

40 Years of Bioinformatics, Then & Next A personal History

By

Dr. Subramanian Subbiah

Wednesday 15th April 2026

Hair to Food at Tirupati



shutterstock.com · 1319365652

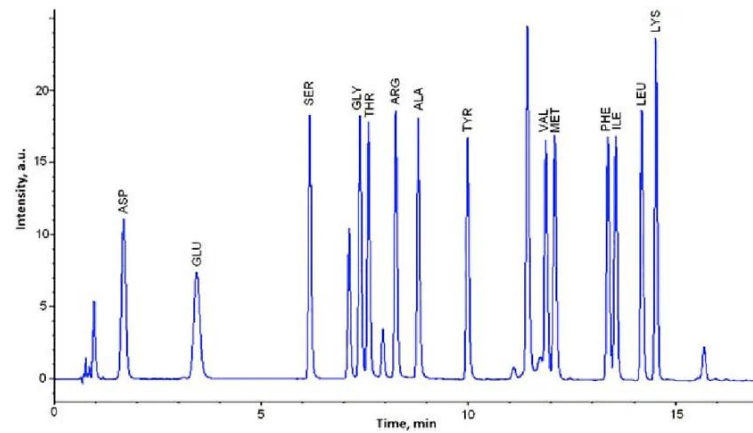


Figure 12: Protein sequencing of hair and food samples.

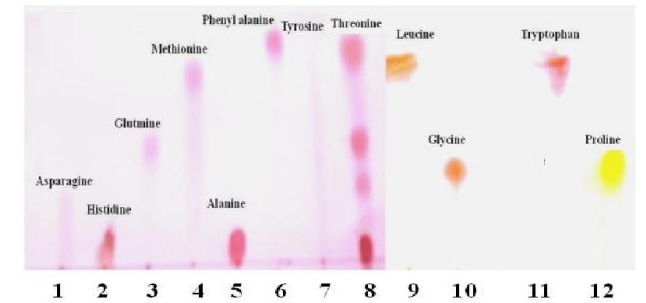


Figure 13: Thin layer chromatography of 11 amino acids.

Prof. Mohammad Abdus Salam

- **1979 Nobel Prize in Physics** for contributions to the theory of the unified weak and electromagnetic interaction between elementary particles
- Inaugural Chair of the Theoretical Physics Group, Imperial College
- PhD Student & Professor, St. John's College, University of Cambridge



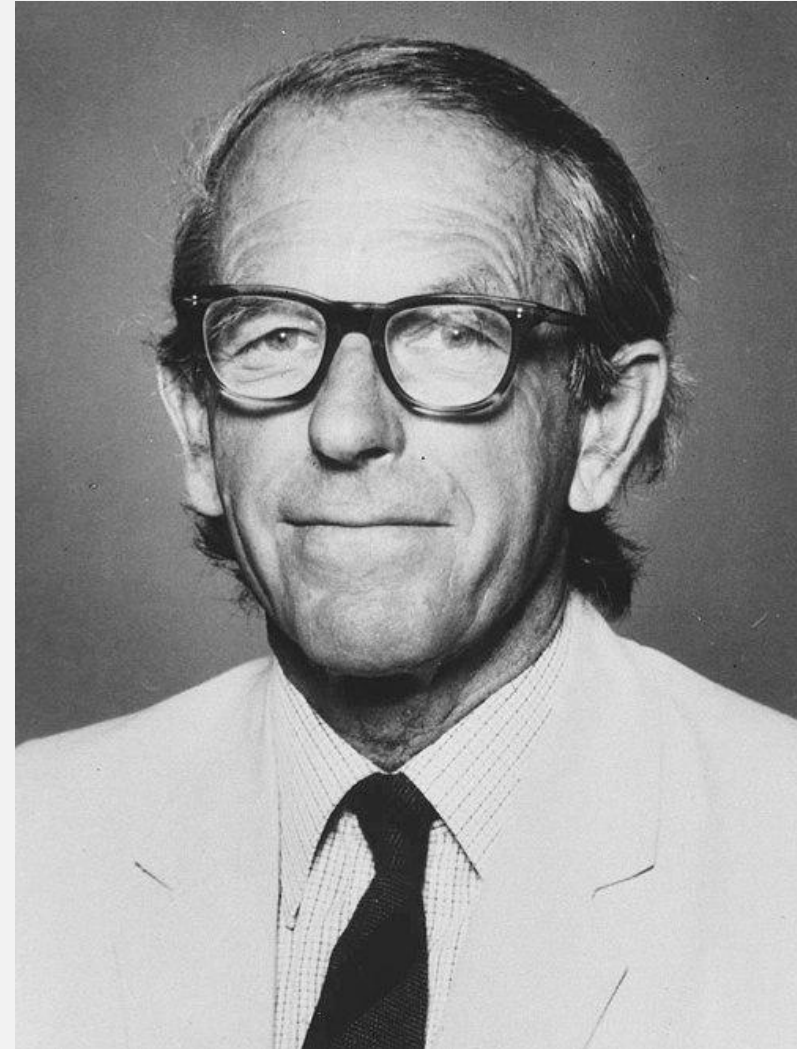
Prof. David Mervyn Blow

- **1987 Wolf Prize in Chemistry** for advancing X-ray crystallography
- PhD in 1958 for X-ray analysis of haemoglobin under the supervision of Max Perutz at the MRC LMB
- Professor, Blackett Laboratory, Imperial College, London



Prof. Frederick Sanger

- **1958 & 1980 Nobel Prizes in Chemistry** for amino acid sequences & their determination in protein structure and DNA sequencing, respectively.
- Professor, MRC LMB, University of Cambridge



Prof. Stephen Hawking (Quantum Gravity)



Prof. Walter Gilbert

- **1980 Nobel Prize in Chemistry** for developing DNA sequencing methods
- **Founder of Biogen**
- Professor, Biophysics Program, Harvard University



Tulla to Clustal – top 10 most (of 100M) cited works/algorithm in history



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Sh:
Co: Sheep
Hu: Cow
Mo: Human
Fr: Mouse
Fr: Frog

---MATERVEPTAEIGGATGTYYKADPKHGFTALKFTWYMOGAGGGLSISTVEV 57
---MATERVEPTAEIGGATGTYYKADPKHGFTALKFTWYMOGAGGGLSISTVEV 57
---MATERVEPTAEIGGATGTYYKADPKHGFTALKFTWYMOGAGGGLSISTVEV 57
---MATERVEPTAEIGGATGTYYKADPKHGFTALKFTWYMOGAGGGLSISTVEV 57
MEKDKSQVEPTAEIGGATGTYYKADLQSGFTALKFTWYQYQYME---NGLSISTVEV 57
[*****]

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Hu: Cow
Mo: Human
Fr: Mouse
Fr: Frog

ALLRLAEATEMVAEIMDVCAATARTETHTLVNENVDQGLRTYLDKAS99GLPVEVI 117
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ALLRLAEATEMVAEIMDVCAATARTETHTLVNENVDQGLRTYLDKAS99GLPVEVI 117
TLLRLAEATEMVAEIMDVCAATARTETHTLVNENVDQGLRTYLDKAS99GLPVEVI 117
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KELMQFLDGLDFLMANCTVMDLKNENILVTSQGTWKLADTGLARYSTQWALTFFVVT 177
KELMQFLDGLDFLMANCTVMDLKNENILVTSQGTWKLADTGLARYSTQWALTFFVVT 177
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[*****]

