

# The 3<sup>rd</sup> wave of AI can help develop apps generating the 4<sup>th</sup> economic booming

## Abstract

We discuss several AI apps that can promote the economic booming growing out of inflammation and recession:

- a) Unmanned Autonomous Trucks;
  - b) Unique Facial Recognition;
  - c) Precision Cancer Drug;
  - d) Several Longevity Procedures for keeping the health care intact.
- i. Honorable Secretary of Transportation Elaine Chao can authorize National Highway Traffic Safety Administration to broaden the manned driven car safety technologies, known as Driver Assistant Technology (DAT). If the DAT includes a simple dashboard day & night camera, their car insurance premium can be saved. The device can connect through 5<sup>th</sup> Gen mm wave communication available in April 2020 to monitor driver's facial expressions without recording their voice for privacies. The benefit is clear that can indicate driver's sleepiness, idling, multi-tasks (checking maps, talkative on phones), as well as hurried or madness emotion, so that its neighborhood cars can express friendly warning and keep away from it on the high speed freeway.
  - ii. One can take the advantage of newly discovery of Inferior temporal cortex region of 205 neurons to help identify for unique individual like fingerprint.
  - iii. Leverage the success of Merck Keytruda cancer marker drug for early precise detection at cellular level.
  - iv. Invest on several longevity discoveries in mice to develop a fit to individual physiology needs.

**Keywords:** artificial intelligence, economic booming, facial ID, drug discovery, longevity

Volume 3 Issue 3 - 2019

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**Received:** April 17, 2019 | **Published:** May 10, 2019

## Introduction

The 1st Booming was due to President Ike Eisenhower) who admired German Autobahn and wished to build after WWII Interstate Freeways. For example, while the E-W horizontal used even number e.g. I-10; I-80, the N-S vertical odd numbers. e.g. I-95. The 3 digits are reserved for surrounding big cities I-495 (4 for "for"), I-695 (6 for "exit"), and I-395 (3 for "throughput"). The originally design of Interstate freeway is for military missile launcher, but it has instead boosted the Interstate commerce; those are the days that we did not yet have the power of supercomputer to support AI. The 2nd Booming was due to President J.F. Kennedy after Russian Sputnik has challenged the public and mobilized the whole nation with the ambitious goal of Astronaut Armstrong to land on the Moon. As a consequence the Precision Electronic has developed enhancing the development of supercomputing & Robot Control Theory; the 2<sup>nd</sup> booming of economics seems to be driven by the supercomputing and the mini-super PC. We believe that AI 1st wave began.

The 3rd Booming was due to Vice-President Al Gore has leveled the Internet playfield of ARPA net (among PI's & PM's) into World Wide Web (WWW) boosting Internet consumer business (e.g. Amazon, etc.). AI helping e-Commerce is key driving force. The 4th economic booming: Exemplars AI e-IQ: UAT Robots must to know the emotion aspect of the other human drivers (or understandable to real soldier). The other topics are AI Classifier: unique Facial ID; AI Drug: marker for Cancers; AI Genetics: Longevity. Although AI 3rd

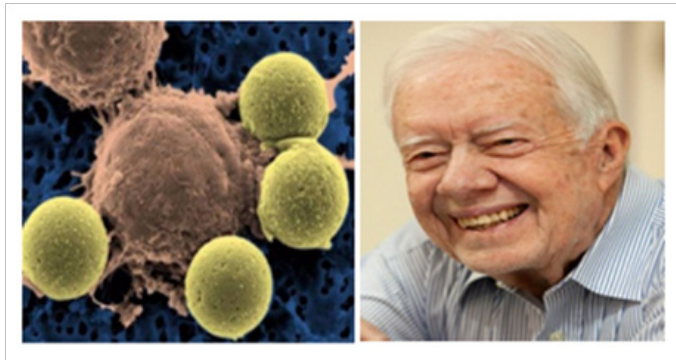
Wave blooming has not entered in the Creativity & Literature, the AI painting seems to be exception to Stanford Prof. Andrew Ng who has used AI deep learning to imitate the painting styles by Pablo Picasso whose 3D forms, Henri Mattes on colors, as well as the impressionist by Claude Monet's.

