Algorithmic Human Development:

What is it and why do we need it now?

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"Walk gently, *breathe peacefully*, *laugh hysterically*." Nelson Mandela

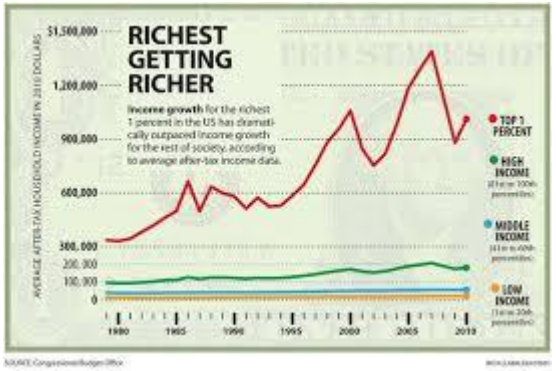
Existential Problems Worsening

Global Warming

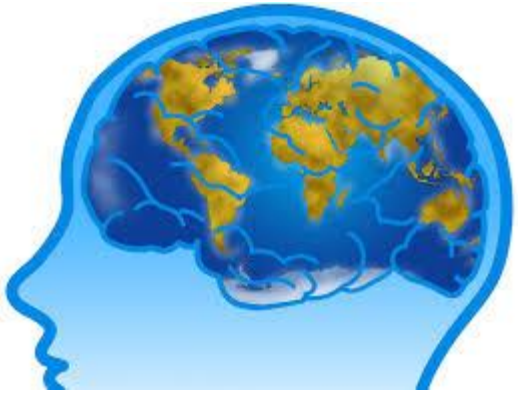
Environmental Crisis

Destruction of Life Habitats

Global Inequality



Global Mental Illness



Centres of Global Conflict

International Terrorism

What is the solution?

- For each of these, either good solutions exist or can be worked out.
- Material or vested interests of various shape remain the obstacle.
- The Social/Emotional intelligence/Creativity (SEIC) required is lacking
- These three capacities distinguish us from other animals.
- Problems rooted in aggressive instinct to dominate: greed for money, power, etc.
- To adapt to new conditions, need to raise SEIC for more cooperation, sharing.
- By enhancing SEIC in humans the aggressive instinct can be sublimated to creative work in myriad areas of human activity.

The Origin of Artificial Intelligence

- Alan Turing introduced his test for AI in 1950 in the Cybernetic Society
- Cybernetics: Control and Communication in goal-directed agents such as Animals and Machines.
- Since 1950's, we have developed algorithms, in the mirror image of the human mind, to make machines computationally intelligent .
- Given the progress in developmental psychology and neuroscience, a new quest is to develop protocols to enhance SEIC in humans.
- Protocols modelled by optimal interactions in child/human development.

Machine learning algorithms versus human development algorithms

	Electronic/Quantum Computer	Human Cybernetic System
Architecture	Computer electronic/quantum hardware	Human Brain
Operator	Operating system	Human individual self
Foundational Basis	Logic, Mathematics, Analysis, Psychology, Physics	Neuroplasticity, Long Term Potentiation (LTP), Logic, Mathematics, Analysis, Psychology, Physics
Guiding Principle	What humans can do machines can learn to mimic	Any generic human behaviour can be learned by the human individual
Programmes	Computer programmes/ software	Action programmes
Components	Substitution, Iteration, Rebooting Sub-routine, Application, updating	Substitution, Iteration, Rebooting Sub-routine, Application, updating
Learning Active inference	Reinforcement Learning (RL) Free Energy/Surprise minimisation (FEP)	Neuroplasticity, Long Term Potentiation RL, FEP
Time Performance	Seconds or minutes	Weeks or months

Goals for Adaptive Human Development

- For a new equilibrium in the world of interacting cybernetic humans, need

Higher level of SEIC = Become more Compassionate, Cheerful, Creative (CCC)

- A higher degree of CCC for the human individual is now adaptive for life.

- By reverse engineering, find self-administrable action programmes based on neuroplasticity and long term potentiation (LTP) that lead the human biological cybernetic system efficiently towards these goals!

- It should also provide a scalable, new type of effective psychotherapy.

