fitness_iteration_analysis

October 10, 2020

! pip install mlrose ! pip install sklearn ! pip install numpy ! pip install matplotlib

[1]:
```
import six
import sys
sys.modules['sklearn.externals.six'] = six
import mlrose
from sklearn import preprocessing
from sklearn import metrics
from sklearn.model_selection import train_test_split
import time
import random
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

[2]:
```
def __discrete_iteration_problems(problem,algorithm,length,␣
↪max_iter,max_attempt, init_state, edges=None,coords=None):
    if problem == 'fourpeaks':
        __fit = mlrose.FourPeaks()
        __problem = mlrose.DiscreteOpt(length=length, fitness_fn = __fit,␣
↪maximize=True, max_val=2)
    elif problem == 'kcolor':
        __fit = mlrose.MaxKColor(edges=edges)
        __problem = mlrose.DiscreteOpt(length=length, fitness_fn = __fit,␣
↪maximize=True)
    elif problem == 'flipflop':
        __fit = mlrose.OneMax()
        __problem = mlrose.DiscreteOpt(length=length, fitness_fn = __fit,␣
↪maximize=True, max_val=2)
    elif problem == 'continouspeaks':
        __fit = mlrose.ContinuousPeaks()
        __problem = mlrose.DiscreteOpt(length=length, fitness_fn = __fit,␣
↪maximize=True, max_val=2)
    elif problem == 'travellingsales':
        __fit = mlrose.TravellingSales(coords=coords)
        __problem = mlrose.DiscreteOpt(length=length, fitness_fn = __fit,␣
↪maximize=True, max_val=2)
```

```
    if algorithm == 'random_hill_climb':
        start_time = time.time()
        best_state, best_fitness, best_curve = mlrose.
↪random_hill_climb(__problem, max_iters =␣
↪max_iter,max_attempts=max_attempt,init_state=init_state,curve=True)
        end_time = time.time() - start_time
    elif algorithm == 'simulated_annealing':
        start_time = time.time()
        best_state, best_fitness, best_curve = mlrose.
↪simulated_annealing(__problem, max_iters =␣
↪max_iter,max_attempts=max_attempt,init_state=init_state,curve=True)
        end_time = time.time() - start_time
    elif algorithm == 'genetic_alg':
        start_time = time.time()
        best_state, best_fitness, best_curve = mlrose.genetic_alg(__problem,␣
↪max_iters = max_iter,max_attempts=max_attempt,curve=True)
        end_time = time.time() - start_time
    elif algorithm == 'mimic':
        start_time = time.time()
        best_state, best_fitness, best_curve = mlrose.mimic(__problem,␣
↪max_iters = max_iter,max_attempts=max_attempt,curve=True)
        end_time = time.time() - start_time
    #print(best_curve, end_time)
    return best_curve, end_time
```

[3]:
```
def train_discrete_iteration_problem(problem,␣
↪length=100,max_iter=100000,max_attempt=100):
    __fitness_curve_ = {}
    for algorithm in ['random_hill_climb', 'simulated_annealing',␣
↪'genetic_alg', 'mimic']:
        print(algorithm)
        init_state = np.random.randint(2,size=length)
        best_curve, time = None, None
        if problem == 'flipflop':
            best_curve, time =␣
↪__discrete_iteration_problems(problem,algorithm,length,␣
↪max_iter,max_attempt,init_state, edges=None,coords=None)

        elif problem == 'fourpeaks':
            best_curve, time =␣
↪__discrete_iteration_problems(problem,algorithm,length,␣
↪max_iter,max_attempt,init_state, edges=None,coords=None)

        elif problem == 'kcolor':
            #edge_list = []
```

```
            #while len(edge_list) < i:
            #    new_coord = createNewEdge()
            #    if new_coord not in edge_list:
            #        edge_list.append(new_coord)
            edge_list = []
            edge_list = [(random.randrange(0, length), random.randrange(0,␣
↪length)) for i in range(length)]
            best_curve, time =␣
↪__discrete_iteration_problems(problem,algorithm,length, max_iter,␣
↪max_attempt,init_state, edges=edge_list)

        elif problem == 'continouspeaks':
            best_curve, time =␣
↪__discrete_iteration_problems(problem,algorithm,length,␣
↪max_iter,max_attempt,init_state, edges=None,coords=None)

        elif problem == 'travellingsales':
            coords = [(random.randrange(0, length), random.randrange(0,␣
↪length)) for i in range(length)]
            best_curve, time =␣
↪__discrete_iteration_problems(problem,algorithm,length,␣
↪max_iter,max_attempt,init_state, edges=None,coords=coords)