DARPA Mr. David Gunning has introduced explainable AI (XAI), and Communicating with Computers (CwC), as well as Machine Common Sense (MCS). Furthermore, 2018 ONR "Advanced AI in Naval Domain." We believe that the new DARPA 3<sup>rd</sup> Wave AI program after July 2019 should be broad based to stimulate the comprehensive economic booming.

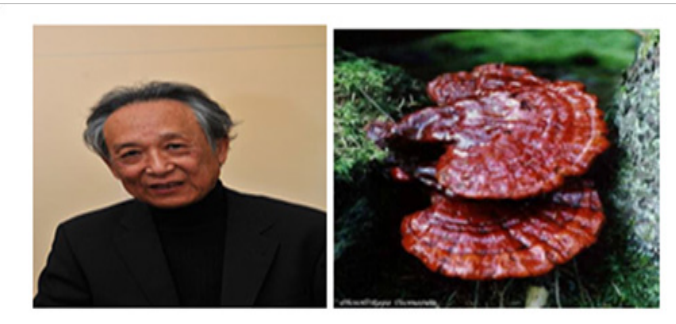
## Application AI to precision cancer ID for biomedical wellness (BMW)

AI has been already been used in Medical Expert System to account for the complexity of medical terminology. There is the difference in Clinical diagnosis versus Pathogen diagnosis. How many stages in cancer? Cancer begins the "carcinoma in situ (inception stage 0)", localized stage (I, II, III), the last stage IV (Metastasis). What kinds of cancers? There are blood, lymph, bone, lung, liver, node, etc. Since National Institute of Health has advocated 4P medicine: namely personalized, precision, predictive and preventive medicine, we wish to apply AI to further extend the commercial success of the drug marker exemplified by Merck Keytruda drug (pembrolizumab targets gene PD-1 & PD-L1, the interaction between two genes).

Anecdotal story goes as follows: In 2004 Former President Jimmy Carter has diagnosed both the liver & brain cancer cells that were already in the last stage. President was in the last stage of liver and brain cancers, yet was able to be pointed out by the Keytruda yellow balls, and his own strong immune system can fight off the melanoma cells. Merck has further documented the drug works for lung cancer. After 15 years later, President Jimmy Carter is now 94 living in Georgia apparently healthy eating peanuts, salmons, and met the former Presidents and prayed for the current President (Figure 1A) (Figure 2B).



**Figure 1A** Yellow balls are Keytruda cancer (central cells) marker drug. 1B: President Jimmy Carter 94 years old recovered from the 4<sup>th</sup> metastasis state of liver & brain Cancers a decade ago.



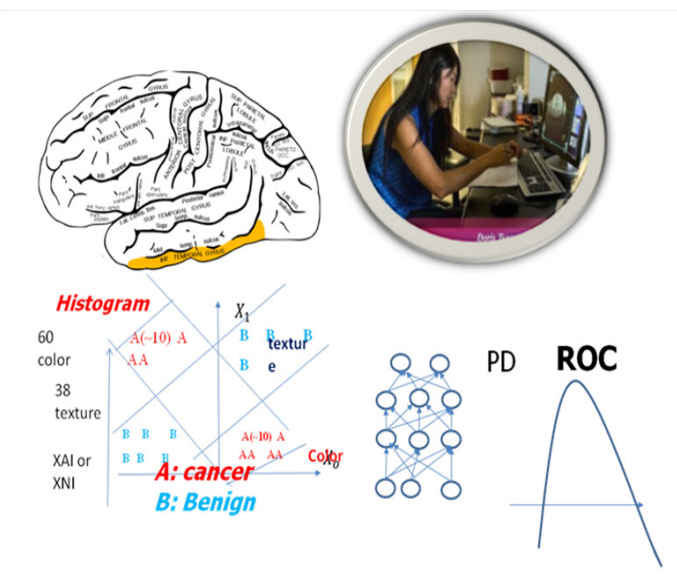
**Figure 2A** Nobel Laureate in the Literature Mr. Gao Xingjian survived from the cancer taking Lin-Chi Herbal Medicine (a special kind of mushroom). Asia (Japan, (Precision Farming Takeshi Yamakawa), Korea (KAIST Soo-Yung Lee), & China may be developing Herbal Medicine that can be systematically helped with AI data mining studies.

