[OCaml-LLVM/Polly-Owl-Satallax(Theorem Prover in OCaml) - CoqTP/OCaml - Q*cert/OCaml/Eigen] in the Context of IoT/HPC-High Performance Computing - Heterogeneous Environments to [Design+Test+Implement DNA based Theoretical Gene Therapy Informatics] R&D Framework – A Simple Suggestion & Novel Approach.

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[I] Inspiration + Introduction :

"The brain is one of the richest green fields of science. There's so much yet to be discovered." - Paul Allen.

"In my experience, each failure contains the seeds of your next success—if you are willing to learn from it." - Paul Allen. [Microsoft Co-founder]

"A multi-disciplinary team approach to drug discovery - Revolutionize The Way Drugs Are Discovered & Developed - Currently, it takes 12 years and $2.6 billion to get a single drug to market, with the drug discovery and development process costing $1.4 billion.Most drugs only target one gene at a time - Neurological diseases are caused by complex interactions between many genes. Many drug discoveries fail because researchers target only one gene at a time."

[**Source** - https://www.vergegenomics.com/ && https://www.vergegenomics.com/#current-approach]

OCaml – Functional Programming Language - **https://ocaml.org/** - OCaml is an industrial strength programming language supporting functional, imperative and object-oriented styles. Install OCaml .

Owl – Scientific Library/Machine Learning Concepts - **https://devmesh.intel.com/projects/owl-an-ocaml-numerical-library/** ***https://github.com/owlbarn/owl / opam.ocaml.org/packages/owl /*** - Owl is an OCaml library for scientific computing and machine learning using functional programming.Owl is an OCaml library for scientific computing. **It enables academic researchers to fast prototype machine learning algorithms and construct deep neural networks with very concise code**. It also facilitates industry programmers to develop robust analytical applications using functional language at a large scale.

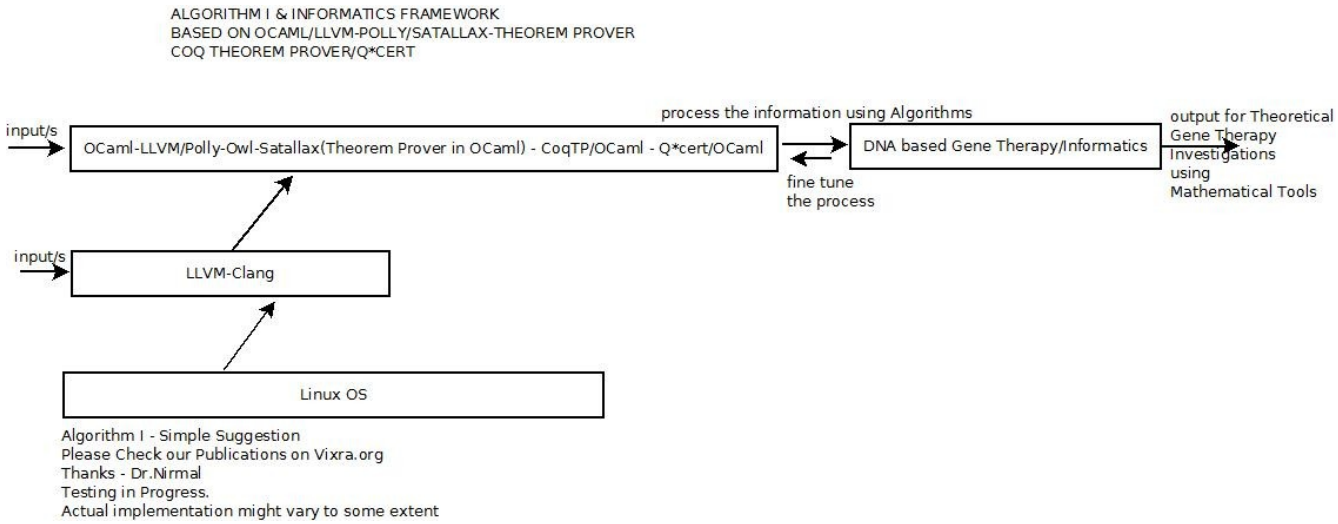
Q*cert – Query Compiler - Compilation and verification of data languages https://querycert.github.io/
Q*cert, a framework for the development and verification of query compilers. It supports a rich data model and includes an extensive compilation pipeline 'out of the box'.Q*cert is built using the Coq proof assistant (https://coq.inria.fr). A significant subset of the provided compilation pipeline has been mechanically checked for correctness.