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LWYRASEVLLQSTYATFVDMSTVGCIFAEHTWAKLFCGNSHADQLGKIFDGLGSPEDD 237
LWYRASEVLLQSTYATFVDMSTVGCIFAEHTWAKLFCGNSHADQLGKIFDGLGSPEDD 237
LWYRASEVLLQSTYATFVDMSTVGCIFAEHTWAKLFCGNSHADQLGKIFDGLGSPEDD 237
LWYRASEVLLQSTYATFVDMSTVGCIFAEHTWAKLFCGNSHADQLGKIFDGLGSPEDD 237
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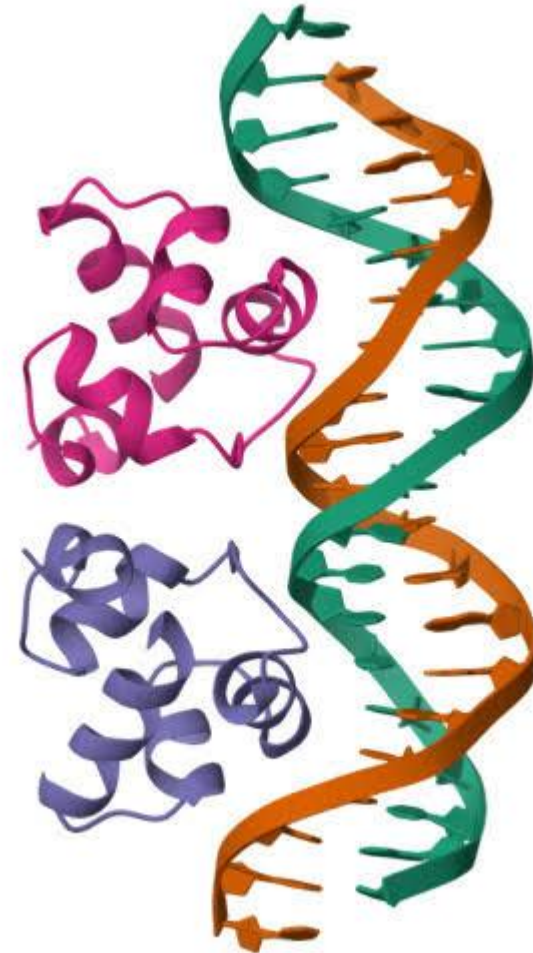
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WPRDVLSPGATSPGSPRPVQSTVVELEESGQQLLEMLTTF9HOKISATRALQMSYLNK 297
WPRDVLSPGATSPGSPRPVQSTVVELEESGQQLLEMLTTF9HOKISATRALQMSYLNK 297
WPRDVLSPGATSPGSPRPVQSTVVELEESGQQLLEMLTTF9HOKISATRALQMSYLNK 297
WPRDVLSPGATSPGSPRPVQSTVVELEESGQQLLEMLTTF9HOKISATRALQMSYLNK 297
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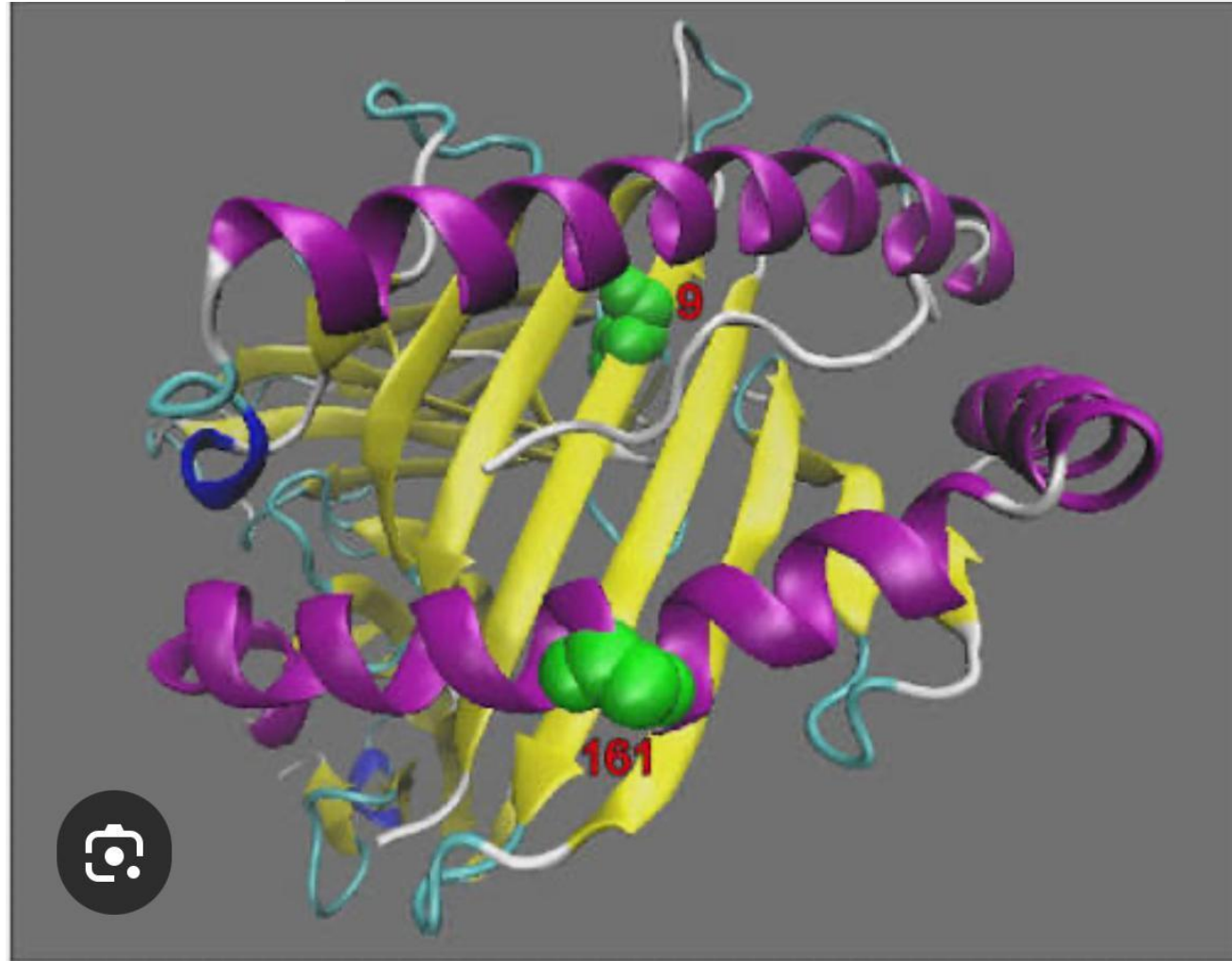
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Co: Sheep
Hu: Cow
Mo: Human
Fr: Mouse
Fr: Frog

AE---GDAE----- 303
AE---GDAE----- 303
AE---GDAE----- 303
AE---GDAE----- 303
AE---GDAE----- 303
DPQACENQEMTSTICTATDEVK 319
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First atomic resolution structure of Protein bound to DNA



HLA Structure – most cited paper of the 80s, lead to Nobel



Prof. Hopfield (Nobel for Modern AI Neural Networks)

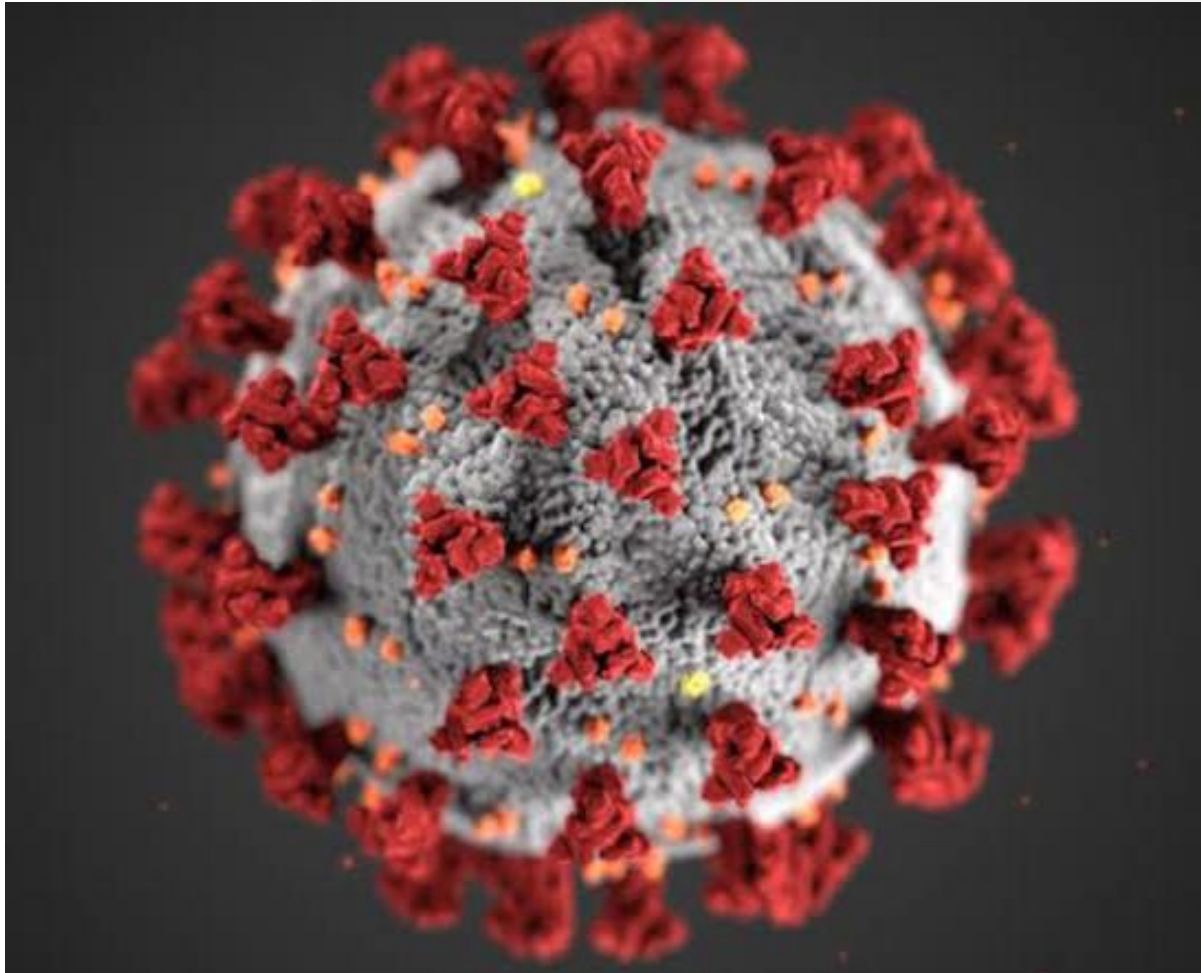


Prof. Martin Karplus (Molecular Dynamic Simulation)

- **2013 Nobel Prize in Chemistry** for developing molecular dynamic simulations to model complex chemical systems
- Professor, Biophysics Program, Harvard University



Coronavirus Stand-in for cousin COVID-19 structure – most famous molecule ever



Prof. Allan Cormack (Nobel CATSCAN math)