### AppAI Deep Learning (DL) at feature domain to unique facial ID

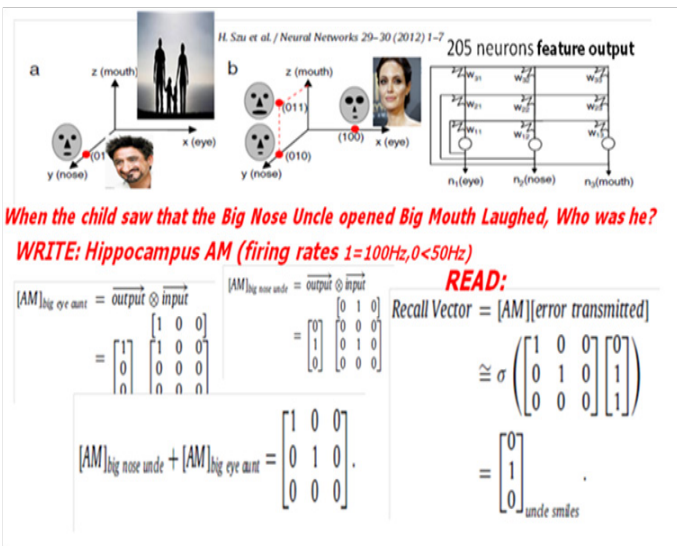
Prof. Doris Tsai, Caltech, published in Sci. Am. Feb 2019 pp.22-29,<sup>1</sup> proved from fMRI (blood) + in-situ (firing rates at Inferior temporal Cortex (yellow) of 205 neurons). How unique are their collective decision is to recognize the individual as if animal connecting to their mother? Is this brain internal feature similar to human eye Iris folds or finger prints? If so, is this unalterable ID by measuring firing rates pattern of 205 neurons that could be useful for spy cyber warfare ID (Figure 3A-3C).

Scientists at Google, CALICO (CA Life Co), NIH/NIA believe that human is possible to be rocketed to the “immortality promising land” with a sufficient escape velocity. e.g. 2012 Nobel Laureate Shinya Yamanaka of Kyoto (4 specific genes of induced Pluripotent Stem (iPS) can rewind back the “clock (of Hayflick)” (chromosome

XY etc. Telomeres and cell senescence) to embryonic state. However, there are more than one methods done to mice already, some human also been successfully thus NIH Gold Standard must “do no harm” and more in a Double Blind (DB), Negative Control (NC) with placebo, Sufficient Statistics (SS). Recently, Dr. Linsay Wu & David Sinclair published in Cell. March 22 2018 “NAD<sup>+</sup> signaling a key regulator protein STR1” & thus treated NMN can extend the life “mice are as old as their blood vascular vessels.”



**Figure 3** (A) Power of Pairs Feature Extraction (FE); (B) Homeostasis Brain relaxation.

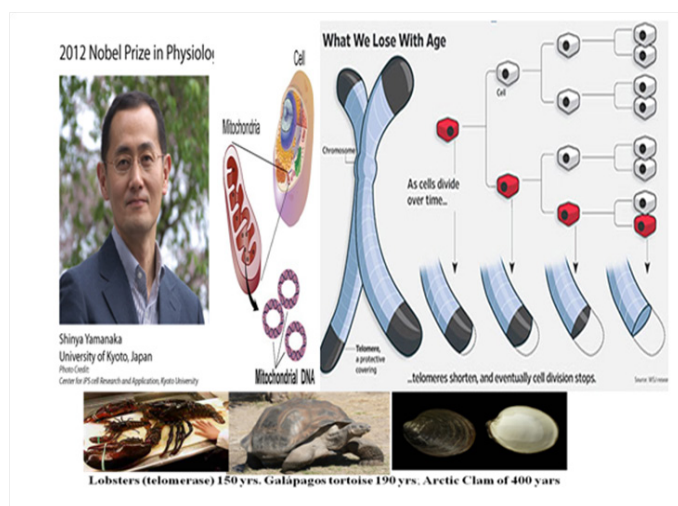


**Figure 3** (C) AI Longevity Studies: Can AI help us live healthy to 150?

**Longevity may have many courses that may need AI to keep track**

- Nonstop production of telomerase enzyme;
- P. Mattson's (NIA Dir.) “Dietary (Calorie) Restriction Normalizes Glucose Metabolism.