A model for brain architecture:
inspired by Bowlby's Attachment theory

- Human brain as a cybernetic system of two interacting agents:

1. Adult Self: thought-driven faculty dominant when stress free
2. Child Self: emotion-driven faculty dominant under stress

- Early optimal development with parents results in capacity for emotion self-regulation in the child, mirroring those in the parents.
- This provides an optimal interactive play between these two agents.

- This secure self-attachment is the basis of compassion for the self and the other and thus social and emotional intelligence.

- Lack of emotion self-regulation reflects insecure self-attachment:
- Avoidantly insecure, anxiously insecure, disorganisedly insecure

How to become compassionate?
By Rebooting via Self-Attachment (E. 2015).

1. The Adult connects compassionately with the Child using mental imagery, photos or VR of his/her childhood (based on primary narcissism)

2. Adult imaginatively, passionately bonds with Child by singing, dancing, play

3. Adult re-parents Child by emulating optimal parent-child interactions.

- Can lead to emotion self-regulation and compassion to others: pilot project

- Hypothesis: Based on neuroplasticity and LTP, this creates new optimal neural circuits by rebooting, substitution and iteration.

An artificial neural model of the Bayesian brain

(E. and Mancinelli 2013, E. 2013 NIPS)

Sad

- Hopfield network (1982): Images are stored using a Hebbian rule.
- Then, exposed to any image, it retrieves closest match in its memory.
- For p images in a net with N pixels: Good memory for $p < 0.138\ N$
- If Sad is a strong pattern, i.e., stored $k>1$ times, with hundreds of random faces present, the net interprets almost any face as Sad.
- Good memory of strong pattern Sad for $p < 0.138\ N\ k^2$
- The square law explains the tenacity of human behavioural prototype.

Prototype Change: Uprooting the Bayesian brain by iterated learning of an optimal pattern

Happy

- Start with Sad as a strong pattern with multiplicity $k > 1$.
- Store Happy as a stronger pattern with $m > k$ times.
- With high probability a random face is now interpreted as Happy.
- The SAD brain is transformed to Happy brain.
- Human learning= iteration + loving focus in anticipation of reward (dopamine)

Decision Theoretic Model: Child-Parent Interaction

Buono et al., 2006

Strange Situation Test

Relief/Stress table for six Child-Parent interactions

Child Action	Parent Action: Attend — Probability q	Parent Action: Ignore — Probability 1 - q	**Expected Relief for the Child**
Relief for **Seek**	w	- s	wq -s(1-q)
Relief for **Guarded seek**	h	- t	hq -t(1-q)
Relief for **Avoid**	0	0	0

- For $0 < t < s$, $0 < h < w$ and $h > w\,t / s$, three equilibria for organised attachment:
  1. **Secure:** Seek optimal for $(s-t) / (w+s-h-t) < q < 1$
  2. **Anxious:** Guarded Seek optimal for $t / (h+t) < q < (s-t) / (w+s-h-t)$
  3. **Avoidant:** Avoid optimal for $0 \leq q < t / (h+t)$

Attachment as Free Energy/Surprise Minimisation

Cittern, Nolt, Friston, E. 2018

Karl Friston: FEP or Free Energy Principle

By “active inference”, the brain minimises **Free Energy**, a measure of **Surprise**

- **Actions** by Child: Seek, Guarded Seek, Avoid

- **Hidden states of the world**

  –Pairs of actions and caregiving behaviours, capturing the effect caregiver has (parametrised by q) on Child’s internal relief (stress)

- **Observations** that Child experiences

  – Relief (stress) Child senses parametrised by w,h,s,t

- Child’s **model** of hidden state and observation dynamics

  – Used to predict future consequences of behaviour (i.e. hidden states and observations)

  – By minimising expected free energy, Child behaves in ways that it expects will result in observations that are a priori preferred (i.e. high relief states)

