Machine Learning in Javascript

Canarias JS Meetup

September 14, 2017

Machine learning in javascript, why?

Machine learning libraries are appearing,

people are finding ways to harness the GPU in browser for computation,

popular mainstream machine learning tools are publishing JS interfaces.

Why do this?

Any application that can be written in Javascript, will eventually be written in Javascript

Atwoods Law, https://blog.codinghorror.com/the-principle-of-least-power/

Some more reasons

- the browser - the user already has the goods installed!
- node.js
- massive js ecosystem
- edge computing
- a huge community of developers
- functional, loosely typed, productive and a pleasure to code in (ES6+ obviously)

Detractors - the Why Not’s

- Numeric Support
- Performance
- Small ecosystem

Vs

Arbitrary Precision with bignumber.js & decimal.js

BigNumber.prototype methods

absoluteValue	abs	isNegative	isNeg	toDigits	
ceil		isZero		toExponential	
comparedTo	cmp	lessThan	lt	toFixed	
decimalPlaces	dp	lessThanOrEqualTo	lte	toFormat	
dividedBy	div	minus	sub	toFraction	
dividedToIntegerBy	divToInt	modulo	mod	toJSON	
equals	eq	negated	neg	toNumber	
floor		plus	add	toPower	pow
greaterThan	gt	precision	sd	toPrecision	
greaterThanOrEqualTo	gte	round		toString	
isFinite		shift		truncated	trunc
isInteger	isInt	squareRoot	sqrt	valueOf	
isNaN		times	mul		

BigNumber.config properties

DECIMAL_PLACES	20
ROUNDING_MODE	4
EXPONENTIAL_AT	[-7, 20]
RANGE	1e+7
ERRORS	true
CRYPTO	false
MODULO_MODE	1
POW_PRECISION	0
FORMAT	{}

BigNumber methods

another	
config	set
max	
min	
random	

BigNumber properties

ROUND_UP	0
ROUND_DOWN	1
ROUND_CEIL	2
ROUND_FLOOR	3
ROUND_HALF_UP	4
ROUND_HALF_DOWN	5
ROUND_HALF_EVEN	6
ROUND_HALF_CEIL	7
ROUND_HALF_FLOOR	8
EUCLID	9

Decimal.prototype methods

absoluteValue	abs	comparedTo	cmp	cosine	cos
ceil		equals	eq	sine	sin
floor		greaterThan	gt	tangent	tan
negated	neg	greaterThanOrEqualTo	gte		
round		lessThan	lt	inverseCosine	acos
toDecimalPlaces	toDP	lessThanOrEqualTo	lte	inverseSine	asin
toFraction				inverseTangent	atan
toNearest		cubeRoot	cbrt		
toSignificantDigits	toSD	dividedBy	div	hyperbolicCosine	cosh
truncated	trunc	dividedToIntegerBy	divToInt	hyperbolicSine	sinh
		logarithm	log	hyperbolicTangent	tanh
toBinary		minus	sub		
toExponential		modulo	mod	inverseHyperbolicCosine	acosh
toFixed		naturalExponential	exp	inverseHyperbolicSine	asinh
toHexadecimal	toHex	naturalLogarithm	ln	inverseHyperbolicTangent	atanh
toJSON		plus	add		
toOctal		squareRoot	sqrt	isFinite	
toPrecision		times	mul	isInteger	isInt
toString		toPower	pow	isNaN	
valueOf				isNegative	isNeg
		decimalPlaces	dp	isPositive	isPos
toNumber		precision	sd	isZero	

Decimal methods

add	abs	cbrt	cos	cosh
div	ceil	hypot	sin	sinh
mod	floor	sqrt	tan	tanh
mul	max			
pow	min	exp	acos	acosh
sub	round	ln	asin	asinh
	trunc	log	atan	atanh
clone		log2	atan2	
noConflict		log10		random
set				sign

Decimal properties

precision	20	ROUND_UP	0
rounding	4	ROUND_DOWN	1
maxE	9e15	ROUND_CEIL	2
minE	-9e15	ROUND_FLOOR	3
toExpNeg	-7	ROUND_HALF_UP	4
toExpPos	21	ROUND_HALF_DOWN	5
modulo	1	ROUND_HALF_EVEN	6
crypto	false	ROUND_HALF_CEIL	7
		ROUND_HALF_FLOOR	8
		EUCLID	9

decimal.js - https://github.com/MikeMcl/decimal.js/

bignumber.js - https://github.com/MikeMcl/bignumber.js

biginteger.js - https://github.com/peterolson/BigInteger.js

Machine Learning

Strictly - a class of adaptive algorithms that use iteratively learn from data without having to be explicitly programmed to do so.