- c) Metformin timing Insulin secretion to digest glucose energizes glia cells in brain). Brain-Derived Neurotrophic growth Factor can slow down Disease Progression and Increases Survival in Huntington Mutant Mice” PNAS Feb. 10 2003;
- d) 2012 Nobel Laureates Shinya Yamanaka 4 induced Pluripotent Stem (iPS) Genes of mice & human. Cf. W. Duan, et.
- e) Dozen Mitochondria cells within our cell need to be protected from Free Oxygenated Radical (FOR) e.g. recently advocated Magnesium salt processing water giving rise hydrogen ions water to neutralize FOR to protect our symbiotic energy power houses: Mitochondrial (Figure 3D).



**Figure 3 (D) Unmanned Autonomous Trucks (UAT).**

**UAT background:** If there were easily made thousands Unmanned Autonomous Trucks (UAT) that can ship goods day and night nonstop (from South Lake Union Seattle Amazon 1<sup>st</sup> HQRT with 40K employees & \$38B to all US Cities in days.

- A. Whether or not Amazon still needs to invest the 2<sup>nd</sup> HQRT at the cost of \$2.5B with 25K high-paying jobs in Crystal City & Pentagon City known as National Landing.
- B. UAT's is not so easily be made in 2 years, partly due to machine cannot understand other human driver emotion so that Amazon

decided to build the 2nd HQRT. Why not so easy? “Not to mention that a human cannot understand the human,” the machine is much more difficult to understand human without better (fuzzy) representation of emotion-IQ, and Logic-IQ, as well as Claustrium & insular integration.

DARPA is different from NSF. It must be High Risk, High Payoff. However their program must be executed through ONR, ARO, AFOSR. DARPA Dir. Dr Steve Walker announced “3<sup>rd</sup> Wave AI” with \$2B RFP by July 2019. Early, Mr. David Gunning has introduced Explainable AI (XAI) Communicating with Computers (CwC), and Machine Common Sense (MCS). Historically, DARPA developed “Road Follower, (in no man land) thus we also bet on high Payoff Highway

- a) Self-driving Truck solving high risk emotion of other drivers; The other 3 of 4 legs R/D's,
- b) Terrorist Face Recognition,
- c) Health Issue of Soldiers,
- d) Longevity of Veterans.

Synopsis (6.2 Gap; 6.1 Shortfall): Self Driving Truck at \$3M over 3 years: can stand a long hours on the road, heavy lifting AI machine, which can take over human choir going beyond commercial Embark, TuSimple, Tesla, to apply to all humanoids:

**Gap:** Gunning MCS lacked new Communication with Human (CwH) knowing human emotion: “Machine is causal, rational, but human may not be.” Human may abide the law, but sometime violate the traffic rule (that's what happened in Temple Arizona). We should take the advantage of **broadcast driver facial stress** (not conversation) to develop thousand-fold impact Truck that can drive in freeway from depots to depots shipping goods day-night in non-stop.

**Approach:** We take the advantage of NHTSA recommendation for those who let their faces (not voice) be monitored can save the car insurance premium, so that new car will come with facial sensor suites on dash board to make sure that the driver concentrates on the driving.

#### Lab Test: Dash Board Face Processing Code: Input to Truck

Let the dashboard facial emotion conditions to be input model to a scale-down test model UAT's Lab Test..



**Delivery** (1) Lab Code & (2) Scaled Down Model (3) Represent e-IQ for the AI approaches biological brain NI; (4) compute 4 neighbors matrix Langevin for UAT decision; **transferable to Humanoids.**

**Gap ID:** Technical shortfall of UAT initiated when explainable AI is recognized by DARPA (XAI) in 2016, and exasperated by Uber

Autonomous Vehicle (AV) killed a woman in temple Arizona. “When will we get there?”(Sci., Dec 152017, V358, pp.1353-1488).

**DARPA “Road Follower” & NASA “Martian Cruiser,” were successfully done in “No Man Land”.** (isl.ecst.csuchico.edu/DOCS/darpa2005/DARPA%202005%20Stanley.pdf)





It is the human who gives the unprecedented challenge! Their inscrutable emotion (fuzzy set).



