

Demystifying Artificial Intelligence Sorcery

(Part 3: Deep Learning)^a

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^aAvailable @ <https://github.com/a-mhamdi/isetbz/>



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ROADMAP

1. An overview
2. CNN
3. VAE
4. Quizzes

An overview

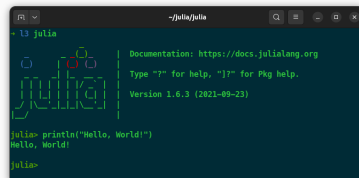


REMINDER

PROGRAMMING LANGUAGE



julialang.org/

A screenshot of a Julia REPL window. The window title is "~julia/julia". The prompt is "julia". The output shows a stylized "julia" logo made of colored circles and lines. To the right of the logo, the text reads: "Documentation: https://docs.julialang.org", "Type '?' for help, ']' for Pkg help.", and "Version 1.6.3 (2021-09-23)". Below the logo, the prompt "julia>" is followed by the command "println(\"Hello, World!\")" and the output "Hello, World!". The prompt "julia>" is shown again at the bottom.

DEVELOPMENT ENVIRONMENTS



Pluto.jl



▲ \$ docker compose up

▼ \$ docker compose down



JULIA IN A NUTSHELL

- ▲ Fast
- ▲ Dynamic
- ▲ Reproducible
- ▲ Composable
- ▲ General
- ▲ Open Source



JULIA MICRO-BENCHMARKS (1/2)



<https://julialang.org/benchmarks>



JULIA MICRO-BENCHMARKS (2/2)

Geometric Means of Micro-Benchmarks by Language

1	C	1.0
2	Julia	1.17006
3	LuaJIT	1.02931
4	Rust	1.0999
5	Go	1.49917
6	Fortran	1.67022
7	Java	3.46773
8	JavaScript	4.79602
9	Matlab	9.57235
10	Mathematica	14.6387
11	Python	16.9262
12	R	48.5796
13	Octave	338.704





SOURCE CONTROL MANAGEMENT (SCM)

The screenshot shows the GitHub web interface for the repository 'a-mhamdi/jlai'. The repository is public and has 0 forks and 0 stars. The 'Code' tab is selected, showing a commit history table. The table lists the following files and their commit details:

File	Commit Message	Commit Hash	Time Ago
.github/workflows	fix typo.	996ee27	27 minutes ago
toml	sync *.toml files		last month
.gitignore	add .gitignore file		last month
Dockerfile	change repo's name & references		15 days ago
LICENSE	Initial commit		last month
README.md	ref. to jlai @ dockerhub		37 minutes ago
docker-compose.yml	change repo's name & references		15 days ago
sync-script.sh	sync *.toml files		last month

On the right side of the repository page, the 'About' section is visible, showing the repository description: 'Image of julia on ubuntu to run labs of AI.' Below this, there are links to the README, MIT license, stars, watching, and forks. The 'Releases' section shows 'No releases published' and a link to 'Create a new release'. The 'Packages' section is also visible at the bottom.

<https://github.com/a-mhamdi/jlai>



CONTINUOUS INTEGRATION (CI)

The screenshot shows the Docker Hub interface for the repository `abmhamdi/jlai`. The page includes a search bar, navigation tabs (General, Tags, Builds, Collaborators, Webhooks, Settings), and a description of the repository as 'Artificial Intelligence Labs @ ISETBZ'. It also displays Docker commands for pushing a new tag, a table of tags and scans, and information about automated builds.

abmhamdi /jlai

Description
Artificial Intelligence Labs @ ISETBZ
Last pushed: 2 minutes ago

Docker commands
To push a new tag to this repository,
`docker push abmhamdi/jlai:tagname`

Tags and scans
This repository contains 1 tag(s).
VULNERABILITY SCANNING - DISABLED [Enable](#)

Tag	OS	Type	Pulled	Pushed
latest	linux	Image	—	2 minutes ago

[See all](#) [Go to Advanced Image Management](#)

Automated Builds
Manually pushing images to Hub? Connect your account to GitHub or Bitbucket to automatically build and tag new images whenever your code is updated, so you can focus your time on creating.
Available with Pro, Team and Business subscriptions.
[Upgrade](#) [Learn more](#)

