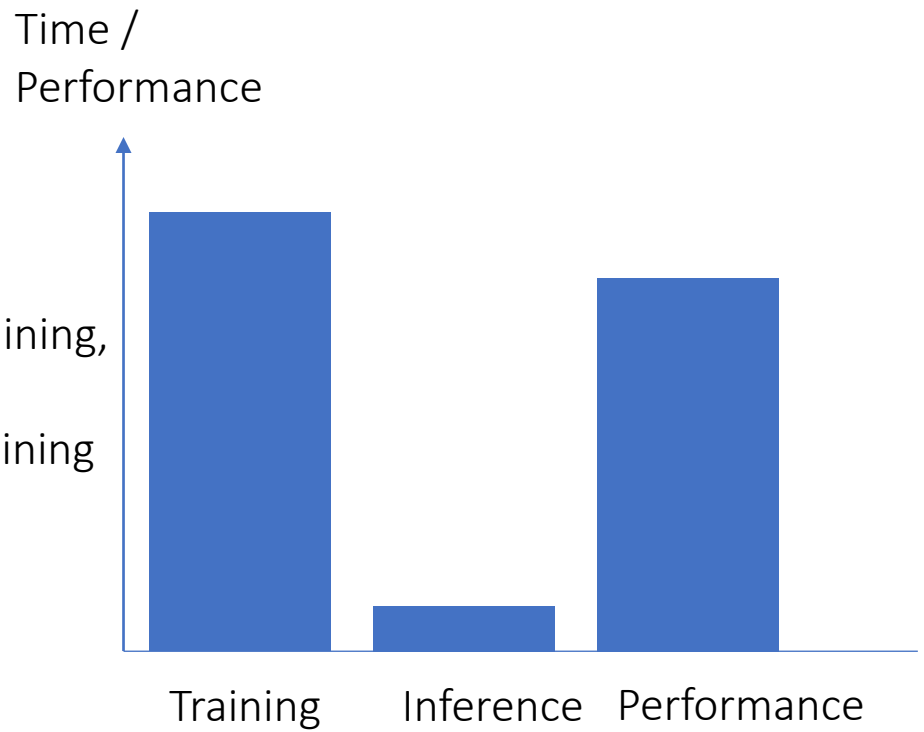
Extreme Learning Machines

Extreme Learning Machines

Introduction

- normal Neural Networks
  - take long to train
  - predict fast

- Possible Problem:
  - Your network requires regular retraining, because of data change
  - could be impossible due to long training time



Typical Neural Network

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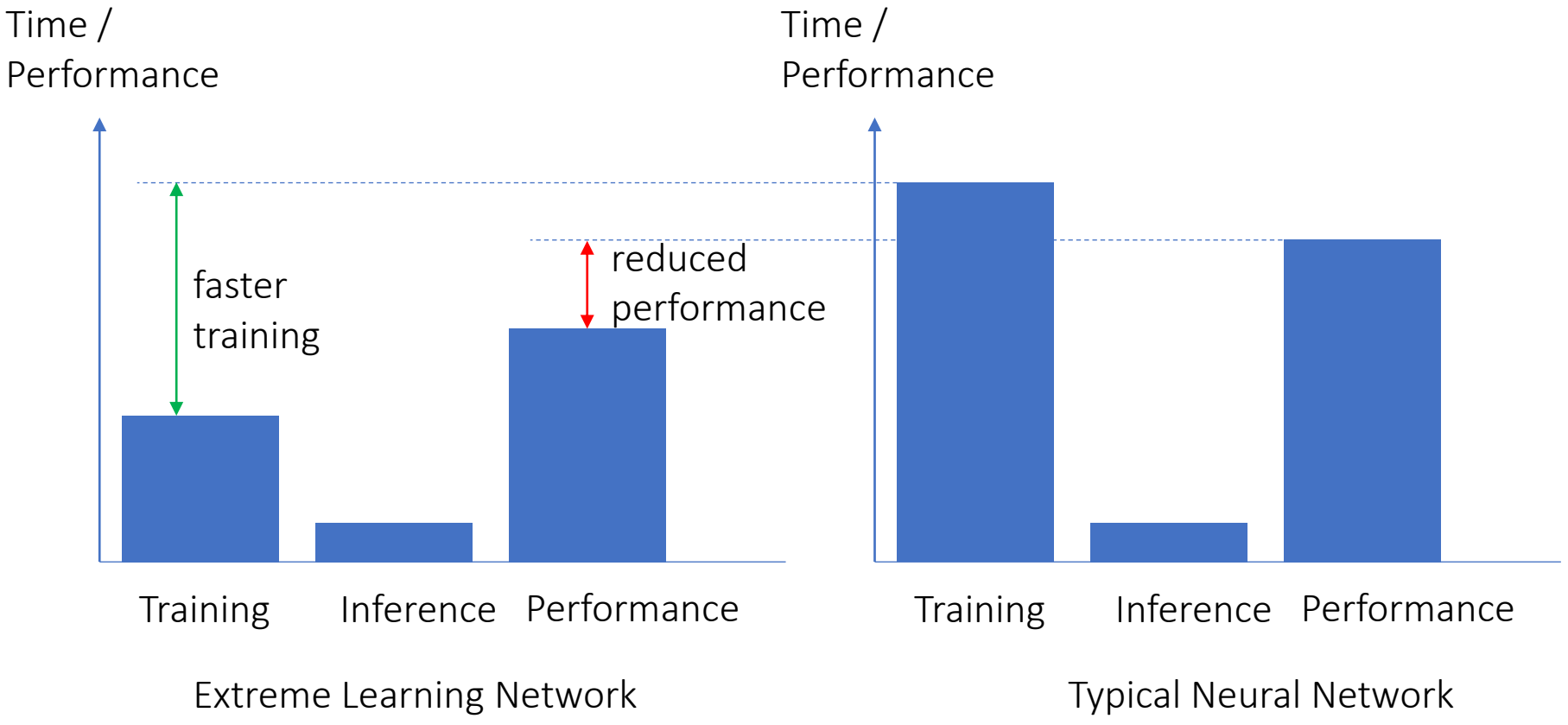
Pros and Cons



