
AIToolbox

A toolbox of AI modules written in Swift: Graphs/Trees, Linear Regression, Support Vector Machines, Neural Networks, PCA, KMeans, Genetic Algorithms, MDP, Mixture of Gaussians, Logistic Regression

This framework uses the Accelerate library to speed up computations, except the Linux package versions. Written for Swift 3.0. Earlier versions are Swift 2.2 compatible

SVM ported from the public domain LIBSVM repository See <https://www.csie.ntu.edu.tw/~cjlin/libsvm/> for more information

The Metal Neural Network uses the Metal framework for a Neural Network using the GPU. While it works in preliminary testing, more work could be done with this class

Use the XCTest files for examples on how to use the classes

Playgrounds for Linear Regression, SVM, and Neural Networks are available. Now available in both macOS and iOS versions.

###New - Convolution Program For the Deep Network classes, please look at the Convolution project that uses the AIToolbox library to do image recognition.

New Swift Package - Mac and Linux compatible!

The package is a sub-set of the full framework. Classes that require GCD or LAPACK have not been ported. I am investigating LAPACK on Linux alternatives, and may someday figure out how to get libdispatch to compile on Ubuntu... Use this subdirectory to reference the package from your code.

Manual

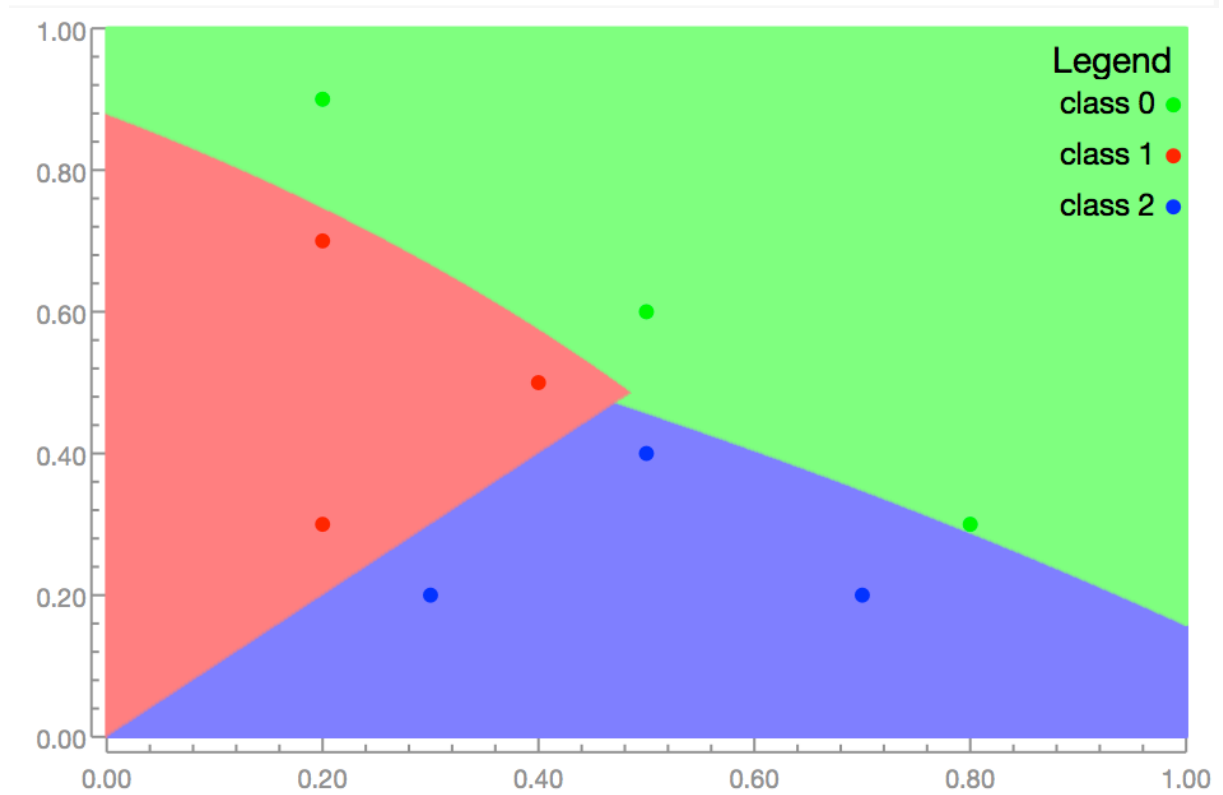
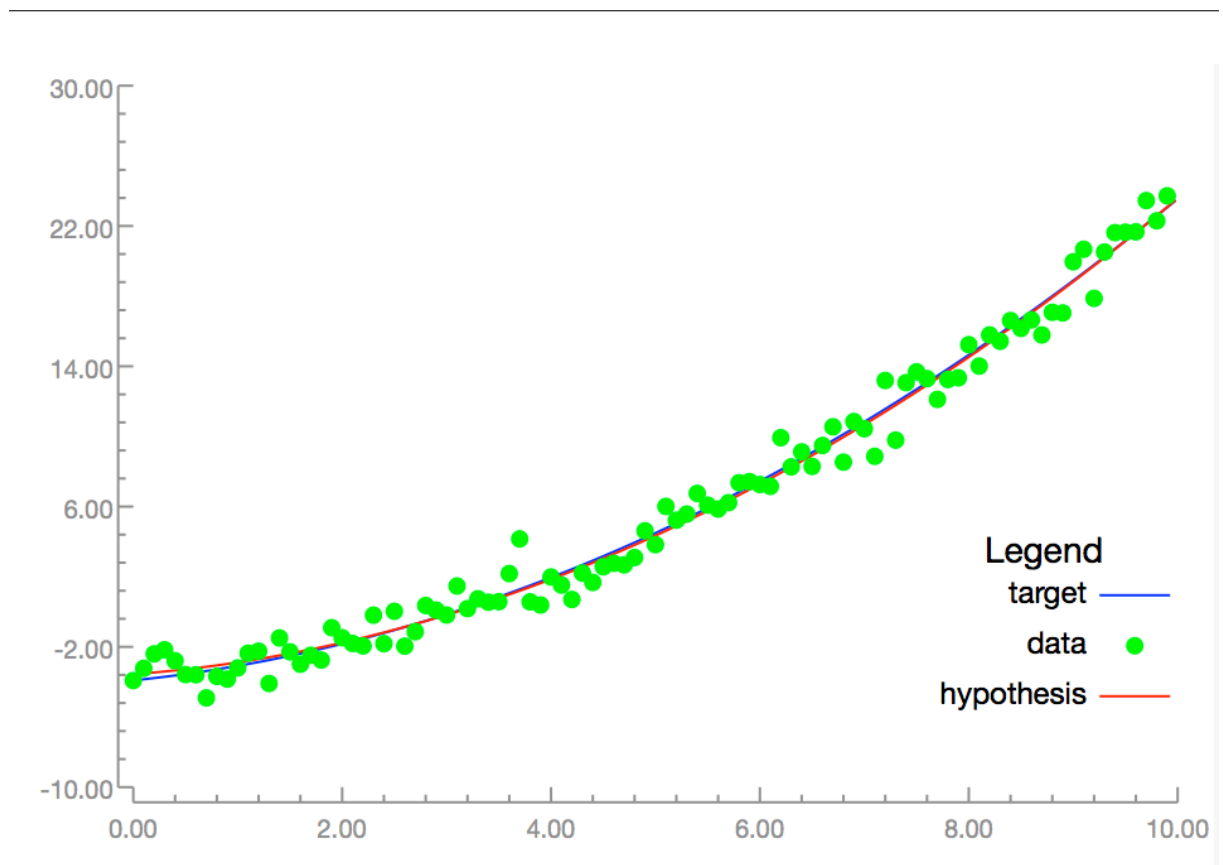
I have started a manual for the framework. It is a work-in-progress, but adds some useful explanation to pieces of the framework. All protocols, structures, and enumerations are well defined. Class descriptions are there, but not class variables and methods.

