Testing a Combination of [AI/ML/IoT/HPC] Heterogeneous Computing Concepts based on MXNet/Flux in the Context of Cryo-EM Image Processing & Informatics Using [Julia+JNI+Java+(ImageJ/Fiji)+JikesRVM - Research Virtual Machine] - A Simple Suggestion towards Novel Design of Electron Microscopy(EM) Image Processing Frameworks for better [Nano-Bio] Informatics R&D.

[Exploring EM Images With Julia +Java – an Interesting ML based Intelligent Approach]
[Julia - "Walks like python. Runs like C."]

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[I] Inspiration & Introduction :

Understanding JikesRVM in the Context of Cryo-EM/TEM/SEM Imaging Algorithms and Applications – A General Informatics Introduction from a Software Architecture View Point
D.N.T. Kumar, Gagik Shmavonyan - DOI:10.5958/0975-8089.2016.00001.4

An Insight into Cryo-EM Imaging Process Architecture Using GENTLE Compiler Construction System with an Informatics Design Paradigm - Nirmal Tej Kumar - DOI:10.5958/0975-8089.2016.00008.7

A Technical Note on Hilbert Spaces as Mathematical Tools to Probe and Process Cryo-EM Images – An Architectural and Computational Point of View Using Higher Order Logic (HOL)/Scala/Java/JVM Software Environment - N.T. Kumar - DOI:10.5958/0975-8089.2016.00016.6

A Simple Introduction and Short Communication on Higher Order Logic (HOL)-JVM/Jikes RVM-Based Deep Learning Algorithms and Mechanisms to Probe the Frontiers of Cryo-EM Image Processing: Tasks and Big Data-Related Applications -*D.N.T. Kumar* - DOI:10.5958/0975-8089.2018.00021.0

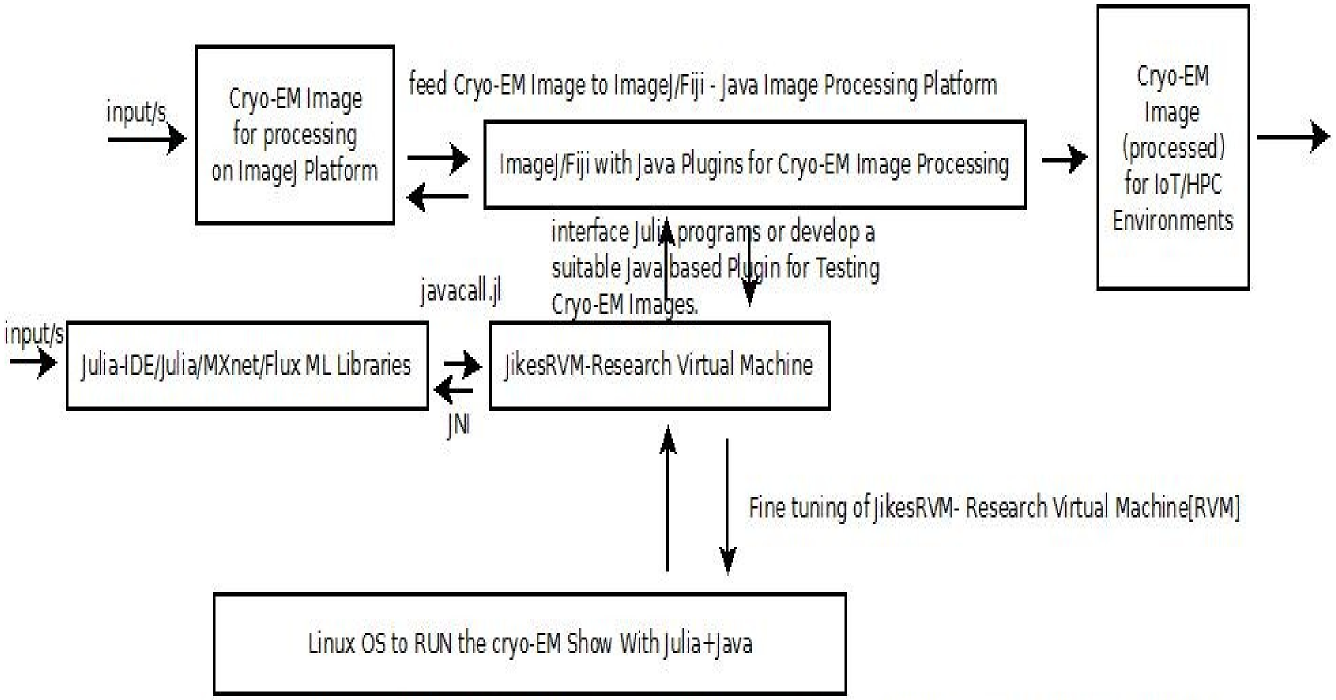
Formalizing Image Processing in Higher Order Logic(hol) by Understanding and Using XML-Hol-Scala-JVM Software Framework Towards Processing of Cryo-Em/tem/sem Images Based on Levy Processes a Novel Suggestion - Authors: D.N.T.Kumar - [http://vixra.org/abs/1709.0412]