FEP Modelling of Attachment & Self-Attachment

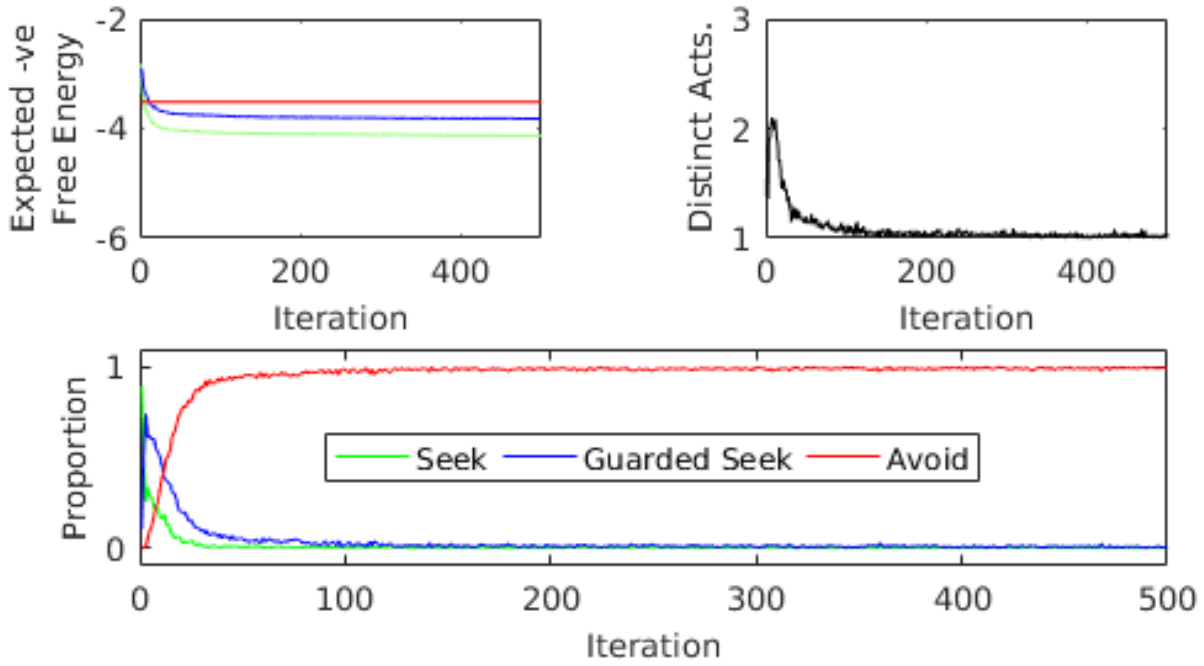
- Not knowing how Adult is likely to behave
  - **Child learns this by minimising Surprise**
- Child starts with a model that is uniform with respect to caregiving behaviour (average q=0.5, with high uncertainty)
  - Model gradually learns with experience by Surprise minimisation
  - Fixed relief/stress parameters: w=s=2, h=0.75, t=0.9

To model self-attachment:

Probably q of Adult attending increases from 0.1 (avoidantly self-attached) to 0.4 (anxiously self-attached) to 0.9 (securely self-attached)

