

Debate #2 Is the predictive coding account relevant for understanding consciousness?

My points

- Predictive coding may be a good theory for brain functions (in particular learning) but unlikely to be good for phenomenology.
- Predictive coding is likely to apply equally well to conscious and non-conscious processes in all spatiotemporal scales
 - “Unconscious inference” by Helmholtz
- Conscious phenomenology is determined by a state of a certain mechanism and flows at a particular temporal scale.
- IIT offers much more satisfying explanation on all of the above...

Evidence against long-term statistics & conscious perception

- No matter how long we are exposed to “invisible” stimuli, we do not become conscious of it
 - e.g., super high-frequency stimulus (very very fine gratings), temporal flickers, ultraviolet, infrared, blood pressure, hormonal levels, etc
 - *What mechanisms select which aspects of statistics to be consciously experienced?*
- Conscious/non-conscious boundary problem of predictive coding

Transcranial Magnetic Stimulation or Direct Electrical Stimulation

- Highly unnatural way to stimulate the brain
- Vivid spontaneous reports of visual or auditory qualia with stimulation of the relevant areas
- Is statistics of input pattern “now” relevant for explaining why I’m experiencing it in that way?

Is learning necessary for consciousness?

- Congenitally blind, deaf, and tetraplegic people
- Phantom sensations (Brugger et al 2000 PNAS)
- Dreams (Bertolo 2003 Cognitive Brain Research, Saurat 2011 Consciousness & Cognition, Voss 2011 Consciousness and Cognition)
 - - But also see Kerr 2004 Dreaming, Lopes da Silva 2003 TICS)

(Short-term) visual/auditory statistics may
or may not affect conscious vision and
audition

- Positive evidence: adaptation, surprising stimulus (though unclear about conscious aspects)
- Negative: looking at white wall (no change), looking at very fast movie frames (lots of changes), dreams (no structure in sensory statistical inputs)

Can we experience something we never experience in the life?

- What is the statistical structure of stubbed in the heart?
- Does it become more or less painful as you get stubbed again to sample statistical properties of stubbing?

*Possible alternative interpretation of the
roles of prediction error (in short-term,
non-learning situation)*

- Bottom-up attention?

From Ryota's slide:

Levels of disagreement (Relevance)

1. Do you agree that *how the brain represents the external world* is relevant for phenomenal consciousness?
2. Do you agree that phenomenal consciousness for visual and auditory experience *reflects differences in statistical regularities* in the sensory domains?
3. Do you agree that *how the brain **learns** such regularities (e.g. Bayesian learning)* is relevant for understanding consciousness?

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Levels of disagreement (Mechanisms)

Do you agree that the brain ***learns*** to represent the external world through some information measure?

Do you agree that the brain ***learns*** regularities with approximate statistical measures?

Do you agree that the brain ***learns*** them through (approximate) Bayesian?

If it is all about how brain *learns* to be conscious,
 predictive coding can be useful
 (but there can be a lot of learning mechanisms - or
 instances - that may not fit with PC story - evolution is very,
 very random....)

	Historical explanation	Explanation - now
Individual	Development (PC) (Self/Body)	Mechanistic and Causal explanation (IIT)
Species	Evolution (PC) (Self/Language/Body)	How it works now in the current environment Function/Adaptation (PC) (Self/Language/Body) (Freewill)

If it is all about how consciousness arises from my brain now, then PC is not relevant.

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Now more tricky part

1. Do you agree that *how the brain represents the external world* is relevant for phenomenal consciousness?
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- Yes, if it's about ***learning***.

Statistics of world
vision/audition

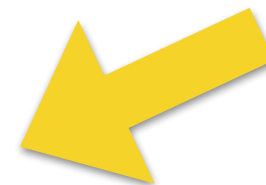


Neural activity &
connectivity
patterns

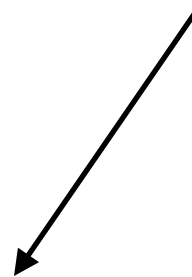


Qualia of “vision” vs “audition”

Statistics of world
vision/audition



Neural activity &
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Every
possible
ways to perturb!

Qualia of “vision” vs “audition”

(long-term) statistical properties of vision/sound vs visual/auditory qualia

- Rewiring
- Sensory substitution
- Blindsight
- Restoring vision
 - but they are all very long-term effects.
 - all relevant to “learning” issue, then