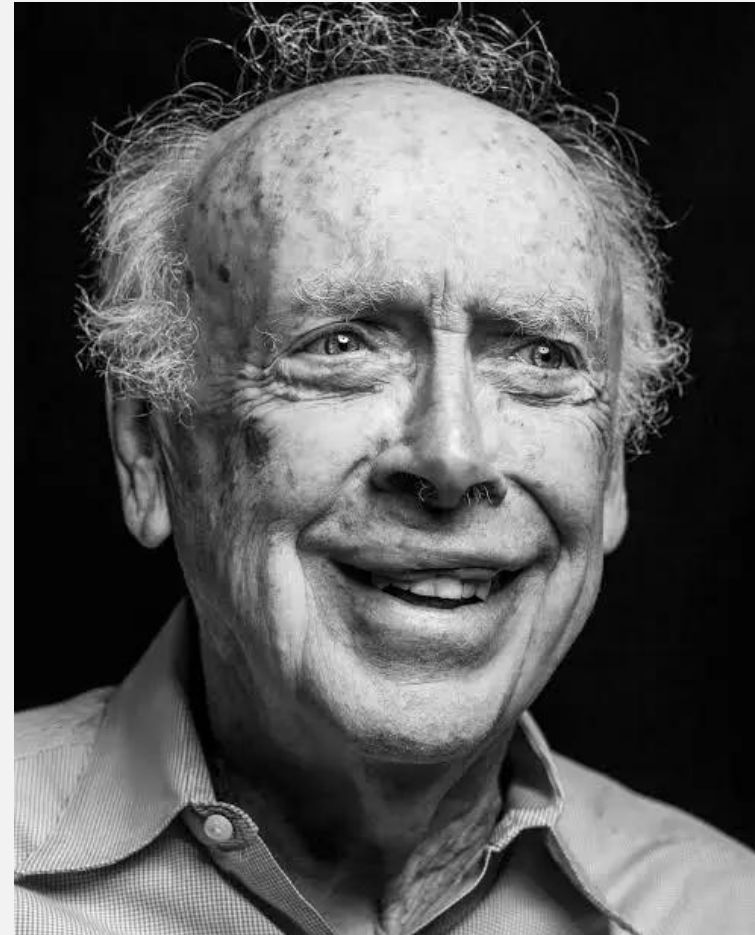
Prof. Eric Lander (Broad Inst, Human Genome Project)

- Lead efforts at the Human Genome Project; major contributor to Crispr Cas-9 gene editing development
- **Cabinet Science Advisor to Presidents Obama & Biden**
- Founding Director of the Broad Institute
- Professor of Biology at Harvard University & MIT



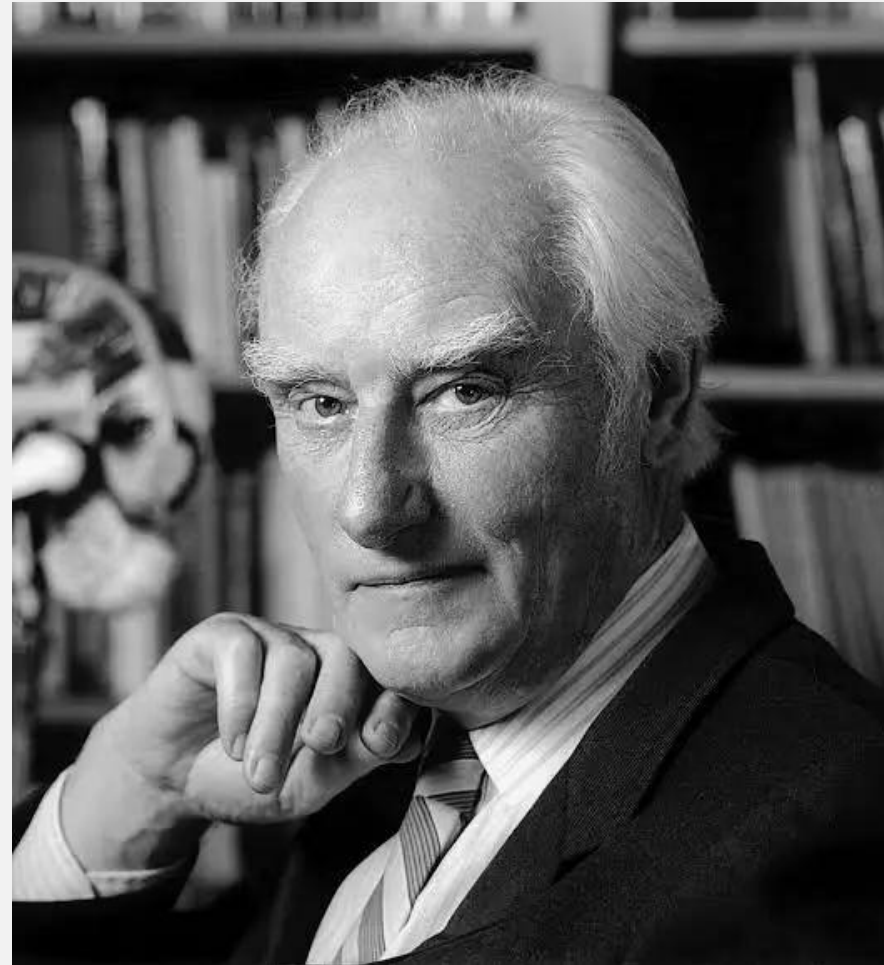
Prof. James Watson (Nobel Discovered Double Helical DNA)

- **1962 Nobel Prize in Medicine** for the discovery of DNA's double helical structure
- Director, Cold Spring Harbor Laboratory, New York



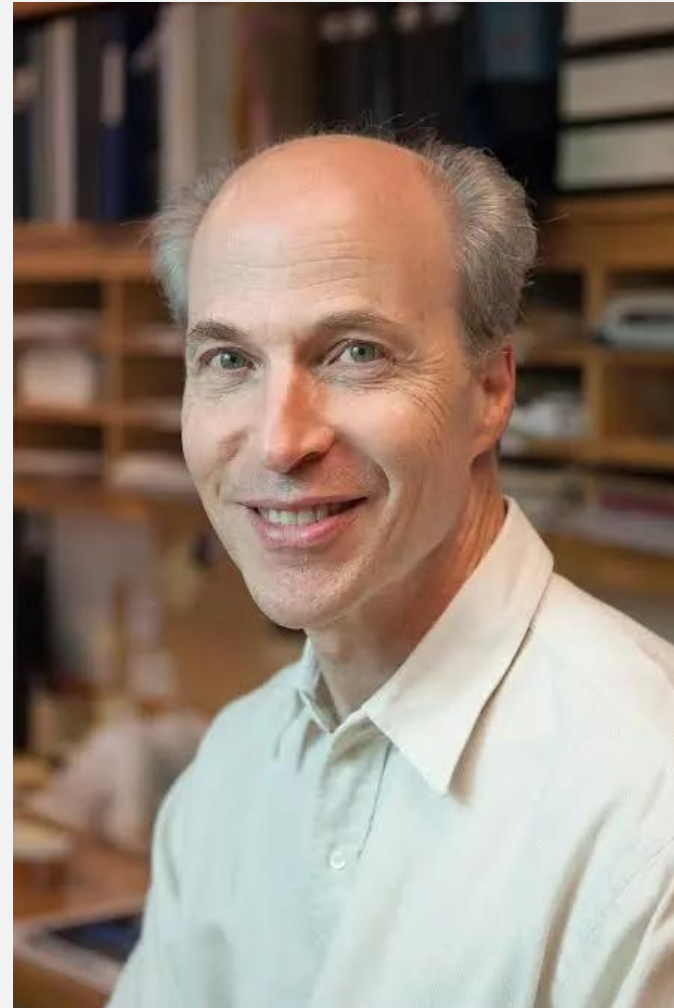
Prof. Francis Crick (Nobel discovered DNA Double Helix)

- **1962 Nobel Prize in Medicine** for the discovery of DNA's double helical structure
- Professor, Salk Institute for Biological Studies, La Jolla, California



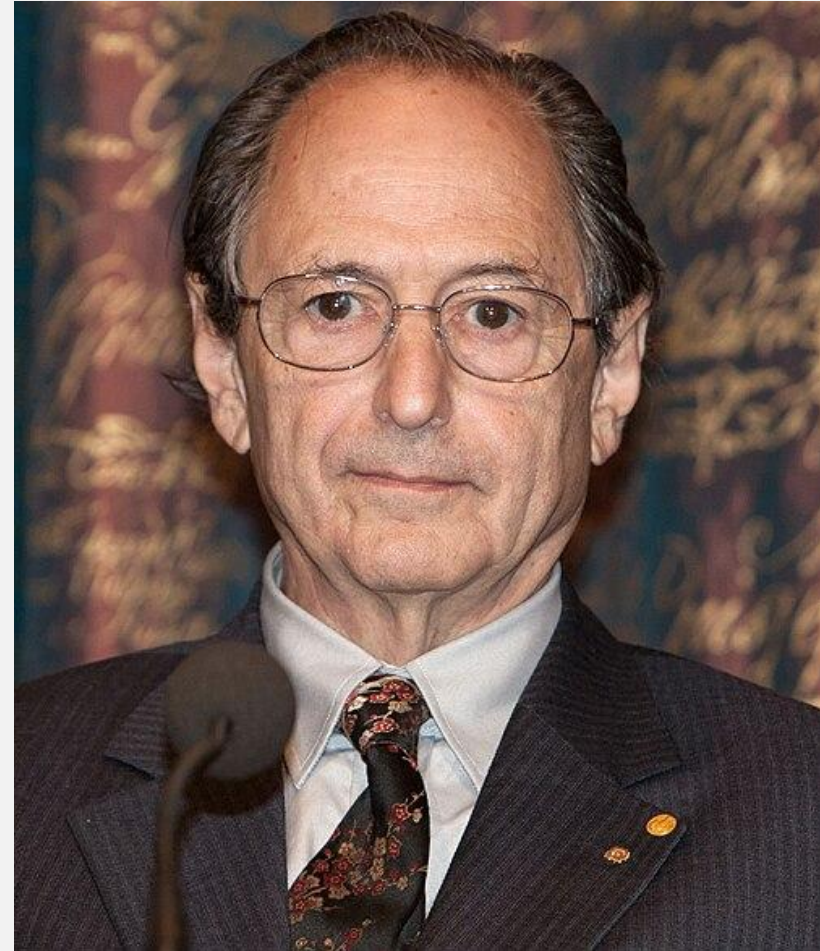
Prof. Roger Kornberg (Nobel Polymerase Structure)

- **2006 Nobel Prize in Chemistry** for the discovery of the molecular methodology of how DNA's transcription into RNA
- Father Arthur Kornberg received 1959 Nobel Prize in Medicine for the discovery of polymerase
- Professor of Structural Biology, Stanford University Medical School