Actually - the term is now used to encompass most of data science, numerical, statistical, stochastic analysis, optimisation, inverse problem .. or anything to do with an algorithm

Some Machine Learning Objectives

That are used on their own or as part of larger ML pipelines

- Classification
- Regression
- Clustering
- Density Estimation
- Dimensionality Reduction
- Generation
- Transformation / Translation

General Machine Learning in JS

The Awesome List - https://github.com/josephmisiti/awesome-machine-learning#javascript

ml.js https://github.com/mljs/ml

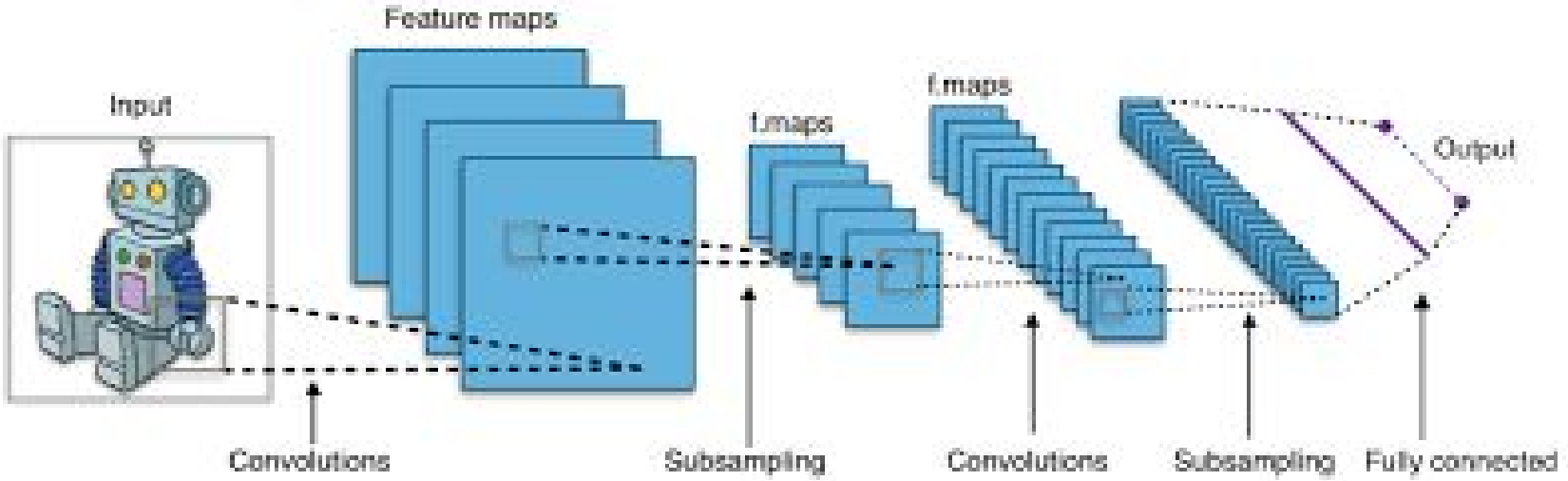
Deep Learning in the Browser with ConvNet.js

ConvNetJS
Deep Learning in your browser

http://cs.stanford.edu/people/karpathy/convnetjs/

Classify CIFAR-10 with Convolutional Neural Network

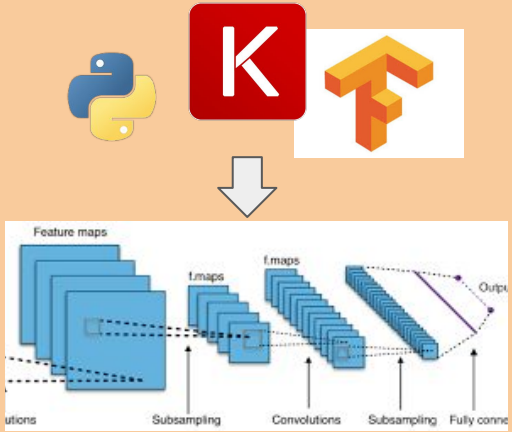
Convolutional Neural Network



Kera.js run trained models in the browser / javascript

training data (image net)

http://keras.io



"snapshot"

keras.js

- cat: 98%
- dog: 21%
- hot dog: 3%

The Future - Ones to Watch

Square

Crossfilter

Fast Multidimensional Filtering for Coordinated Views

slides online at:

github.com/experoinc/machine-learning-in-javascript

Thank you

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