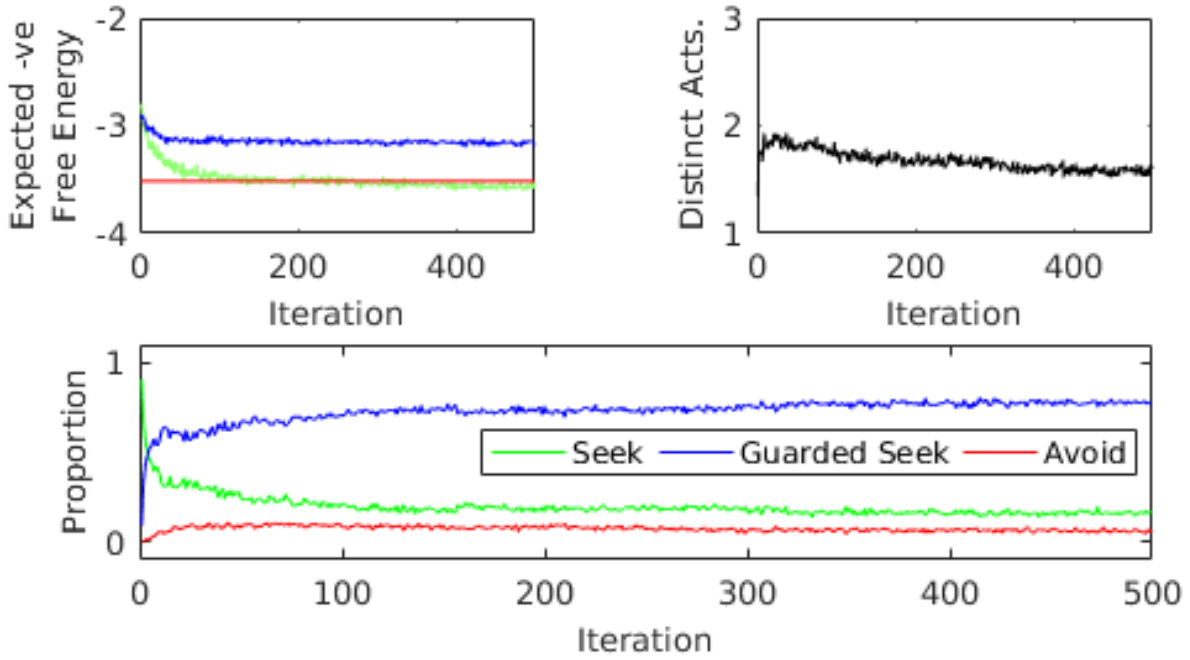
Avoidant Self-Attachment

- Consistently unresponsive Adult caregiver (*q=0.1)*
- Top left: expected negative free-energies
  Top right: number distinct actions chosen per iteration
  Bottom: proportion action selections per iteration.



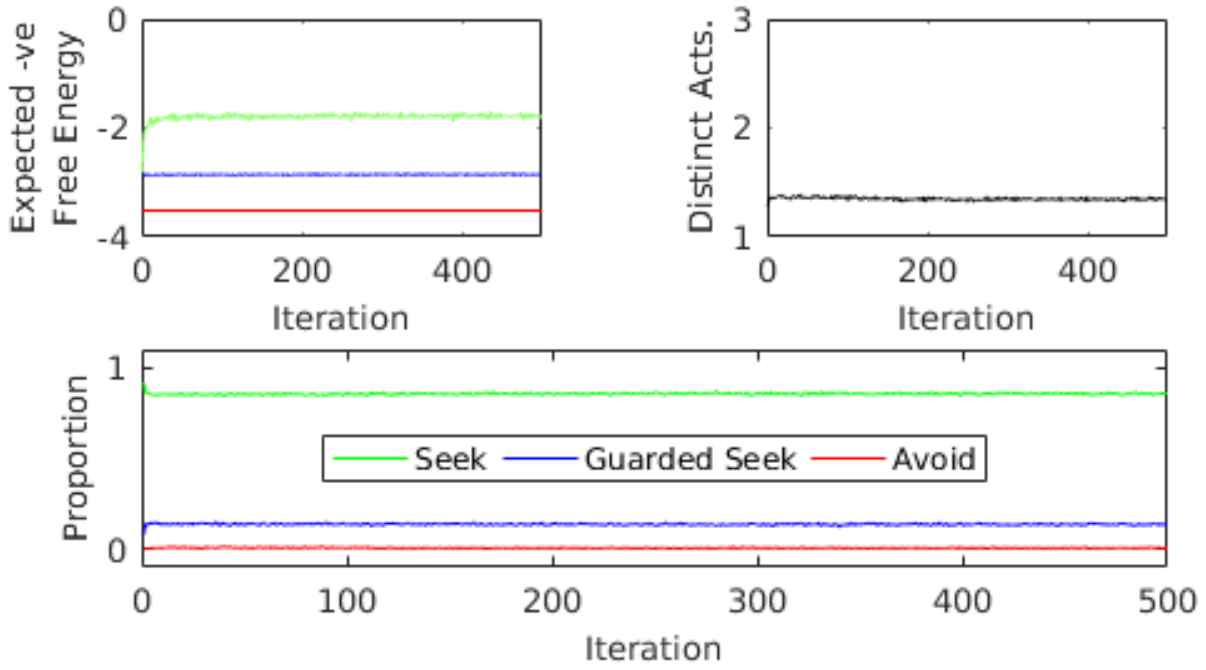
Anxious Self-Attachment

- Inconsistent Adult caregiver (*q=0.4)*
- Top left: expected negative free-energies
  Top right: number distinct actions chosen per iteration
  Bottom: proportion action selections per iteration.



Secure Self-Attachment

- Consistently responsive Adult caregiver (*q=0.9)*
- Top left: expected negative free-energies
  Top right: no. of distinct actions chosen per iteration
  Bottom: proportion of action selections per iteration



How to become Cheerful? By Laughing.

- Logical basis of laughter?
- Do we laugh because we're happy or are we happy because we laugh?