Prof. Michael Levitt (Nobel Protein Folding)

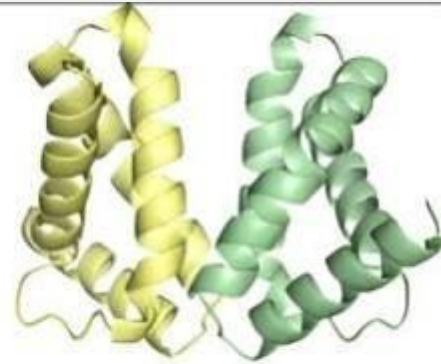
- **2013 Nobel Prize in Chemistry** for the development of structure prediction methods in protein folding
- Professor of Structural Biology, Stanford University Medical School



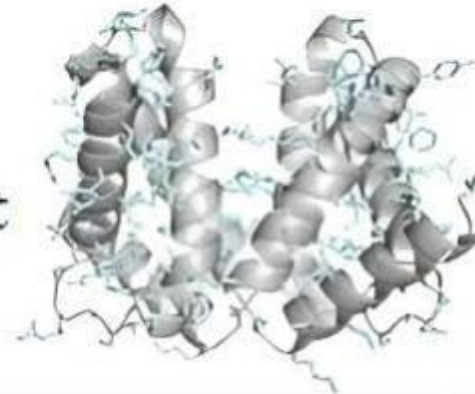
Side-Chain Packing – Seminal Advance (Stanford startup based on it)

**Backbone
&
Sequence**

: Z



Side-chain: X_t



Top 50 challenge math problem (Fourier Transform) solved in special case of Crystallography

Science



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 | **REPORT**       

Low-Resolution Real-Space Envelopes: An Approach to the Ab Initio Macromolecular Phase Problem

[S. SUBBIAH](#) [Authors Info & Affiliations](#)

SCIENCE • 5 Apr 1991 • Vol 252, Issue 5002 • pp. 128-133

DOI: [10.1126/science.2011749](https://doi.org/10.1126/science.2011749)

 19  23

Prof. Steve Chu (Nobel Discovered Double Helical DNA)



Prof. Joachim Frank (Nobel for Cryo Electron Microscopy)



Prof. Ada Yonath (Nobel for Ribosome Structure)



Prof. David Baker

- **2024 Nobel Prize in Chemistry** for work on computation protein design (alongside AlphaFold computer scientists).
- Professor of Biochemistry, University of Washington



3 Heroes in Indian Bioinformatics

Prof. Meena Sarkhahar

Prof. Kanguene Panderjasme

Prof. Shobha Ramanathan

- Did you know that one girl from Pune and two Tamils from India were pioneers of the Indian bioinformatics from 30 years ago?
- In fact, they were amongst the 1st 30 modern bioinformatics PhDs globally!!
- But unfortunately, India itself has still remained behind and only stirring now even with Kangs maniacal devotion for 3 decades to make it happen.

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pp. 20-23

Article

The S-star trial bioinformatics course: An on-line learning success*

Yun Ping Lim, Jan-Olov Höög, Phyllis Gardner, Shoba Ranganathan,
Siv Andersson, Subramanian Subbiah, Tin Wee Tan, Winston Hide,
Anthony S. Weiss

First published: 03 November 2006

<https://doi.org/10.1002/bmb.2003.494031010160>

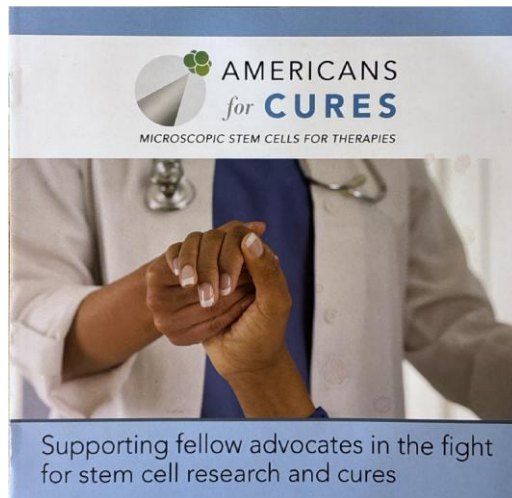
Digital Object Identifier (DOI)

VIEW METRICS

Why I left in the late 90s

- In 15 years 100 top specialist journal papers, mostly single or two author, over 35 patents and 2 single author papers in Science I decided to quit bioinformatics.
- Why ?
- Too much data from chips, no synthesis.
- Back then, I said I would return 20 to 30 years later when far more pairwise expression data (quadrillion quadrillion) between genes than the maximum human gene interaction of 20000 x 20000 exists.
- Armchair thinking should **unravel the final gene interaction network with the massive overfit.**

Americans for Cures – Microscopic Stem Cells for Therapies



“We’re almost at the point where we’re going to be doing something with those cells to cure a disease. **Not treat a disease – cure a disease.** I’ve never heard of anything that could go from discovery to treatment in that time scale.”

Chad Cowan
Center for Regenerative Medicine, Massachusetts General Hospital
Department of Stem Cell and Regenerative Biology, Harvard University

Americans for Cures Scientific Advisory Board	Patient Advocate Ambassadors
Aileen Anderson, Ph.D. University of California, Irvine	Brooklyn Hamilton Type 1 Diabetes
Maria Gracia Roncarolo, MD Stanford University	Manny Hernandez Type 1 Diabetes
Gay Crooks, M.B.B.S. University of California, Los Angeles	Katie Jackson Huntington's Disease
Rusty Gage, Ph.D. The Salk Institute for Biological Studies	Fred Leisker Heart Disease
Larry Goldstein, Ph.D. University of California, San Diego	Loring Leach HIV/AIDS
Carlotta Jamison, MD, Ph.D. University of California, San Diego	Don Reed Spinal Cord Injury
Brian Kennedy, Ph.D. Buck Institute for Research on Aging	Roman Reed Spinal Cord Injury
Donald Kohn, MD University of California, Los Angeles	Judy Robinson Huntington's Disease
Arnold Kriegstein, MD, Ph.D. University of California, San Francisco	Subbiah Subramanian Heart Disease
Andy McMahon, Ph.D. University of Southern California	Frances Sakkina Huntington's Disease
Phil Pizzo, MD Stanford University	Adrienne Shapiro Sickle Cell Disease
David Schaffer, Ph.D. University of California, Berkeley	John Ball Parkinson's Disease
Judith Shizuru, MD, Ph.D. Stanford University	
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Ivy Weissman, MD Stanford University	Don Reed
Owen Witte, MD University of California, Los Angeles	Steven Swig
Samuel C. Greer, MD, Ph.D. Stanford University	Mary Swig
Kelly A. Fryer, Ph.D. University of California, San Diego	

Who We Represent

In 2004, 59% of California voters—more than 7 million people—passed **Proposition 71, the California Stem Cell Research and Cures Initiative**. Prop 71 authorized the investment of \$3 billion into stem cell research across California through the creation of the **California Institute for Regenerative Medicine (CIRM)**. CIRM is the State's public agency that funds stem cell research and therapy development, following strict financial oversight and ethical controls, including the prohibition of human reproductive cloning.

Americans for Cures Foundation is a nonpartisan, 501(c)(3) organization whose mission is to advocate on behalf of the 100 million Americans who suffer from chronic disease and injury who can benefit from stem cell research.

Today, for the first time in history, stem cell research offers real hope to those whose suffering has been called incurable. Better treatments and cures from stem cell research will **improve the lives of patients** from within California, across the nation and around with the world. These potential treatments are in **human trials**; these trials will bring victories, defeats, setbacks and, finally, hopefully, FDA-approved therapies that are widely available.

Milestones of Progress

Stem cells are microscopic cells that scientists believe can be used to develop therapies for patients afflicted by **more than chronic 70 diseases** and conditions like cancer, diabetes, heart failure, HIV/AIDS, and spinal cord injury. In just the short amount of time since Prop 71, **stem cell research is already changing medicine**:

1. CIRM funding has led to **29 FDA-approved human clinical trials** with therapies going into patients, including trials that allow kids with diabetes to regulate insulin without daily shots and allow elderly people suffering from blindness to regain sight.
2. Stem cell research **breakthroughs** have enabled scientists to better understand why our bodies get sick with various diseases in the first place.
3. CIRM funds **research for rare, fatal diseases**, like ALS, that affect a small population but can provide clues to therapies for many more diseases, such as Alzheimer's and Parkinson's.

Report Back to the Public

AMERICANS for CURES REPORT BACK TO THE PUBLIC

We are leading a **Report Back to the Public** program to provide substantive scientific updates on the progress being made **across the disease spectrum** to the patient advocate community. Public awareness and engagement is essential to increasing support for elected officials and opinion leaders to fund this critical research. We want to share these Milestones of Progress with you and your communities and here's how you can get involved:

- Become a trained **Stem Cell Ambassador**, with public speaking opportunities at events, conferences, and with the media
- **Convene a group of advocates or attend a meeting** in your area to learn more about these Milestones of Progress
- **Volunteer** to help us at an event
- **Spread the word** online by sharing our content on social media:
[@americans4cures](https://twitter.com/americans4cures) [/americans4cures](https://www.facebook.com/americans4cures)

For more information, go to www.americansforcures.org and sign up—we'll be sharing the latest news on stem cell research and releasing new content every week as our Report Back to the Public continues!

Subbiah was just 51 years old when he suffered a massive heart attack—what cardiologists call a “widow-maker”—while driving his twin 10 year old sons to their sailing competition.

“What I had was called the widow maker.”

“I had a perfect heart, perfect whole body CT scan. Everything was perfect except for the fact this thing had happened. What I had was called the widow maker. That's the term that is used, I found out. And I told my wife about it. I'm 51 and it happened to me.”

