Algorithmic Human Development: Emotional Intelligence, Social Intelligence and Human Creativity

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Limitations of ICT Revolutions

- There is a gigantic global movement for more intelligent programmes and machines in the era of ICT revolutions.
- Supported by governments and profit-driven tech giants.
- The race for General AI epitomises this movement.
- The resulting technological tools, all based on algorithms and protocols, are undoubtedly enabling for human beings in a variety of ways in particular in accessing and processing information and knowledge.
- But these revolutions have not raised our emotional and social intelligence to resolve our key economic, social, environmental and political problems and conflicts.
- In fact, they were never designed or envisaged to do so.

Emotional and Social Intelligence and Creativity

- The human animal can be defined by its capacity for Emotional and Social Intelligence and Creativity.
- Our civilisation is the result of these three traits.
- Our global problems can only be effectively tackled by an enhancement of these human traits.
- PwC consultancy on future results of automation: *Creative thinking & emotional intelligence will be valued*.
- Yet in comparison to the gigantic intellectual effort and resources allocated to construct algorithms to make machines computationally intelligent, hardly any step has been taken to develop protocols that can effectively enhance these three traits in humans.
- This, I think, is not because the task itself is unfeasible but because it is not directly and immediately profitable.

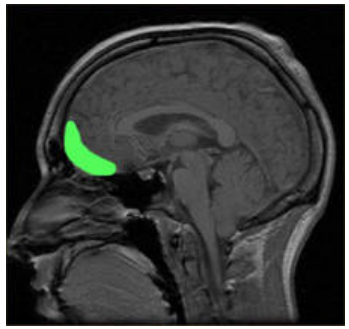
The Turing Test in the Cybernetic Society

- Turing introduced his now well-known test in 1950 in the second meeting of the Ratio club of psychiatrists, psychologists, physiologists, mathematicians, engineers.
- Norbert Wiener had defined Cybernetics as the science of **Control and Communication in Animals and Machines**.
- Computer Science is the science of developing and harnessing algorithms, in the mirror image of the human mind, to make machines computationally intelligent .
- A different quest is to develop protocols to enhance emotional and social intelligence and creativity in humans.
- This quest would be in the mirror image of interactions in child development and human life that can maximise emotional and social intelligence and creativity.

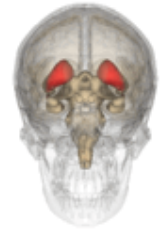
Attachment Theory (Bowlby 1960's)

- Dominant paradigm in developmental psychology pioneered by John Bowlby influenced by cybernetics.
- Toddlers have one of four types of **attachment** with their primary caregivers depending on their relationship, crucial for childrens emotional development in life:
- **Secure** (loving parent, quick appropriate response to distress)
- **Avoidantly insecure** (rejecting parent)
- **Anxiously insecure** (inconsistent parent)
- **Disorganised** (frightening or fearful parent)
- Experimentally validated by the **Strange Situation Protocol** (Ainsworth 1965) in many cultures in the world.
- Attachment types regulate gene expression (Schore 03).

Secure attachment (Schore 2003)



- The loving mother–by **mutual gaze, mirroring, affection, singing, dance and play**– attunes, resonates and fine tunes with, and thus regulates the baby's affective states, maximising positive and minimising negative affects.
- Synchronised right brain–right brain interactions in the mother-baby dyad greatly increase dopamine/endogenous opiates, inducing rapid growth of the baby's brain.
- The **orbital prefrontal cortex** (OFC) develops as the executive director of the limbic system, to regulate and delay response to arousal of emotions.
- The child slowly acquires a mental image of the loving mother, an internal model/neural circuits used increasingly in the absence of the mother too.



Human bonding examined with fMRI

(Bartles and Zeki 2000, 2004; Schjoedt et al. 2008)

- Adult lovers, respectively mothers, look at photos of their loved ones and some friends, respectively other children.
- Activated brain areas of adult lovers significantly overlap with those of mothers in **dopaminergic, reward pathways of the brain**, in particular in the caudate nucleus.
- Deactivated brain areas for maternal and romantic love overlap in regions associated with negative emotions.
- Reward pathways are also activated in devout protestants when praying if they pray at least 3 times a week.
- **Being in love** produces similar activations in the brain in maternal and romantic bonds or in **internal** religious bonds, in which a deity is an **attachment object**.

Self-Attachment: 'Reboot, Substitute and Iterate'

- Create new optimal neural circuits by emulating nature.
- Conceive the brain as comprised of **two agents**:
  (i) **Adult** Self: a thinking/reasoning faculty dominant in the absence of stress with neural activities mostly in the prefrontal cortex or the left brain.
  (ii) Inner **Child**: a feeling/emotional faculty dominant under stress with neural activities mostly in the limbic system or the right brain.
- Stages for Adult to re-raise Child by mental imagery or VR:
- **Connecting**: Adult connects to Child with compassion.
- **Bonding**: Adult creates an internal affectional bond with Child, subjectively experienced as falling in love.
- **Re-parenting**: Adult regularly practices with Child to minimise negative affects and maximise positive affects.
- **Hypothesis**: By increasing dopamine, serotonin, etc., Self-Attachment leads to new optimal neural circuits as a consequence of neuroplasticity and long term potentiation.