https://juliacomputing.com/case-studies/ibm.html – Image Processing Notes.

https://**imagej**.nih.gov/ij/ - ImageJ Java based Image Processing Platform.

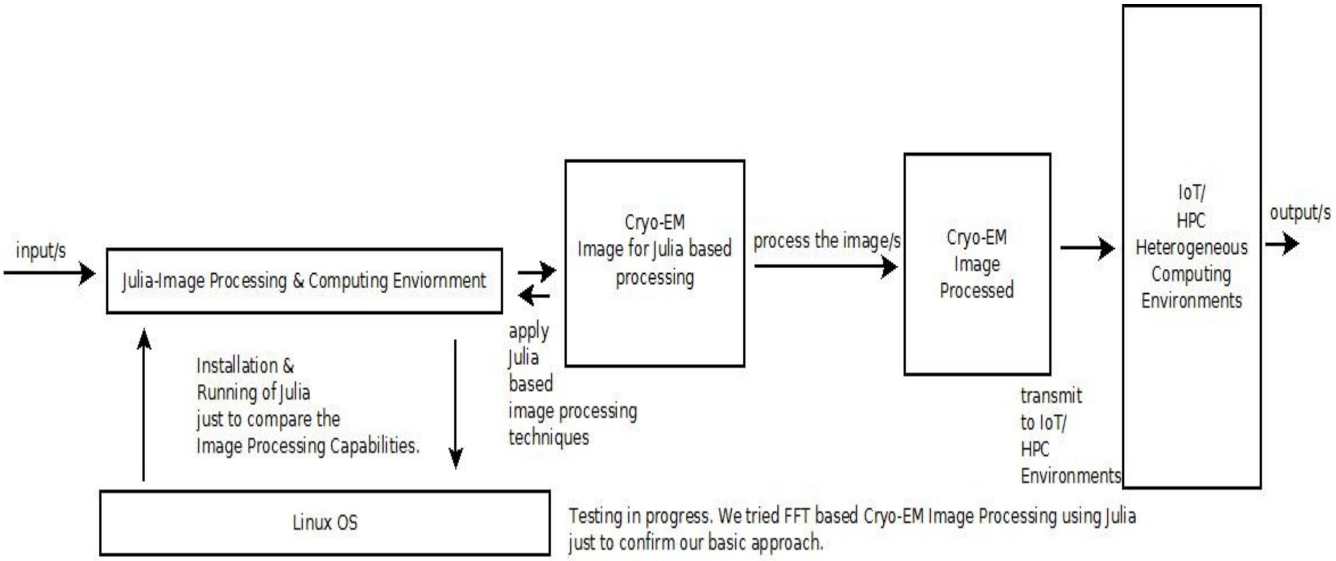
https://fiji.sc/ - Fiji – Java based Image Processing Platform.
https://smist08.wordpress.com/.../**julia-flux**-for-machine-learning/
https://en.wikipedia.org/wiki/**ImageJ** / https://**mxnet**.apache.org/
joss.theoj.org/papers/10.21105/joss.00602 - [**Flux**: Elegant machine learning with **Julia].**

[II] Cryo-EM Image Processing & Informatics R&D Framework :


input/s
Cryo-EM Image for processing on ImageJ Platform
feed Cryo-EM Image to ImageJ/Fiji - Java Image Processing Platform
ImageJ/Fiji with Java Plugins for Cryo-EM Image Processing
Cryo-EM Image (processed) for IoT/HPC Environments
interface Julia programs or develop a suitable Java based Plugin for Testing Cryo-EM Images.
javacall.jl
input/s
Julia-IDE/Julia/MXnet/Flux ML Libraries
JikesRVM-Research Virtual Machine
JNI
Fine tuning of JikesRVM- Research Virtual Machine[RVM]
Linux OS to RUN the cryo-EM Show With Julia+Java

Approximate OVerview of our Cryo-EM Image Processing Framework by extending to IoT/HPC Computing Environments
Testing in progress.Needs Checking.Please Check & Satisfy Yourself.
Thanks - Dr.Nirmal.