Subbiah enrolled in an FDA approved human clinical trial and was treated 30 days after his heart attack, after having no sign of a natural recovery.

One month after his treatment, Subbiah experienced a 90% recovery; in another month, his condition improved to 95% recovery; six months later, an MRI showed stronger pumping capacity that he probably had before the attack, and showed no scars or other remaining evidence of a heart attack.

Subbiah is one of hundreds of patients that are receiving treatments, thanks to funds approved by Prop 71. It is important to note, however, that not all patients will have Subbiah's dramatic results, and not all will be successful.

18 companies co-founded or funded, 10 countries, 3 listed (Nasdaq, UK AIM, Kosdaq), raised hundreds of Millions of dollars in VC funding

Successful serial entrepreneur with startups since 1991 in bioinformatics, pest control, ship repair, residential development, rental landlord, fintech payments, travel e-commerce, multilingual internet, cyberfraud, cybersecurity, ai data privacy, event ticketing, HIV vaccines, portable EEG, wastewater recycling, novel cryptocurrency, money transfer exchange, mobile heart attack risk screening, AI voicebots, webmail, isp etc.

Internationalized Domain Names (IDN) – Trillions in GDP

Internationalized domain names (IDN)

Arabic: موقع.وزارة الاتصالات

Chinese: 阿里巴巴.中国

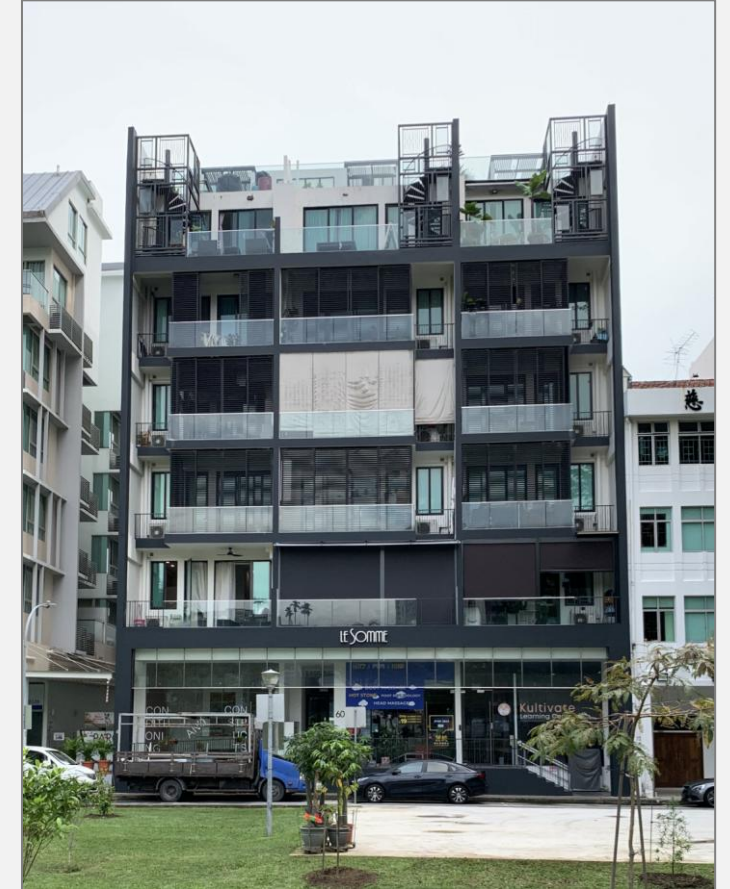
Russian: сайт.рф

Tamil: இந்தியா.தமிழ்

Via Unicode acceptance brought 7 billion non-English speakers of 6000 native languages truly online

Residences@Somme and Le Somme

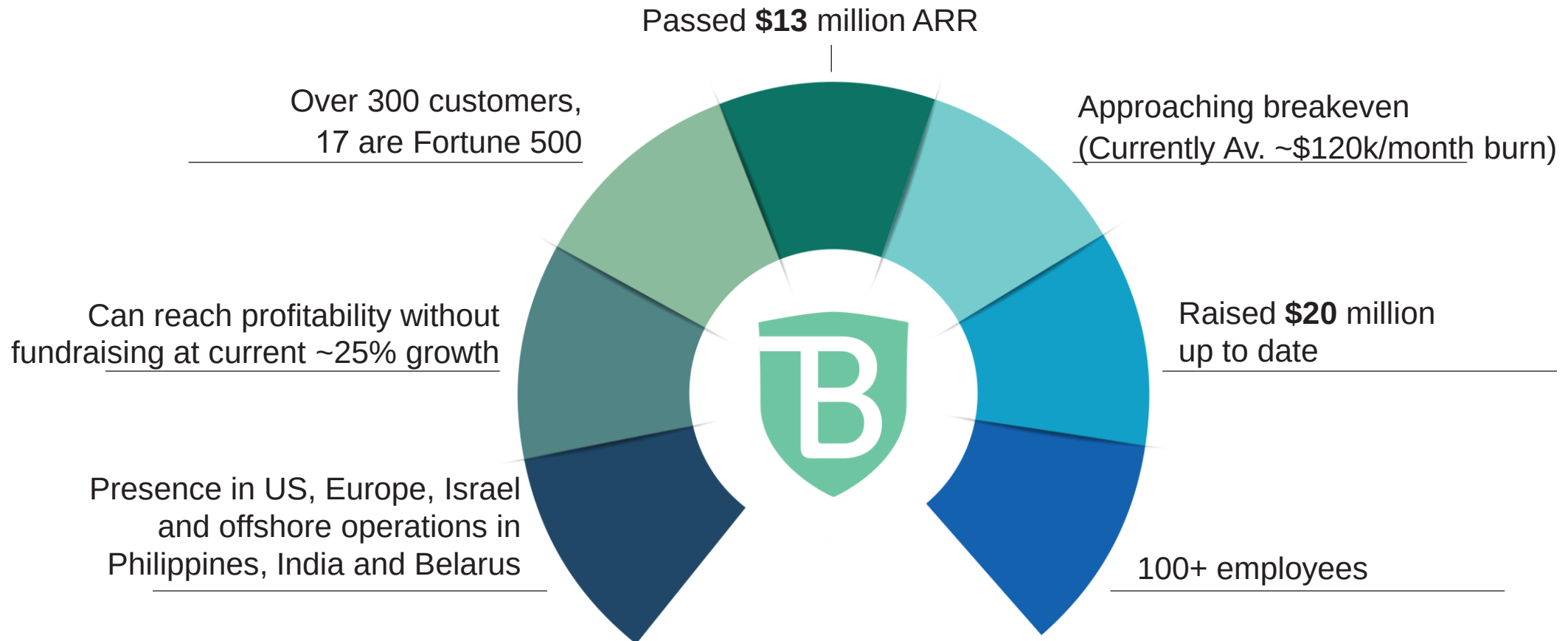
- **60 condos, 6 shops** in downtown Singapore
- **2x \$25M USD project**, I designed (nominated for design award) had built and sold



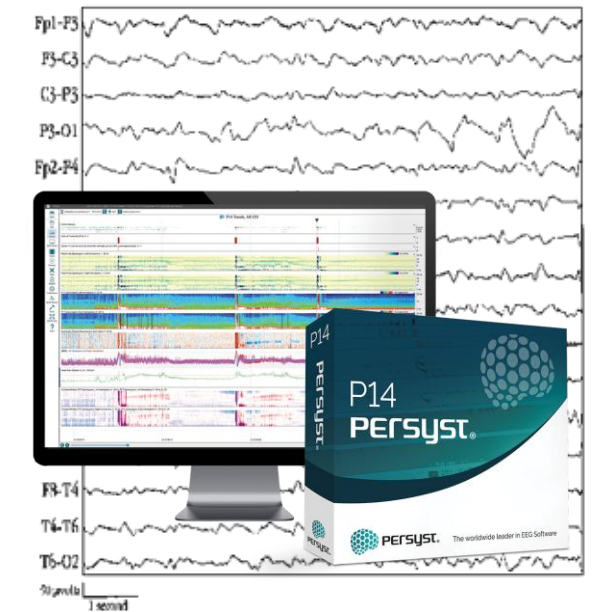
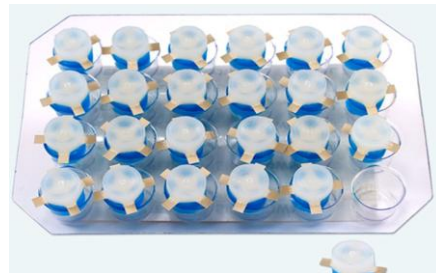
High-tech ventures & startups since then



BrandShield Overview



Bio-Signal Group Corp -EEG



Kadalneer – Ship Ballast Water Treatment (35000 big ships)



Now I am back 30 yrs later...

- **Over 30 years and a quadrillion data points later,**
- And the armchair thinking made unexpectedly much easier by the AI tools of today,

Why are we still stuck ?

=> Because no one will share the private quadrillion expression data lending kept, let alone more being thrown away daily.