Various Computational Models for Self-Attachment

- Strong attractors in artificial (Hopfield) neural networks (E. 2013, E. & Mancinelli 2013)
- Game-theoretic model to change the NE of an insecure attachment game by reinforcement learning to the NE of a secure attachment game (Cittern & E 2015, E 2017).
- Using Q-Learning to create strong patterns of a Hopfield network hypothetically corresponding to positive affects in the mind (E. & Zheng 2014).
- A neural model of the bond making by hypothesising how emotional appraisals in the OFC can mediate between activity in neural circuits that drive stress and facilitative responses to social stimuli (Cittern & E. 2015).
- A neural model how the empathy circuitry (involving the anterior insular, anterior midcingulate cortex, medial prefrontal cortex) might stimulate a mesolimbic pathway involved in caregiving behaviour (Cittern & E. 2017).

Preliminary Results of a Pilot Project

- Three psychotherapists were trained in Self-Attachment.
- A group (≈ 25) of patients with chronic anxiety and depression rooted in early childhood development.
- Many had unsuccessful experiences of different forms of psychotherapy or drug therapy.
- In a course of eight 50-minutes sessions in 12 weeks (weekly sessions for the first four weeks and bi-weekly thereafter), each patient was trained by a therapist to self-administer the Self-Attachment protocol.
- All patients who finished the first month had already reported a profound change.
- These patients continued to improve and most reported a complete transformation of themselves in week 12.
- Several patients also overcame symptoms of moderate or severe OCD or their physical abuse of children or wife.

Humans as goal-directed, interactive, self-regulating complex systems:

The Entropy Model of Uncertainty (Hirsh et al. 2012)

- As a cybernetic agent, the brain is characterised by:
  - its desired goals,
  - its current state in the representation of the world as relevant to the goals, and,
  - a set of operations (skills, strategies and plans) for transforming the current state to the desired goal.
- The amount of uncertainty in these three elements is considered as the **psychological entropy** of the system.
- What is happening? What do I want? What should I do?
- Anxiety (noradrenaline) is the innate response to increase in the psychological entropy.
- Uncertainty is also an innate incentive reward linked to **dopamine** which promotes **exploration** for value reward and information reward (DeYoung 2013).

“Self-Attachment increases dopamine for exploration”

- In normal circumstances, stressful life events increase the global dopamine level to promote exploration.
- We then would “rise to the challenge” and try hard to find optimal solutions to our problems.
- Individuals prone to depression and anxiety, rooted in suboptimal early development, respond to stress by sinking to depression and inactivity.
- All the project patients with chronic anxiety and depression have reported profound change by practicing Self-Attachment for only a few weeks.
- **Hypothesis I**: Self-Attachment increases the global dopamine level promoting exploration to find solutions to the underlying problems and lift the chronic depression.
- **Hypothesis II**: Self-Attachment decreases the psychological entropy and anxiety as a result of effective exploration and solution finding.

Socialising in 2nd year and Social Intelligence

- The mother of a 13-17 month old expresses a prohibition on average every 9 minutes.
- The mother plays a socialising role to persuade the child to restrain unsafe and anti-social actions the child enjoys, including unrestricted exploration, tantrum, violence, etc.
- By repeated experience of mis-attunement, shame and re-attunement the child learns that disruption in homeostasis with the mother can be set right.
- The second year of life is thus labelled “socialising”.
- It is the beginning of social intelligence, the capacity for negotiating one’s goals with empathy and compassion.
- An incapacity for self-regulation of emotions usually implies an incapacity for social intelligence to negotiate one’s interests and goals in social settings.
- Nearly all the project patients initially had severe inter-personal problems which, interestingly, they self-learned to cope with harmoniously by week 12.

Increase in Creativity following Self-Attachment

- All the project patients who were professionals became either creative for the first time or became significantly more creative in their professions after the course.
- Here are three examples:
- An MSc student of computer science who had been stuck with her MSC project for four years as a result of chronic anxiety and depression:
- After the course, she started to write, as the lead author, several papers in her subject.
- An engineer who, following the course, has had significant increase in his creativity at work leading to a number of novel creative solutions in his subject.
- A patient with writing skills who, following the course, has written a novel about Self-Attachment, which she intends to publish for the first time to start a career in writing.

Why Self-Attachment May Increase Creativity?

- Creativity is the act of making new things or presenting new ideas that are useful.
- In experiments to study creativity as measured by “divergent thinking” in school children, what predicts creativity is working memory, not intelligence.
- The most fundamental factors contributing to creativity are **internal motivation** and **openness to new experiences**.
- Thus, the observed increase in creativity follows from the hypothesis on dopamine increase in Self-Attachment:
- The love practised for the inner child is later emulated in loving to work on a subject or profession.
- There are also parallels between the highly creative mind and the child’s mind: curiosity, spontaneity, flexibility, associative thinking, full range of affective states.
- By creating a bond with the inner child in Self-Attachment, the individual co-opts the creative mindset of the child.

A Protocol to Nurture and Enhance Creativity

- Creativity has been **biologically adaptive**, defining us.
- Every human has the potential to be creative in some area.
- Creativity in all areas of human activity raises the quality of life of the creative individuals and those around them.
- Creativity is the **anti-dote** to our social ills, the instinct to dominate by private wealth, power, war, fundamentalism.
- Given a real choice, people and in particular young people would choose to become creative in order to leave a legacy rather than engage in "material" gains in life.
- An increase in the creativity of the individuals of a society, based on emotional and social intelligence, would be a **game changer** for solving the problems in that society.
- Creativity is the result of **operant conditioning** and reinforcement of novel behaviour (Skinner 1974).
- The core sub-protocols of Self-Attachment can be used in an app for creativity and tested independently.