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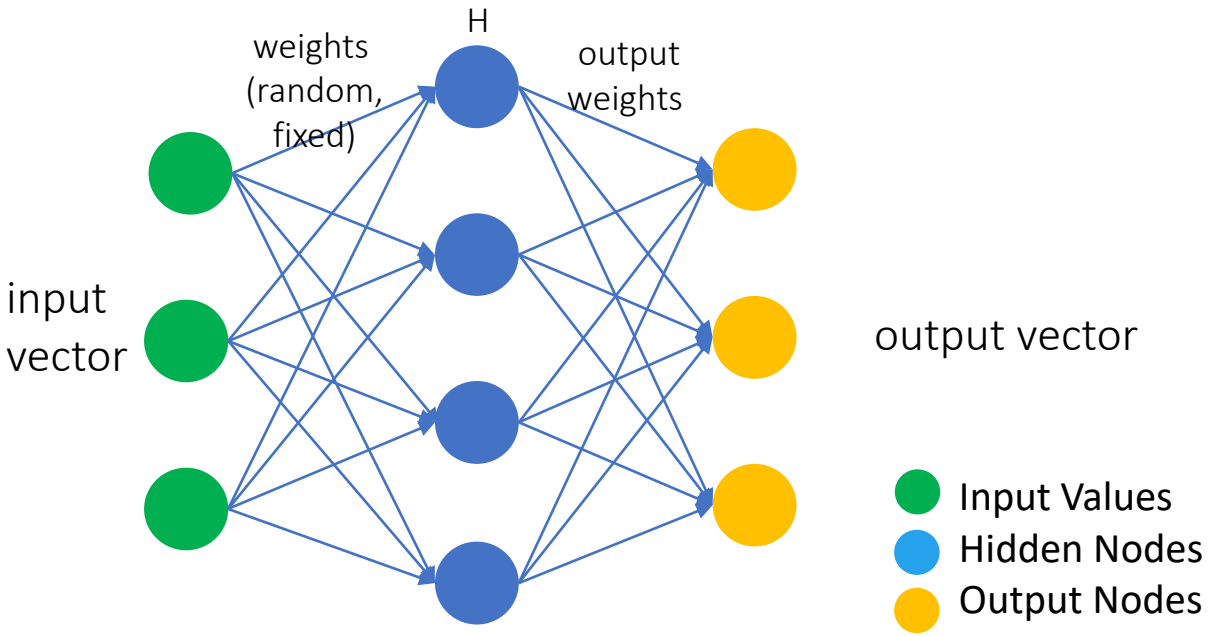
ELM theory

- ELM…single hidden layer feedforward neural network
- learns faster
- similar to classical NN, but without learning process (no backpropagation)
- developed by Huang, et.al.