Satallax – Theorem Prover - *satallaxprover.org - / www.ps.uni-saarland.de/~cebrown/**satallax*** - *https://**en.wikipedia.org**/wiki/Automated_**theorem_proving*** -/ *https://link.springer.com/chapter/10.1007/978-3-642-31365-3_11* - Satallax is an automated theorem prover for higher-order logic. The particular form of higher-order logic supported by Satallax is Church's simple type theory with extensionality and choice operators.

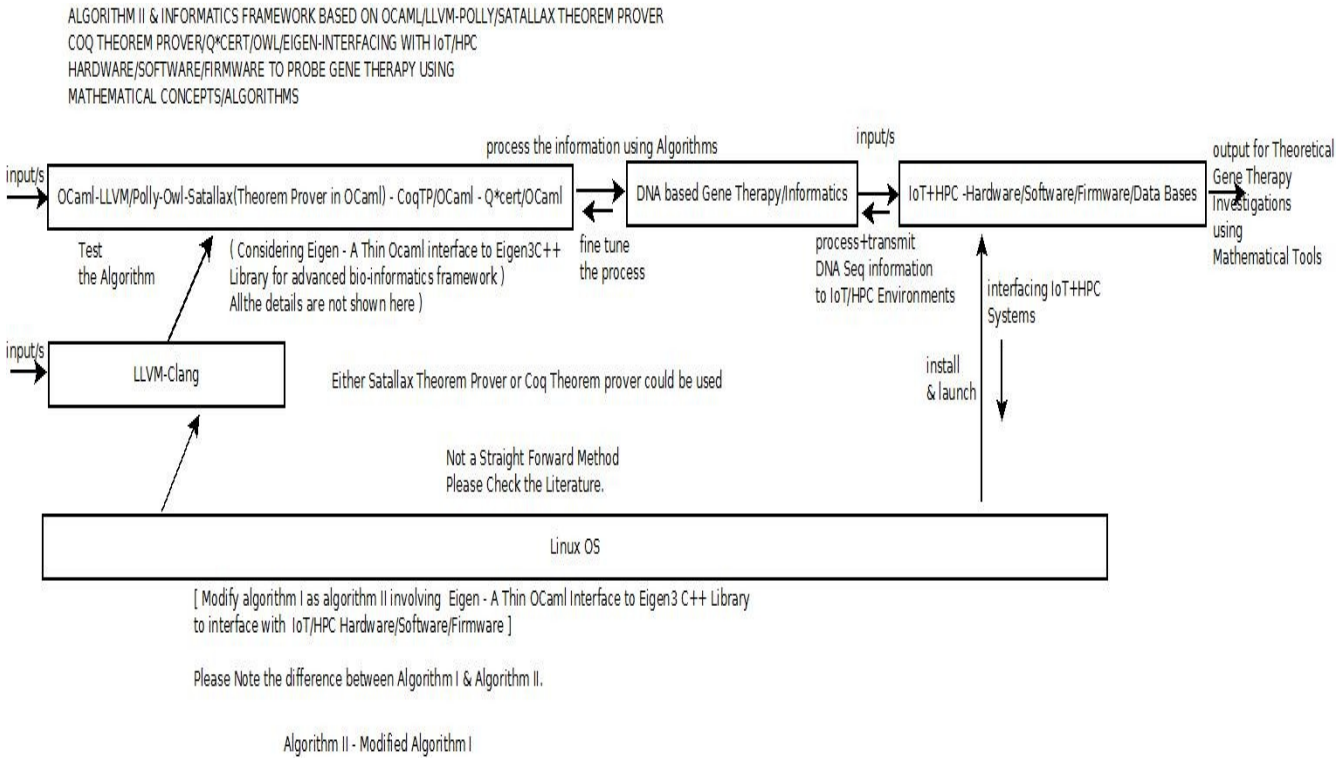
Coq – Theorem Prover - *https://**coq**.inria.fr* - Coq is a formal proof management system. It provides a formal language to write mathematical definitions, executable algorithms and theorems together with an environment for semi-interactive development of machine-checked proofs.