Classes/Algorithms supported:

- 1 Graphs/Trees
- 2 Depth-first search
- 3 Breadth-first search
- 4 Hill-climb search
- 5 Beam Search
- 6 Optimal Path search

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7
8 Alpha-Beta (game tree)
9
10 Genetic Algorithms
11     mutations
12     mating
13     integer/double alleles
14
15 Constraint Propagation
16     i.e. 3-color map problem
17
18 Linear Regression
19     arbitrary function in model
20     regularization can be used
21     convenience constructor for standard polygons
22     Least-squares error
23
24 Non-Linear Regression
25     parameter-delta
26     Gradient-Descent
27     Gauss-Newton
28
29 Logistic Regression
30     Use any non-linear solution method
31     Multi-class capability
32
33 Neural Networks
34     multiple layers, several non-linearity models
35     on-line and batch training
36     feed-forward or simple recurrent layers can be mixed in one network
37     simple network training using GPU via Apple's Metal
38     LSTM network layer implemented - needs more testing
39     gradient check routines
40
41 Support Vector Machine
42     Classification
43     Regression
44     More-than-2 classes classification
45
46 K-Means
47     unlabelled data grouping
48
49 Principal Component Analysis
50     data dimension reduction
51
52 Markov Decision Process
53     value iteration
54     policy iteration
55     fitted value iteration for continuous state MDPs - uses any
56         Regression class for fit
57         (see my MDPRobot project on github for an example use)
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57     Monte-Carlo (every-visit, and first-visit)
58     SARSA
59
60     Gaussians
61         Single variable
62         Multivariate - with full covariance matrix or diagonal only
63
64     Mixture Of Gaussians
65         Learn density function of a mixture of gaussians from data
66         EM algorithm to converge model with data
67
68     Validation
69         Use to select model or parameters of model
70         Simple validation (percentage of data becomes test data)
71         N-Fold validation
72
73     Deep-Network
74         Convolution layers
75         Pooling layers
76         Fully-connected NN layers
77         multi-threaded
78
79     Plotting
80         NSView based MLView for displaying regression data, classification
            data, functions, and classifier areas!
81         UIView based MLView for iOS applications, same as NSView based for
            macOS
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License

This framework is made available with the Apache license.

Contributions

See the contribution document for information on contributing to this framework