[Figure I – Algorithm I for Cryo-EM Image Processing Application]
[SEM/TEM/Cryo-EM Images/Medical Images could be processed]


input/s
Julia-Image Processing & Computing Enviornment
Cryo-EM Image for Julia based processing
process the image/s
Cryo-EM Image Processed
IoT/ HPC Heterogeneous Computing Environments
output/s
apply Julia based image processing techniques
transmit to IoT/ HPC Environments
Installation & Running of Julia just to compare the Image Processing Capabilities.
Linux OS

Testing in progress. We tried FFT based Cryo-EM Image Processing using Julia just to confirm our basic approach.

Approximate Algorithm for Cryo-EM Image Processing Using Julia alone With MXNet/Flux ML Libraries.
Please Check & Satisfy Yourself before trying our Algorithms.
Thanks - Dr.Nirmal.

[Figure II – Algorithm II for Cryo-EM Image Processing Application]

[Review on Machine Learning & Artificial Intelligence With Julia from published literature] :

“Julia comes ready with Flux, a state-of-the-art framework for machine learning and AI.

As machine learning systems become more complex, researchers increasingly need differentiable languages in which they can simply write their algorithms as code. Julia’s mathematical syntax makes it an ideal way to express algorithms just as they are written in papers, while Flux turns code into trainable models with automatic differentiation, GPU acceleration and support for terabytes of data via JuliaDB.

Flux provides a highly intuitive, layer-stacking-based interface for simple models, yet you can easily write your own mathematics for more advanced ones such as variational auto-encoders. Despite how easy it is to use, Flux is the most flexible ML framework on Earth; one can easily integrate it with other Julia libraries like physics simulators or differential equations solvers, and even drop down to writing a quick CUDA kernel via CUDAnative; all from one language, or even from a single script!

Julia also has best-in-class support for other modern machine learning frameworks such as TensorFlow and MXNet, making it easy to adapt to existing workflows.

[Source : Mike Innes - Machine Learning with Julia (Flux)]

At JuliaCon 2017,Mike Innes gives a brief introduction to Flux.jl, a Julia package that expands Julia’s flexibility in machine learning use cases. He further goes on to show how it provides lightweight abstractions on top of Julia’s native GPU and Automatic Differentiation support, while remaining fully hackable.

[**Source : Jonathan Malmaud - Modern Machine Learning in Julia with TensorFlow.jl]**

[Julia In Use – Some Interesting Applications] :

Parallel Supercomputing for Astronomy [**Source: JuliaComputing.com]**

The Celeste research team spent three years developing and testing a new parallel computing method that was used to process the Sloan Digital Sky Survey dataset and produce the most accurate catalog of 188 million astronomical objects in just 14.6 minutes with state-of-the-art point and uncertainty estimates.

Read more

Tangent Works [**Source: JuliaComputing.com]**

Tangent Works uses Julia to build a comprehensive analytics solution that blurs the barrier between prototyping done by data scientists and production development done by developers.

Read more

Diabetic Retinopathy Medical Diagnosis, [Source: JuliaComputing.com]

Diabetic retinopathy is an eye disease that affects more than 126 million diabetics and accounts for more than 5% of blindness cases worldwide. Timely screening and diagnosis can help prevent vision loss for millions of diabetics worldwide. IBM and Julia Computing analyzed eye fundus images provided by Drishti Eye Hospitals, and a built a deep learning solution that provides eye diagnosis and care to thousands of rural Indians.**”**

Read more

https://www.analyticsvidhya.com/blog/2017/10/comprehensive-tutorial-learn-data-science-julia-from-scratch/

[III] Acknowledgment/s :

Special Thanks to all who made this happen in my LIFE. Non-Commercial R&D only.
Non-Profit Academic R&D.

[IV] References :

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[14] https://medium.com/.../10-deep-learning-projects-based-on-apache-**mxnet**- 8231109f3f64

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[THE END]