LLVM - **http://llvm.org/** - The LLVM Project is a collection of modular and reusable compiler and tool chain technologies. LLVM began as a research project at the University of Illinois.

[II] R&D of DNA based Informatics Framework Implementation :



[Figure I – Algorithm I – DNA Informatics R&D Framework]
Approximate Algorithm Only – Actual Implementation Might Vary to Some Extent – Please Note.
Testing in Progress – Please Check some of our publications on Gene Therapy.
We are interested in Targeting Neurosciences.



[Figure II – Algorithm II – DNA Informatics R&D Framework]
Approximate Algorithm Only – Actual Implementation Might Vary to Some Extent – Please Note.
We are interested in Targeting Neurosciences.

[III] Related R&D Information on Mathematics+Software Used :

https://github.com/colinbenner/ocaml-llvm

https://ocaml.org/

http://caml.inria.fr/

https://www.tutorialspoint.com/compile_ocaml_online.php

https://github.com/ocaml/ocaml

https://try.ocamlpro.com

https://github.com/ocaml

https://discuss.ocaml.org

https://ocaml.xyz

https://reasonml.github.io/docs/en/comparison-to-ocaml.html

https://fdopen.github.io/opam-repository-mingw/installation

https://github.com/querycert/qcert

https://en.wikipedia.org/wiki/Coq

http://www.ps.uni-saarland.de/~cebrown/satallax/

*https://polly.llvm.org -/ https://**polly.llvm.org**/get_started.html / https://**github.com/llvm-mirror/polly** -/ **polly.llvm.org**/projects.html / Polly - Polyhedral optimizations for LLVM* - Polly is a high-level loop and data-locality optimizer and optimization infrastructure for LLVM. It uses an abstract mathematical representation based on integer polyhedra to analyze and optimize the memory access pattern of a program.

https://github.com/owlbarn/owl - Owl - OCaml Scientific and Engineering Computing @ **http://ocaml.xyz**

https://github.com/owlbarn/eigen - Eigen - A Thin OCaml Interface to Eigen3 C++ Library - Simply put, Eigen is a very thin OCaml interface to Eigen3 C++ template library. This library is used by another OCaml numerical library -- Owl to provide basic support for both dense and sparse matrix operations.

[**Owl's OCaml Interface to Eigen3 C++ Library** - http://eigen.tuxfamily.org/]

https://bioengineer.org/new-gene-therapy-research-at-neuroscience-2019/

https://www.elsevier.com/books/gene-therapy-in-neurological-disorders/..

https://www.novartis.com/our-focus/cell-and-gene-therapy

https://en.wikipedia.org/wiki/Gene_therapy

[IV] Conclusion/s With Future Perspectives :

Transforming drug discovery using AI/ML(artificial intelligence/machine learning) is very much challenging & promising ,hence,"Leveraging Machine Learning " to drastically reduce the time and cost of drug discovery is the need of the hour.To the best of our knowledge we have used advanced Mathematical Concepts/Theorem Provers/Functional Programming/Ocaml Language/LLVM/Polly to "Leverage" the Health Care Industry R&D domains.We,sincerely hope and are quite sure that in the near future,many researchers would certainly find this approach useful in their R&D Works.

*** Algorithms I & II gave us an opportunity to TEST the performances of Satallax Theorem Prover/Coq Theorem Prover – by studying their underlying logic & mechanisms in Ocaml based HPC Environments.

[V] Acknowledgment/s :

Non-Profit R&D. Special Thanks to all WHO made this happen – My Friends+Mentors.

[VI] References :

[a] https://www.vergegenomics.com/publications

[b] http://www.vixra.org/author/nirmal_tej_kumar

[c] http://www.vixra.org/author/n_t_kumar

[d] http://www.vixra.org/author/d_n_t_kumar

[e] http://www.vixra.org/author/nirmal

[f] https://www.semanticscholar.org/author/Nirmal-Tej-Kumar/12354503/suggest – [Semanticsscholar – Indexing]
[From - Allen Institute/AI Tool]

[g] https://allenai.org/ - Allen Institute Website -Useful in Searching R&D Information Using Semanticscholar.

*** A free tool for uncovering supplement-drug interactions: supp.ai | Powered by Semantic Scholar .

[THE END]