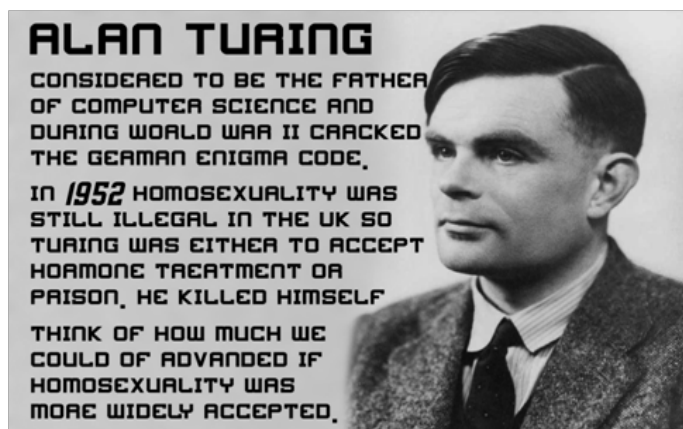
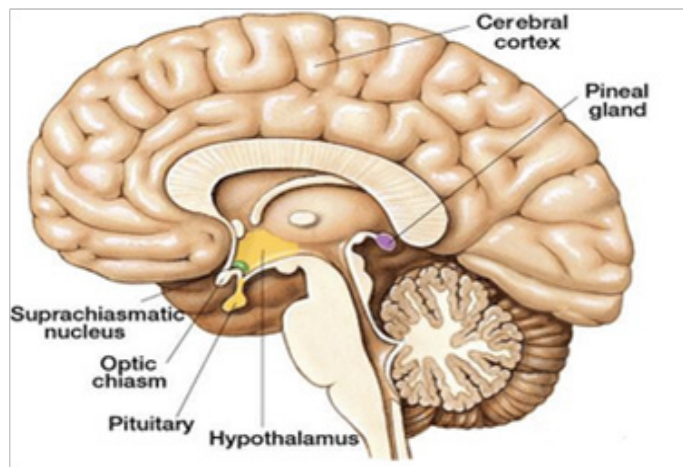
UAT has to track all drivers in all weather conditions. (If 3<sup>rd</sup> Wave AI evolves in punctuated fashion) toward Homo sapiens (wise man) Natural (Survival) Intelligence (NI) that suggested homeostasis Power of Pairs: sensors pair of LIDAR's, RADAR's for rapid pre-processing in case of rain drops blocking sensors pairs "agreed, the signal, disagreed, the noise" for Situation Awareness.



## Tutorial about AI

### What is AI? How did the 1<sup>st</sup> Wave of AI ended?

WWII German Enigma has 5x4 x3=60 ring teeth and each can begin one of 26 English letters) (or 29 German used for U-boats) Factorial # is Navy Shark Codec. Alan Turing broke German Enigma code, Turing was a math genius solved codec without PC. He asked "Can Machine Think?" in 1950 as Artificial Intelligence (AI). Unfortunately, it was ended up sadly by the ignorance of homosexuality. If Man does not understand the others. How can machine do? "Don't forbid the other doing just because you do not do. Let time decide" (Figure 4).



**Figure 4** Homosexuality is now known to be related to hypothalamus stimulating pituitary gland male hormone. God through parents gave us differently.

Then another closed mind killed another genius. After Alan Turing committed suicide circa 1950, Bullish MIT Prof. Melvin Minsky captured human logical intelligence (IQ) by Rule-based system and so monopolized ONR AI funding (ignored emotional IQ). Then, another sad story followed when Cornell Prof. Franck Rosenblatt unfortunately killed himself in a sail boat accident in Chesapeake Bay (Why not in home town Ithaca NY Great Lakes). Although his work of the 1-layer photonics ANN Perception cannot do Exor is kept in Smithsonian as AI landmark of human S&T to every visitors.

Why deep learning is important, for "1-layer" Neural Net photonics caused the death of Franck Rosenblatt and the death of 1-layer perception.



## 2<sup>nd</sup> wave of AI began Alpha-brain (Google in Britain)

It beat Korean Genius Lee Sedol (level 9) as Millions online watched the Chinese Go Chess (black-white territorial Game 4:1 in March 2016) Smart Computer can learn from the losing game to beat human genius. This “learn-able Rule Based AI System” as millions watched on Internet in March 2016 (generated a fear in AI potential taking over the mankind) (Figure 5).