Solving Data Privacy

Powered by

FHEnom

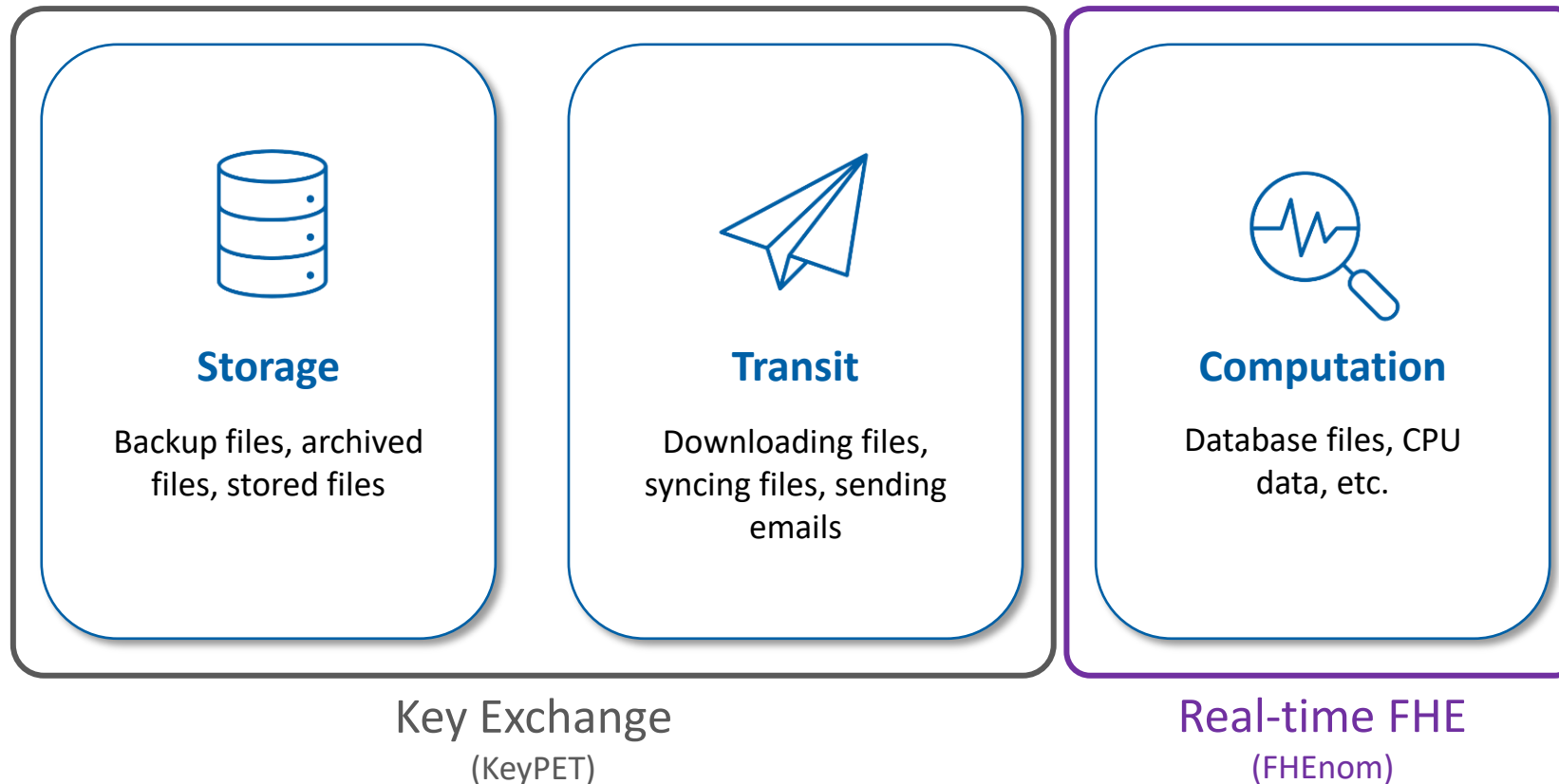
- FHEnomSDK/Cloud – Real-time FHE for Cloud
- FHEnomAI – Real-time FHE for AI
- KeyPET – Key Exchange with a new powerful twist
(appendix)



Problem | For maximum data protection, data needs to be encrypted across all three states



The Three States of Data – At Rest, In Motion, and In Use

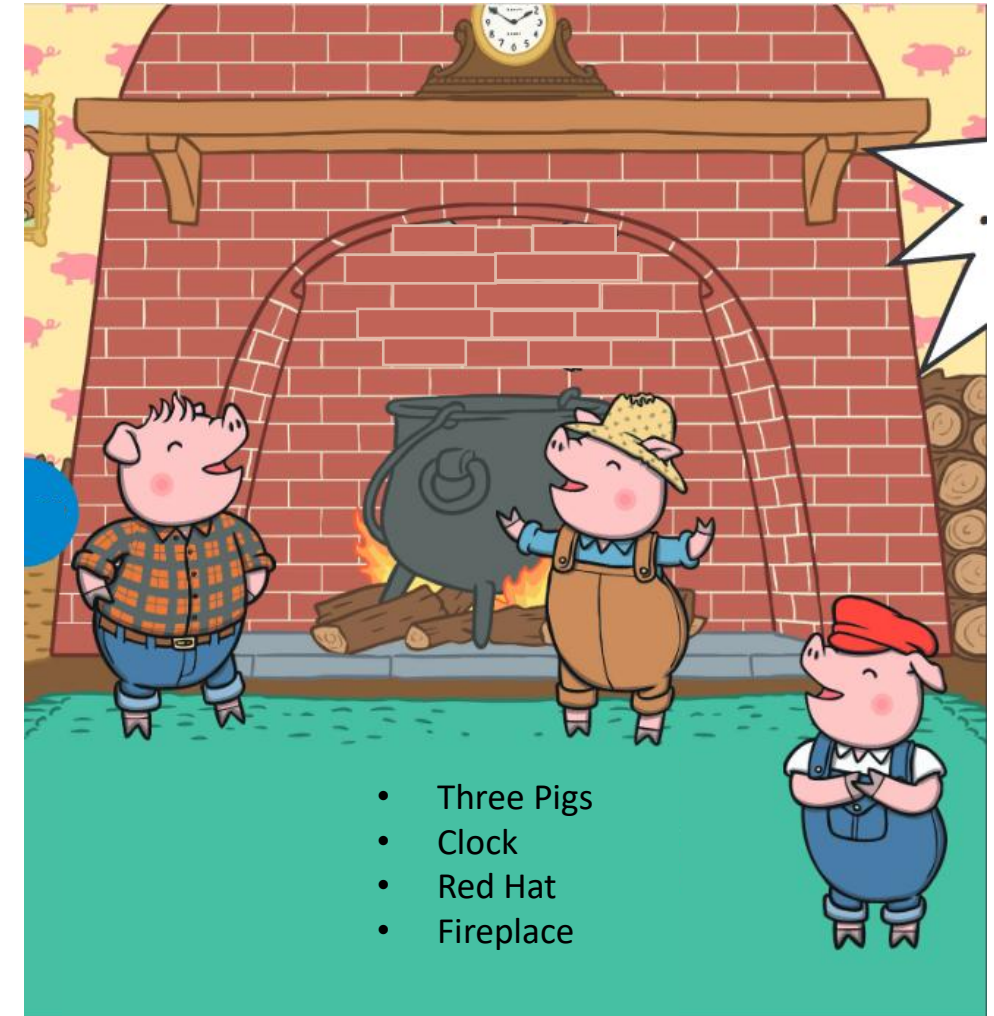


While encryption solutions exist for data in storage and in transit, **none exist to secure data undergoing computations.**

Solution Analogy | What if general queries on encrypted data can be made without decryption?



Source: Twinkl, n.d.



Solution Analogy | Fully Homomorphic Encryption (FHE) allows for general querying without decrypting the data!



Are there little pigs inside?



What color is your hat?



Are your parents with you?



Is there a fireplace for making soup?

Yes, 3.



Red!



No.



Oink! Oink!



Solution | Our Smart Wolf Preserves Sort Order via



Example unencrypted, raw data

Position	Sort Order by Name	Name	Age
#1	1	Alexander	43
#2	2	John	38
#3	3	Michael	21
#4	4	Ulysses	70



Position	Sort Order by Name	Name - Standard Encryption	Age – Standard Encryption
#1	4	X12!4	J4C
#2	2	F9BC7	6KU
#3	3	PQ&8I	IO4
#4	1	AY?5T	8LZ

Sort order is not preserved

Position	Sort Order by Name	Name - FHE Encryption	Age – FHE Encryption
#1	1	BZX90	KQ9
#2	2	J!TMV	S3R
#3	3	M6RBL	JL3
#4	4	ZQML2	7GV

Sort order is preserved

Traditional encryption scrambles data and thus sort order. FHE preserves sort order despite encryption.

Since 1978, everyone, from the IEEE to nascent competitors, has repeated the same mantra...

FHE is the Holy Grail of cryptography....and therefore, complete data security

The Rise of Fully Homomorphic Encryption: Often called the Holy Grail of cryptography, commercial FHE is near.



... FHE is an advanced cryptographic technique, widely considered the “holy grail of encryption,” ...



“It’s the only type of encryption that gives you those two properties, which is why it’s often considered to be the Holy Grail of cryptography,” said Ellison Anne Williams ...



Source: Homomorphic Encryption (2020); Enveil Press Release

The Mathematics Behind FHE

A Fully Homomorphic Encryption Scheme

“ Page 112:

$$\gamma_{\text{subsetsize}}(n) \cdot \log^{c_1} \gamma_{\text{subsetsize}}(n) \leq \left(\frac{\log(r_{\text{Dec}}/m)}{2^{c_2} \cdot \log(\gamma_{\text{Mult}}(R) \cdot r_{\text{Enc}})} \right)$$

...