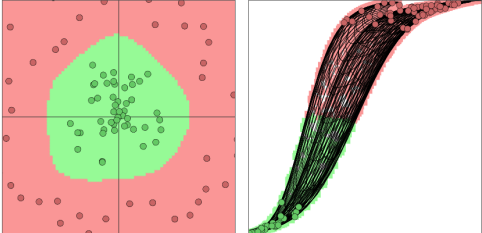
<https://hub.docker.com/r/abmhamdi/jlai>

CNN

CONVNETJS DEMO

Feel free to change this, the text area above gets eval()'d when you hit the button and the network gets reloaded. Every 10th of a second, all points are fed to the network multiple times through the trainer class to train the network. The resulting predictions of the network are then "painted" under the data points to show you the generalization.

On the right we visualize the transformed representation of all grid points in the original space and the data, for a given layer and only for 2 neurons at a time. The number in the bracket shows the total number of neurons at that level of representation. If the number is more than 2, you will only see the two visualized but you can cycle through all of them with the cycle button.



simple data circle data spiral data
random data

Controls:
CLICK: Add red data point
SHIFT+CLICK: Add green data point
CTRL+CLICK: Remove closest data point

Go [back to ConvNetJS](https://cs.stanford.edu/people/karpathy/convnetjs/demo/classify2d.html)

drawing neurons 0 and 1 of layer with index 4 (tanh)

fc(6) tanh(6) fc(2) **tanh(2)**

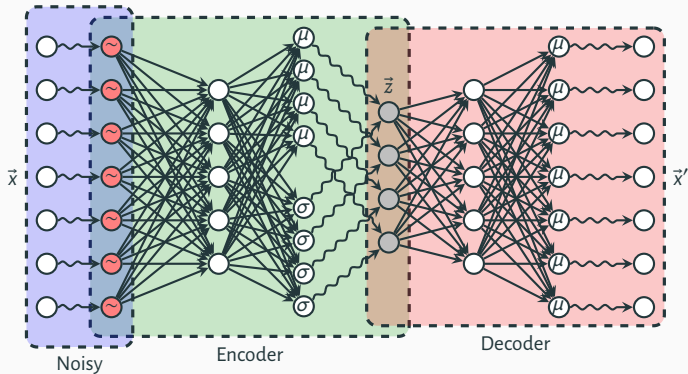
fc(2)

cycle through visualized neurons at selected layer (if more than 2)

<https://cs.stanford.edu/people/karpathy/convnetjs/demo/classify2d.html>

VAE

VARIATIONAL AUTO-ENCODER



Quizzes

MCQ (1/1)

1. Your supervisor asks you to create a machine learning system that will help your human resources department classify jobs applicants into well-defined groups. What type of system are you more likely to recommend?
 - ✗ an unsupervised machine learning system that clusters together the best candidates.
 - ✗ you would not recommend a machine learning system for this type of project.
 - ✗ a deep learning artificial neural network that relies on petabytes of employment data.
 - ✓ a supervised machine learning system that classifies applicants into existing groups.
2. Your data science team must build a binary classifier, and the number one criterion is the fastest possible scoring at deployment. It may even be deployed in real time. Which technique will produce a model that will likely be fastest for the deployment team use to new cases?
 - ✗ random forest
 - ✓ logistic regression
 - ✗ KNN
 - ✗ deep neural network
3. The famous data scientist Andrew Ng has been quoted as saying, "Applied machine learning is basically feature engineering." What is feature engineering?
 - ✗ scraping new features from web data
 - ✓ creating new variables by combining and modifying the original variables
 - ✗ designing innovative new user features to add to software
 - ✗ using deep learning to find features in the data

SOME USEFUL LINKS

1. <https://setosa.io/ev/>
2. <https://karpathy.ai/>
3. <http://yann.lecun.com/>
4. <https://www.hackingnote.com/>
5. <https://stanford.edu/~shervine/teaching/>
6. <https://machinelearningmastery.com/>
7. <https://www.ibm.com/downloads/cas/GB8ZMQZ3>
8. <https://colah.github.io/posts/2014-03-NN-Manifolds-Topology/>

FURTHER READING (1/1)