1. assign random params to hidden nodes

2. calculate hidden layer output H

3. calculate output weights



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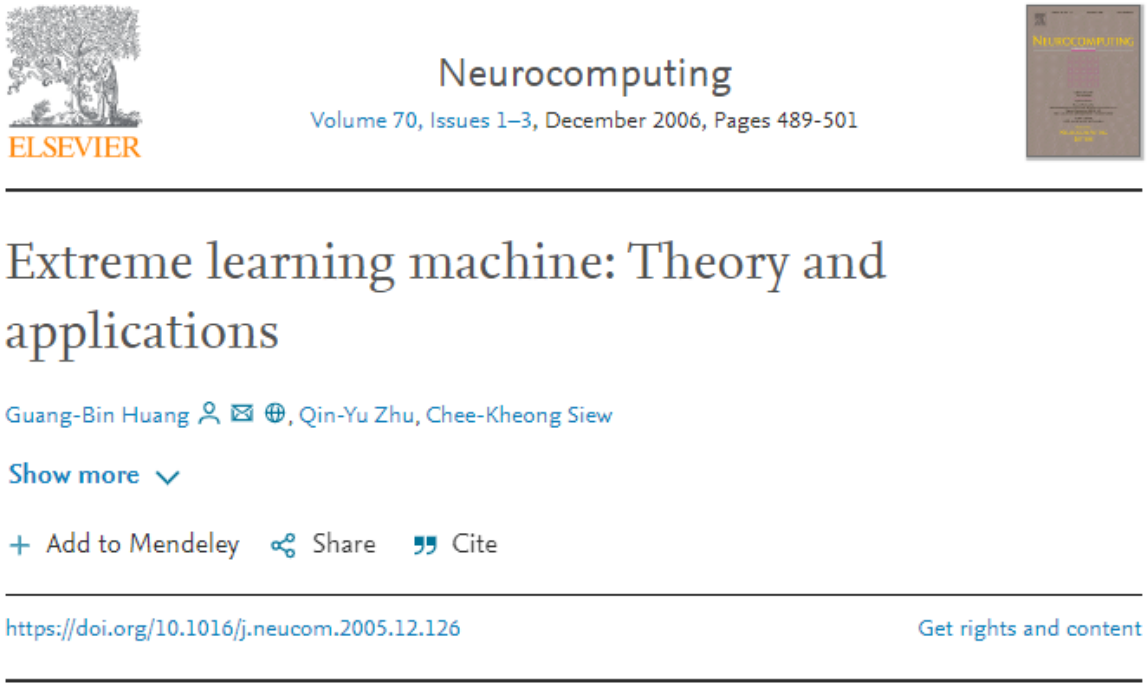
Underlying Research



ELSEVIER

Neurocomputing

Volume 70, Issues 1–3, December 2006, Pages 489-501

Extreme learning machine: Theory and applications

Guang-Bin Huang, Qin-Yu Zhu, Chee-Kheong Siew

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Source: Huang, et.al. „Extreme learning machine: Theory and applications https://web.njit.edu/~usman/courses/cs675_fall20/ELM-NC-2006.pdf

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Model Results

Dataset	Algorithms	Acc Test
CIFAR-10	ELM 1000 (1x)	10.64
	ELM 3000 (20x)	71.40
	ELM 3500 (30x)	87.55
	ReNet (2015)	87.65
	EfficientNet (2019)	98.90
MNIST	ELM 512	92.15
	DELM 15000	99.43
	RNN	99.55
	BP 6-layer 5700	99.65

Problems	Algorithms	Training s	Testing s	Acc Train	Acc Test	Nodes
Satellite image	ELM	14.92	0.34	93.52	89.04	500
	BP	12561	0.08	95.26	82.34	100
Image segment	ELM	1.40	0.07	97.35	95.01	200
	BP	4745.7	0.04	96.92	86.27	100
Shuttle	*ELM*	5.740	0.23	99.65	99.40	50
	BP	6132.2	0.22	99.77	99.27	50
Banana	*ELM*	2.19	20.06	92.36	91.57	100
	BP	6132.2	21.10	90.26	88.09	100

Source: https://towardsdatascience.com/introduction-to-extreme-learning-machines-c020020ff82b

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Resources

Glenn Paul Gara

May 29, 2020 · 5 min read · Member-only · Listen

Build an Extreme Learning Machine in Python

A guide to building a neural network without parameter tuning.

Source: https://towardsdatascience.com/build-an-extreme-learning-machine-in-python-91d1e8958599

Kemal Erdem (burnpiro)

May 29, 2020 · 6 min read · Listen

UNDERSTANDING ML

Introduction to Extreme Learning Machines

Not so quick introduction about what is ELM. Is it really an innovation or just an iteration?

Source: https://towardsdatascience.com/introduction-to-extreme-learning-machines-c020020ff82b