“ Page 157

$$\begin{aligned} \pi \| \mathbf{x} \| (2 \| \mathbf{u} \| + \| \mathbf{x} \|) / \sigma^2 &\leq \pi \cdot \sigma^{-2} \cdot \left(\frac{2 \gamma_{\text{Mult}}(R) \cdot \| \mathbf{u} \|^3}{1 - \gamma_{\text{Mult}}(R) \cdot \| \mathbf{u} \|} + \frac{\gamma_{\text{Mult}}(R)^2 \cdot \| \mathbf{u} \|^4}{(1 - \gamma_{\text{Mult}}(R) \cdot \| \mathbf{u} \|^2)^2} \right) \\ &\leq \pi \cdot \sigma^{-2} \cdot \left(4 \gamma_{\text{Mult}}(R) \cdot \| \mathbf{u} \|^3 + 4 \gamma_{\text{Mult}}(R)^2 \cdot \| \mathbf{u} \|^4 \right) \\ &\leq 4 \beta \cdot \pi + 4 \beta \cdot \pi \cdot \gamma_{\text{Mult}}(R) \cdot \| \mathbf{u} \| \\ &\leq 6 \beta \cdot \pi \end{aligned}$$

Fully Homomorphic Encryption Without Bootstrapping

“ Page 24

$$\begin{aligned} \| e_{q_1} \| &\leq \alpha(d) \cdot \gamma_R^2 \cdot (\| q_1 \| / \| q_2 \|) \cdot \left(r_{q_2, \text{in}} / \alpha(d)^2 - (\| q_2 \| / \| q_1 \|) \gamma_R \cdot 2 r_{\mathbf{B}_I, \text{out}} \cdot \ell_1^{(R)}(s) \right) / (\alpha(d) \cdot \gamma_R^2) \\ &\quad + \gamma_R \cdot 2 r_{\mathbf{B}_I, \text{out}} \cdot \ell_1^{(R)}(s) \\ &\leq (\| q_1 \| / \| q_2 \|) \cdot \left(r_{q_2, \text{in}} / \alpha(d)^2 - (\| q_2 \| / \| q_1 \|) \gamma_R \cdot 2 r_{\mathbf{B}_I, \text{out}} \cdot \ell_1^{(R)}(s) \right) + \gamma_R \cdot 2 r_{\mathbf{B}_I, \text{out}} \cdot \ell_1^{(R)}(s) \\ &\leq \left(r_{q_1, \text{in}} - \gamma_R \cdot 2 r_{\mathbf{B}_I, \text{out}} \cdot \ell_1^{(R)}(s) \right) + \gamma_R \cdot 2 r_{\mathbf{B}_I, \text{out}} \cdot \ell_1^{(R)}(s) \\ &= r_{q_1, \text{in}} \end{aligned}$$

...

Protecting the Core of AI

Continuous Encryption for AI Models and Data

AI Security does not protect data-in-use or data-in-model

Today, AI Security startups only offer 'castle-and-moat' network security and guardrails to provide trust, governance, and compliance, not data protection.

Data Leakage by AI is inevitable:

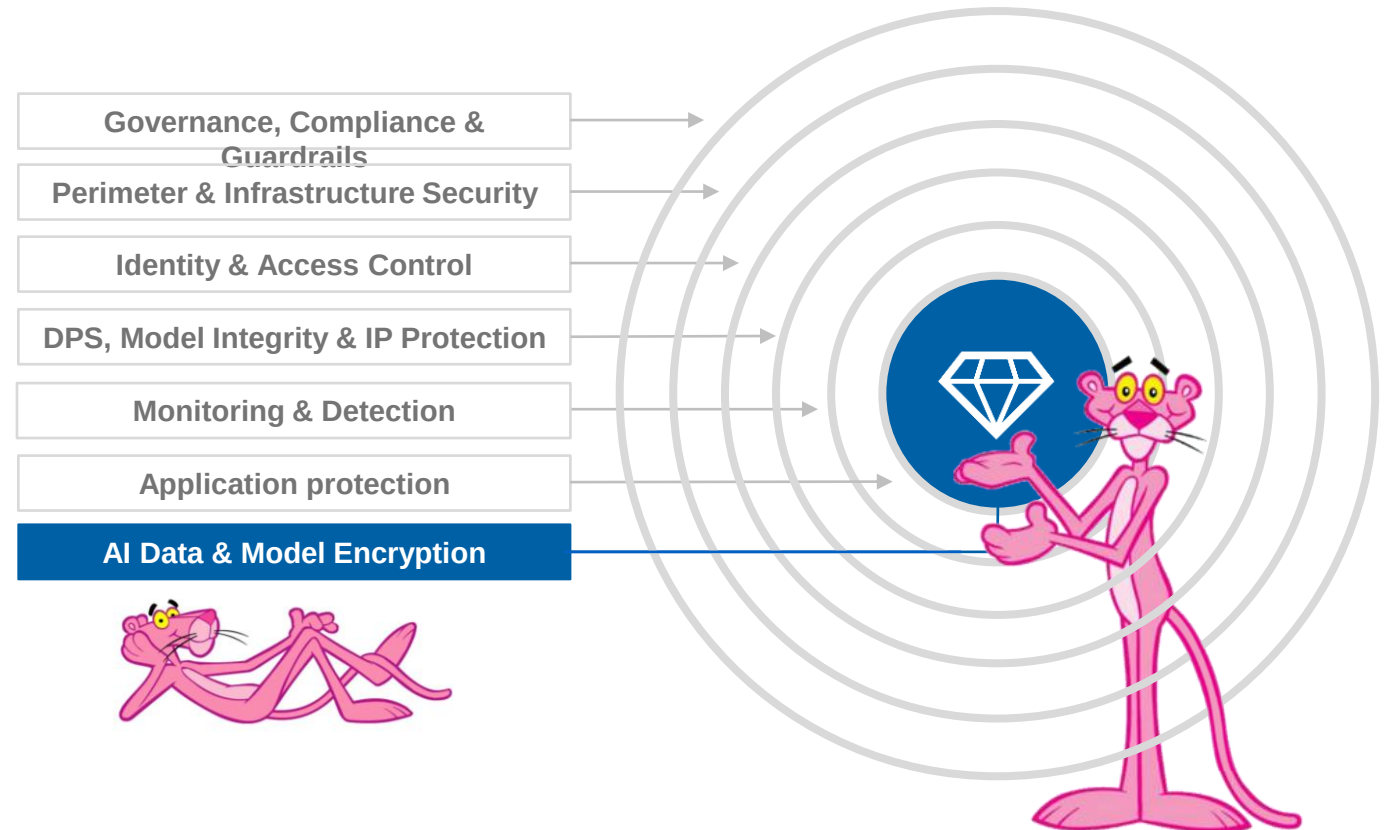
All AI data & models remain unencrypted and vulnerable!

Data exposure, mishandling and breaches are on the rise with rapid adoption of AI.

The emergence of Agentic AI will exacerbate the problem.

Its (1) insatiable demand for data, (2) compression of data, and (3) convenience for exchanging data with users & 3rd parties makes data leakage a matter of if, not when.

Continuous, end-to-end encryption of (1) data, (2) AI models and (3) queries is urgently needed.

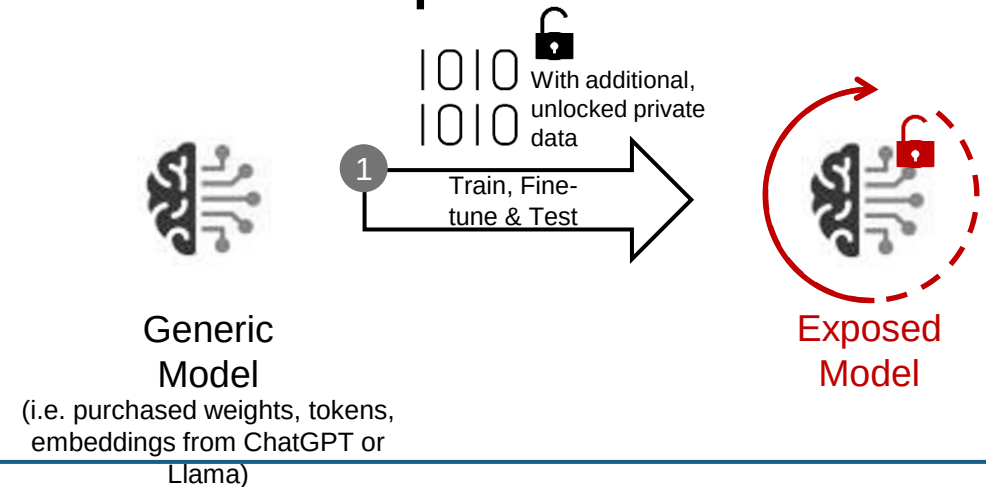


DataKrypto's FHEnomAI: Continuous, End-to-End Encryption

Steps

- 1 Train, fine-tune, test and deploy a generic, 3rd party AI model with **unencrypted, proprietary data**.
- ✗ The **training dataset is exposed** to 3rd party trainer/fine-tuner.
- ✗ **Prompts & inferences exposed** to model, infrastructure provider and 3rd party support.
- ✗ If model is stolen, **all training data & parameters can be derived, recreated & compromised**.

