
[ 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:10.5958/0975-8089.2016.00014.4


https://smist08.wordpress.com/.../julia-flux-for-machine-learning/
joss.theoj.org/papers/10.21105/joss.00602 - [ Flux: Elegant machine learning with Julia ].
[II] Cryo-EM Image Processing & Informatics R&D Framework:

![Diagram of cryo-EM image processing algorithm](image)

- Cryo-EM Image for processing on ImageJ Platform
- Input(s)
- Julia + DEJulia/MXnet/Flux ML Libraries
- jikesRVM-Research Virtual Machine
- JAVA
- Linux OS to RUN the cryo-EM Show With Julia+Java

**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 Environment
- Installation & Running of Julia just to compare the Image Processing Techniques
- Linux OS
- Testing in progress. We tried FFT based Cryo-EM Image Processing using Julia just to confirm our basic approach.

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


[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 :

[1] https://www.jikesrvm.org/
[8] https://fluxml.ai/Flux.jl/v0.2/models/basics.html