- A. The Shortfall of the 2nd Wave of AI is obvious when Uber man-in-the-loop autonomous vehicle killed a woman in Temple Arizona. “When will we get there?” (Sci.12\_15\_2017, pp.1353-1488).
- B. The increasing deaths of AI waves should be approaching to human brain NI.<sup>4</sup> We shall define mathematically the NI Homo sapiens (LHS Brain only)

a. power of pair sensors

b. Operated at constant temperature brains (37°C) as homeostasis. “Agreed signal (double pulses above brain noise); disagree (single pulse in thermal noise is noise.”



**Figure 5** When was the 2nd Wave AI terminated? Because the death of a woman in Temple Arizona. (Note that “wave” is not “generation”).

**High payoff:** What is that Economic Booming? (So we can judge whether or not AI will bring us the next one)

**Deliverable in open set called AI fuzzy for emotion logic:** Applying Fuzzy Membership Functions which are Open Fuzzy Set in rounded brackets (UC Berkeley former Prof. Walter Freeman 89, Lotfi Zadeh 98) to understandably the other human who’s idling, multi-tasking, hurriedness, madness, etc. emotional responses. How to do?

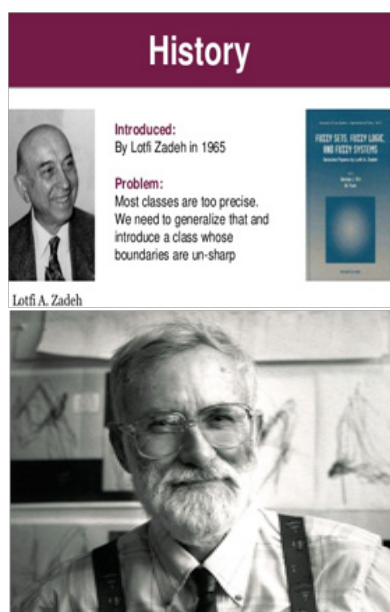
**(idling) (multi-tasking) (Hurry)(Angry) ( Mad)**

**Emptiness**

What is Love? e.g. Love is such a splendor thing, and the morning and evening star! (Movie? Quote)

What is hate? Hate is less than abhor! (Who killed your father & mother).

**All e-IQ are matter of degree open set**



Freedom of Initial Boundary Conditional: We are able to break through NI because we recognize the freedom of initial conditions, since historical debates between Boltzmann and Poincare

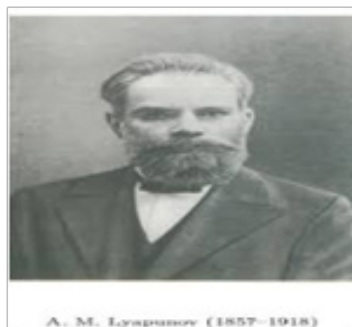
We define AI Emotion with initial boundary condition that is adopted for Open set Fuzzy Logic

- A. French Mathematician Henri Poincare’ recurrence theorem challenged Ludwig Boltzmann time irreversibility that all dynamic equations are second order in time, that is  $t = -t$  invariant or time reversal invariant
- B. Boltzmann cannot answer the public insult, and committed the suicide and on his grave yard he wrote his immortal definition of entropy to be “unusable thermal energy always increasing”
- C.  $S = k \log W$
- D. The resolution is given by Nobel Laureates C.N Yang and T.D. Lee. The irreversible lies in the initial and boundary conditions, not the dynamics equations.
- E. It is this initial freedom of dynamic equation we shall define human e-IQ as an open set fuzzy membership function (FMF) in terms of dynamic change equations
- F. Einstein Proverb: “Science has nothing to do with the truth but consistency,” Time invariant dynamics when movie plays backward is the same as forward.