  - William James
- Three basic laughter theories:

  Superiority theory (Plato, Hobbes)

  Incongruity theory (Aristotle, Kant, Schopenhauer)

  Relief theory (Spencer, Shaftesbury, Freud)
- Evolutionary psychology: Laughter emerged as a play signal in infants

An Overarching Theory of laughter

1. The human individual has the capacity to laugh in reaction to perceiving any change, whether objective or subjective.

2. This can be attained by early learning but also in adulthood.

3. Like any other behavioural prototype, learning to laugh is attained based on long term potentiation and neuroplasticity.

4. Using incongruity and superiority theories create protocols to update prior beliefs for laughter to replace sub-optimal reactions to upsets.

5. The most fundamental learning to focus on now is learning to laugh.

Possible reactions to life upsets

(cf. John Morreall)

1. Negative emotions: natural reaction to upsets
2. Cognitive assimilation: understanding the situation and the emotions
3. Meditation: disengaging, passive resistance to upsets
4. Laughter: disengaging, playful, humorous reaction to upsets

   Option 4 is optimal after any initial reaction using 1, 2, 3. Why?

Subroutine: If you can neither accept or change it, try to laugh at it!

Ashleigh Brilliant

But strong emotional prototypes rule out adopting this subroutine.

Prior-buster of outdated beliefs on suffering!

- Take a past or present tragedy.
- Remember: enduring it would make one stronger!
- Consider this initially “ridiculous” paragraph built by incongruity theory:

  Not only bear it, accept it and try to put up with it, not only live with it, try to endure it, and adapt yourself to it, ,...

  But consider it a cherished fortune (ha ha...), treasure it with great love (ha ha...), welcome it heartily (ha ha...), joyfully celebrate it (ha ha...),

- Laughing at its ridiculous nature, one will lighten up, updating the prior.
- Consistent with the Free energy principle of minimising surprise?

A pathway to solve our existential problems: Learning to laugh at ourselves

- Begin by smiling/laughing on your own after accomplishing any chore at home or work as a sign of success (by incongruity theory + superiority theory, why?)
- Consistently practiced, this will begin to change you.
- By LTP and neuroplasticity, one can eventually laugh at one's own incongruity, mistakes and even defeats.
- In time, these protocols have a transformative impact to make one more humorous, playful and creative.

How to become creative?
Start by returning to Child mode

- The human child is highly creative in using words by age three
- Adventure and play driven rather than task and reward oriented
- Role modelling by children: a basis for later art/scientific creativity
- Highly creative people have much in common with children:

  Spontaneity, flexibility, inquisitiveness, independence, perseverance, lack of dogma, experiencing all opposite emotions and, most of all, playfulness

- This potential for creativity is mostly destroyed by our educational system: Assessment, Surveillance, Competition, Reward

Self-Attachment revives Child mode

- One is usually only a whole person when one is a securely attached child.
- The Self-Attachment protocol allows reactivating the creative Child mode lost due to family life, educational and social systems.
- In various case studies, individuals practicing SAT for three months became more spontaneous, flexible, inquisitive, independent, resolute, playful with a wider experience of varied emotions they could self-regulate.
- They became more creative in social relations and professional activity.
- Hypothesis: SAT can enhance creativity in adult population via sublimation.

Self-laughter in Child mode: efficient path to creativity

- Self-directed humour and laughter allows us to become playful, mentally flexible, constructively critical including self-critical.

- By perpetual laughter at our incongruities, shortcomings and anxieties, our problems are reframed: then new solutions emerge.

- “Humour shows how perceptions set up in one way suddenly can be reconfigured in another way. This is the essence of Creativity.”
  -Edward de Bono

- Perpetual self-laughter allows us to transcend our thoughts to reach the heights of permanent creativity in the Child mode.

- In this state, we tend to seek more Surprise rather than less.

Conclusion: We need to Reboot ourselves!

To adapt to the new challenges, humans need to significantly increase their Compassion, Cheerfulness and Creativity.

This would allow sublimation of aggression and change to more sharing and cooperative behaviour, leading to a new social contract.

1. To increase Compassion, reconnect and bond with Child facilitated by VR, AI for emotion recognition, Virtual Mentor, Simulation

2. To increase Cheerfulness, learn to laugh at yourself and at any thing

3. To increase Creativity, switch to Child mode with perpetual self-laughter