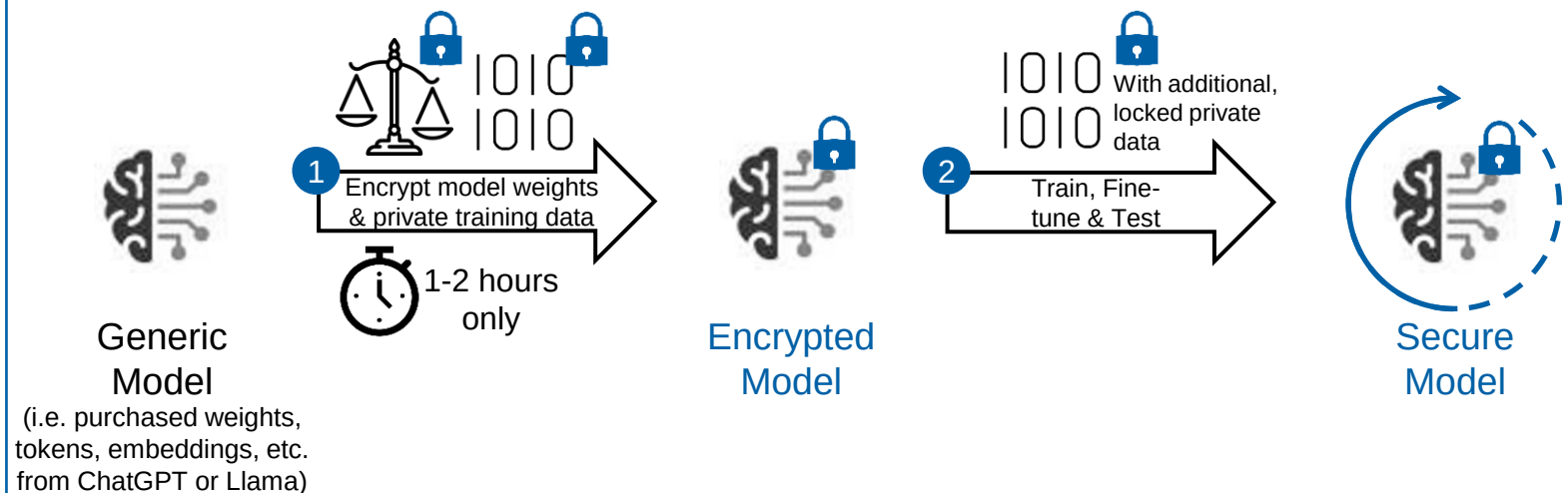
Current, unprotected AI model development



Steps

- 1 Prior to training the generic, 3rd party AI model, **encrypt its weights and the proprietary training data in <2 hours** with FHEnomAI.
- 2 Train, fine-tune, test & deploy the model normally with FHEnom-encrypted data.
- ✓ The **training dataset remains encryption-protected** from LLM owners, 3rd party trainers/fine-tuners and guardrail providers.
- ✓ **End-to-end encryption of data-in-use** from prompt to inference **prevents any data leakage**.
- ✓ The trained model is only compatible with your specific FHEnom-encrypted data. Even if stolen, its **encryption renders it useless to**

Encrypted FHEnomAI model development



FHEnomAI Guarantees Privacy-centric AI



FHEnomAI prevents common AI and data privacy risks:



Training Data Privacy 	✓ Guaranteed by encryption of both training data & model parameters. ❖ Theft of training data is impossible without <u>both</u> user & model keys.
Prompt / Inference Exposure 	✓ End-to-end encryption of query, response & processing ensures query & response are never in clear. ❖ Query & response encryption by user key unique to each individual end user prevents exposure to both unauthorized, internal & external viewers (e.g. insider attacks, etc.). ❖ 2nd layer of encryption by model key (within TEE) provides extra prevention against exposure risk from (3rd party) GPU environment, enabling secure 'hybrid' and 'off-prem'/cloud AI workloads.
Model IP Theft 	✓ Model encryption with model key (secured within TEE) prevents raw model access. ❖ Model theft impossible without TEE entry. ❖ Model theft useless without model key to decrypt encrypted parameters (incl. for Guardrail model(s) as well).
Unauthorized Model / Data Poisoning 	✓ Unauthorized data poisoning impossible without User Key & TEE entry. ❖ Without both, unencrypted, external training data is incompatible with model encryption & registers as noise.
Unauthorized Prompt Injection 	✓ Unauthorized prompt injection impossible without User Key & TEE entry. ❖ Without both keys: => Unencrypted, external input registers as noise by model parameters that were trained by encrypted, not clear, data. => Encrypted output generated remains indecipherable to hacker.
Side-Channel Attacks (SCA) 	✓ TEE + FHE dual isolation prevents pattern recognition needed for SCA.

Early Customers & Pilots Cont'd – Tech & AI Part 1



Partners	Customer & Product Description (redacted)
	
	
	
	
	
	
	
	

2-
தொழில்

[illegible]

பளித்திடும் பகலவன் என்ஊர் பரம்பி ஆகின
திண்ணை காலக்கைய பின்னாடி வானம் எளிமையாகிநீ
தெனியவாகப் புலன்கிறார். தருதவரும் அய்யத்தென
கிளைகைய பதயாணினை உணவுப்படுத்தத்தைப் போக்க
கொடுவாய் வளத்தைப் பதனையைப் பாய்ந்தினல் களந்
திருவீர வயற்குமுடியும். துன்புடைய இடியும். அடங்கு
கூடும் தருந்நன் தெய்வோமென்று வரலாம் உணர்
புடியும். பகுதம் பன் ஊன்கொள்கும் பிம்போடு உவ
ருகிறார். தும் உணக்கி மறுந்து உறவுகி வாப
தன் வயற்கை தம் வாழ்வோடு ஆகினந்த வந்தி
களிப்போடு தம் வாய்ப்புடன் விழ்க்கொடுவ தம்
காலத்தைக் கழித்து வாட்களன்.

தேரம்பலணி நம்போடு அலைமயாக விரையாட
வந்தது அது. நாம் நாயுண்டம் கீதாதி நன்றினை
பாடும் வந்த அநாயாது மீண்டுநேரம் விண்ணம் பாயு
காண மல் நின்றது. விட்டதால் பதிஞ்சுமை
குறைக்க நினைத்து பாவஞ்சுமையை அதிகமாகக்
காட்டின.

அக்காசு அடுக்கு வறள்கியில் வந்துசெத்ததற்கும் முனையின் பேரதிக் கொண்டிருந்தோம். ஆய்ந்து எடுந்வு வது தெய்ய கியளமல் ஆனல் நமமினையல் எடுவல் நெல் வறள்கியை நெயல் வறியாகக் கரடி வரட்டி

தேய்ந்த கிடப்பவன் தமிழன் அன்னை. 2௫௩
கிரைவாகுகள் அனுமையாகவுள்ளதாவது மட்ட
யும் தரப்படு கிடப்பவன் தேய்ந்ததில்
பாறத்தெய்தி அன்னை 4௫௩வது கிரைவாகுகள்
அன்னை தேய்ந்ததில் அன்னை 4௫௩வது கிரைவாகுகள்
யும் கிடப்பவன் தேய்ந்ததில் அன்னை 4௫௩வது கிரைவாகுகள்
யாகுகள் கிடப்பவன் தேய்ந்ததில் அன்னை 4௫௩வது கிரைவாகுகள்

(2)

அன்று ஆண்டுதொடக்கத்தில் எண்ணிக்கையாக அமைந்திருந்தது என்பது
கிடைக்கக்கூடிய மூலக்கூறுகள் 4×10^6 என்பதற்கு மேல் அமைந்திருந்தது.

[illegible]

கிறதும் புதிய ஆராய்ச்சியை கூட்டு முயற்சியே இன்
 நது செய்வதில் வருகிறும் திரு. அப்பையா சிப்பிரமணி
 யம் அவரும் அவருடன் துணையாக தினேக்களா ரு
 னுடனும் மேலும் கிறதும் புதிய ஆராய்ச்சியை கிறுப்க
 ஆய்வு செய்து வருகிறும்.

தனது தாயைப்போட்டு தடுத்த தனது சேவையியன் மொடூட் கனின் கைவலையோடு கைநிழை சரணாகித் தண்ணாக்கத் தயாராகித் தள்ளினார். கிறிஸ்தின் வலம் கிதல் அழிவதற்குப் பற்றும் இரண்டு நாளைக்குள் இரண்டு கிறித்தவ மூலமயிற் றின் கொள்ளா வேண்டுகோள் கிதல்களால் தீயாய் பரிவாயானது. திண்ணையின் மீது சரணாகித் தண்ணாக்கித் தள்ளினார். கிறிஸ்தின் கைவலையோடு கைநிழை சரணாகித் தண்ணாக்கத் தயாராகித் தள்ளினார்.

திருவள்ளூர் கிராமத்திலிருந்து வந்தவர்கள் கூட்டு முயற்சி ஆய்வுகள் அளித்து 50-ம் வயதில் பரிசுதவையாகக் கியூன்ஸ்தி. மேலும் கிராமத்தை ஆய்வு மாவட்டம் பணம் பட்டம் வணிகம் ஆரம்பத்தியை ஆய்வு வணிகம் வணிகம் பட்டம் கிராமத்தை உலகம் கொடுத்திருக்கிறார்கள். வயதில் 30-ம் வயதில் ஆரம்பத்தியை அளித்து கிராமம் பட்டத்திலிருந்து திரிந்து இரு பதவியை உணர்வுமூலம் கூட்டுக்கிராமம் என்ற கிராமத்தியை பதவியை பதவியை பதவியை வணிகம் கிராமத்தை ஆரம்பத்தியை பணம் வணிகம் வணிகம்

அன்றாடம் தேவர்து இன்று கிடைப்பதில் மயம் (தயநியைத்தவர) இன்று உணவாரும் அதிதயததை அநய மறந்து வட்டத்திம் இன்று கிடைக்கவந்தி. அம்மொடியின் பின்னணியில் இது இரண்டினேடு

பெருசுட்டுக்கரியாடுமாறு பெருசுட்டுக்கரியாகத்து
பொரு விதரவது சூதும் அனாதின் வணங்கு அநியம்,
திருநகேயும் பொருந்துவாரி தீண்ட அநுகூ காண்மோம்
திரு, கம்பையம் கப்பிரமணிபு அலத்தினர் ஆழ்வார்
புறந்த

பயனாக
முடிசுட்டுக்கரியாகவது உணவாடுபின்னு வய்யு
(உ)ந்து சூராய்ச்சி உகவாதுதூணவரளாற்றல்

Two lines from a poem

(sd) கி. கண்ணகிரசன்.
9.10.78

5. 4 திய திந்தனை 4 திய கற்பனை
4 திய அபிநயனை நானடித் தோஷனை
உதய மானதி சம்பந்தம் வாழ்வின்
உதித்தது செங்குழி சம்பந்தம் வானின்

Engaging Kannadasan

(sd) ಕಿ. ಕಣ್ಣಣ್ಣಾಶರಣ್ಣ
೨. 10. 78