more contexts and information

# Consciousness: Decisions

We can easily set up contexts of imperative natures, e.g. “I am in danger” or “I must make a decision”, that would necessitate action or decision.

We could set up contexts that necessitate the concepts “I am in danger” or “I must make a decision”. Certainly, in the mixed or density states of the concept, they are mathematically equivalent to the contexts that would alter them. Perhaps concepts become new contexts for thought.

Then with added contexts we create subjects for consideration, and still more contexts collapse those into viable options



# So What?

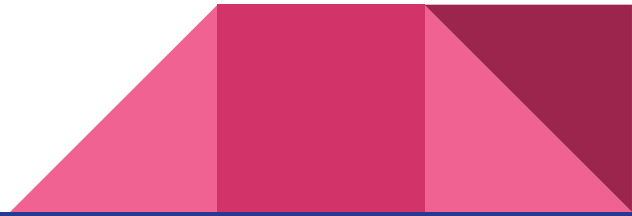
What could this mean for our views of the mind?

Your thoughts?

My thoughts?

Additions or Critiques?

AI?



# References

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