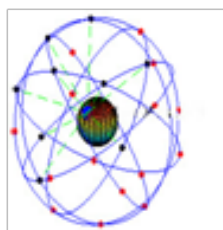
$$\frac{dX^2}{(dt)^2} = \frac{dX^2}{(d-t)^2}; i\hbar \frac{\partial \Psi}{\partial t} = H\Psi; i^* \hbar \frac{\partial \Psi^*}{\partial (-t)} = H\Psi^*$$



However Nobel Laureates Yang & Lee suggested the irreversibility enters through the initial boundary conditions (that turn around give us the freedom to apply equation to define Fuzzy Open Set for e-IQ).



Russian A. M. Lyapunov Nonlinear convergence control (using diffusion Langevin eq. between centrifugal force and acceleration taking into tire-road friction  $\eta$ ). To achieve 1 foot accuracy, we need more satellites (e.g. Iridium 66 satellite).



- Each satellite circles the Earth twice a day. Expandable 24-Slot satellite constellation, as defined in the SPS Performance Standard. It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites
- 3+1 satellite Geodesic intersection (x,y,z) equations have different accuracy depending on the precise locations.
- Add more Satellite to the constraint their accuracy to one feet.
- E.g. Iridium 66 Satellite constellation provides L band voice & data coverage to satellite-phones over the entire earth surface. Taiwan ITRI is developing 5G which is circa 6 GHz carried frequency, which can carry more data info according Nyquist theorem, also in a shorter or a protected range Mobile Edge Computing requires denser cell towers helping UAT's.

$$\frac{dE}{dt} = \frac{\partial E}{\partial X} \frac{\partial X}{\partial t} = - \left( \frac{\partial E}{\partial X} \right)^2 \leq 0$$

If the displacement decreases, as Lyapunov energy E decreases.

$$f \text{ \& only if } \frac{\partial X}{\partial t} = \frac{\partial E}{\partial X}$$

### Scalar energy decay is Langevin force balancing those friction forces

Absolute convergence is possible, but we need all coupled neighborhood matrix vector formulism. We need compute horizontal 2D vector of 4-nn neighbors matrix dynamic equations Einstein of smoke stack Brownian motion matrix Langevin equation to compute various road-tire friction of Stokes radius a (largest size of UAT) at Temperature T  $V = dX/dt$ .

$$D = K_B T / 6\pi\eta a$$

$$\frac{mdv}{dt} = -\frac{m}{\eta} v + \tilde{f}(t)$$

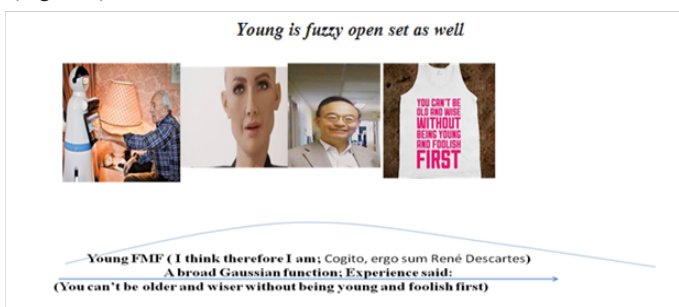
$$m \frac{d}{dt} \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} = -\frac{m}{\eta} \begin{bmatrix} 5 & 1 & 6 \\ 4 & UAT & 2 \\ 8 & 3 & 7 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} + \begin{bmatrix} \tilde{f}_1(t) \\ \tilde{f}_2(t) \\ \tilde{f}_3(t) \end{bmatrix}$$

$$\langle \tilde{f}(t) \tilde{f}(t+\tau) \rangle = \frac{D}{\eta} \delta(\tau)$$



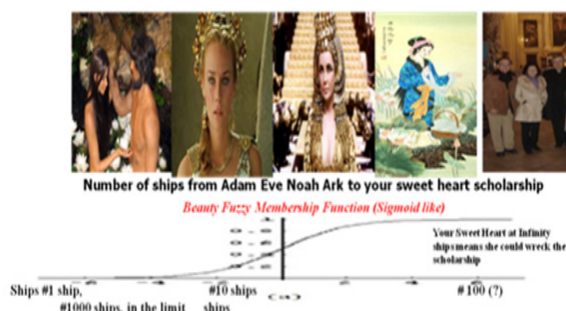
Unique Facial ID is biologically possible because there exists Inferior temporal 205 brain neurons. NHTSA recommended a regulatory lower insurance rate if equipped with dash board sensor suite (no voice recording privacy): Design of Smart Pair (Smartphone Multiple Spectral) sensors capturing subtle emotional behavior by measuring through windows. S-Y Lee, and H. Szu MOJ Applied Bionics and Biomechanics, 2017;1(1):00006 (Figure 6).

**Tutorial Fuzzy:** Illustrate the Fuzzy membership function as open set “Beauty is in the eye of beholder” Fuzzy must use Fuzzy yard stick (Figure 7).





**Figure 6** Using multispectral cameras to image on dash board sensing & track drivers facial pose change as initial condition and add the acceleration of facial vein map to provide UAT decision to stay away rushing drivers or bypass a car.<sup>5</sup>



**Figure 7** Fuzzy Membership Function Sigmoid type for beauty: Adam Eve 1 ship (Noah Ark); Helen's beauty of Troy (100 ship); Cleopatra's beauty of Egypt (1000 ships), Shi Su's beauty of China (10,000 ships all connected as no more sea sick but hazardous under the fire); Your own Sweet Heart (absolutely infinite ships whose significance can cost your "Scholar-ship" for Ph.D.

"As Young as you feel" is very subjective feeling, although there are biological ages. The young woman face of a first man-created robot in October 2017, Sophia, the robot became the first robot to receive citizenship. In November 2017, Sophia was named the United Nations Development Programmer's first ever Innovation Champion, and is the first non-human to be given any United Nations title. Sophia can smile and answer your question on TV show Young & Beautiful become sharper set that can represent by computer.



Tesla Mr. Elon Musk is clever He collects free road test data with thousands volunteer in CA circa 2019, where instead each driver pays him \$35K. This ad hoc approach takes advantage of the psychology that American is crazy about car, esp. own an Manned Autonomous Vehicle.

**High risk:** We recommend and simulate the ubiquitous dash-board sensor suite (possible realized aft. April 2020), UAT can measure and determine all 4 nearest neighborhood human drivers their emotion mood by means of the change facial expression (arbitrary initial conditions enters) as the input Load Time Parameters (LTP) say discretized Fuzzy Membership Function : daydreaming (0), idling(1), multi-tasking(2), hurry-up(3), stressful (4) or angry mood(5). Then based on facial vein pulsation fluctuation map (a)up, (b)down, (c) neutral, to represent the acceleration or not, in Einstein-type Brownian diffusion but in Matrix Langevin eqs of 3x3=9 entries.

$$M(t=0)=\begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix}; A(\text{road random acceleration})=\begin{bmatrix} \tilde{f}_1(t) \\ \tilde{f}_2(t) \\ \tilde{f}_3(t) \end{bmatrix}$$

UAT can determine what to do next, from follow behind to switch lane, pass-by, or stay away. Update rate can be instantly by 5G.

**High payoff:** Useful for AI 3<sup>rd</sup> Wave robot modeling in control, communication. We wish to capture the stress emotion of drivers

**Delivery:** Facial Image Processing for motion state computer codes for lab test, before freeway road test.

## Conclusion

**In Summary:** We have considered 4 general areas for possible proposal in the 3<sup>rd</sup> Wave AI area" Stable AI chair needs multiple tasks like a table having 4 legs to be stable.

**AI Transportation, e.g. UAT:**

**AI Deep Learning:** E.g. Facial ID: Caltech Doris Tsai, Sci. Am. 2019 unique Face ID by 206 neurons;

**AI Data Mining:** E.g. Drug Discovery: Marker for Cancer; cancer drug Merck keytruda for jimmy carter How about dementia?

**AI Pubic Health:** E.g. for Longevity can postpone the cost of the surge of aging WWII baby boomer Nobel Laureate Yamanaka gene,<sup>3</sup> and the other 5 more techniques.<sup>4-5</sup>

**Now we conclude DARPA 3<sup>rd</sup> Wave AI:** Can the 3<sup>rd</sup> Wave AI build UAT (Robots)? We have other than engineering challenges; a gap is how to understand the other human drivers on freeways: How to represent the change by probing & looking their faces? Theoretically we introduce the Fuzzy representation that may take 1 year to implement with 1 year lab test. We have an eye toward general robotic humanoids co-exist with human society with e-IQ.

## Acknowledgment

None.

## Conflict of interest

None.

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