        __fitness_curve_[algorithm] = {'fitness_curve': best_curve, 'times':␣
↪time}
    return __fitness_curve_
```

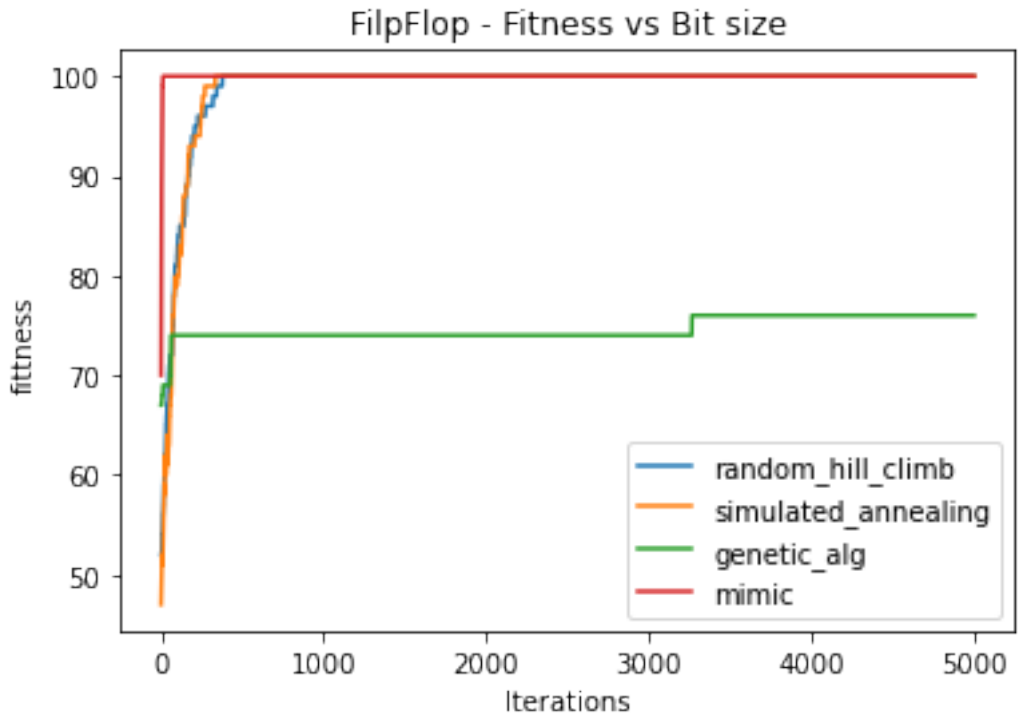
[4]:
```
def plot_discrete_iteration(y_axis,results,x_label,y_label,title,filename):
    [plt.plot(results[algorithm][y_axis],label=algorithm)  for algorithm in␣
↪['random_hill_climb', 'simulated_annealing', 'genetic_alg', 'mimic'] ]
    plt.xlabel(x_label)
    plt.ylabel(y_label)
    plt.title(title)
    plt.legend(loc='best')
    plt.savefig(filename)
    plt.show()
    plt.clf()
```

[5]:
```
__length = 100
__max_iter = 5000
__max_attempt=5000
__fitness_vals = train_discrete_iteration_problem('flipflop',__length,␣
↪__max_iter,__max_attempt)
```

```
random_hill_climb
simulated_annealing
genetic_alg
```

```
mimic
```

[6]:
```
plot_discrete_iteration('fitness_curve',__fitness_vals,'Iterations','fittness','FilpFlop␣
↪- Fitness vs Bit size','flipflop_fitness_iterations2.png')
```

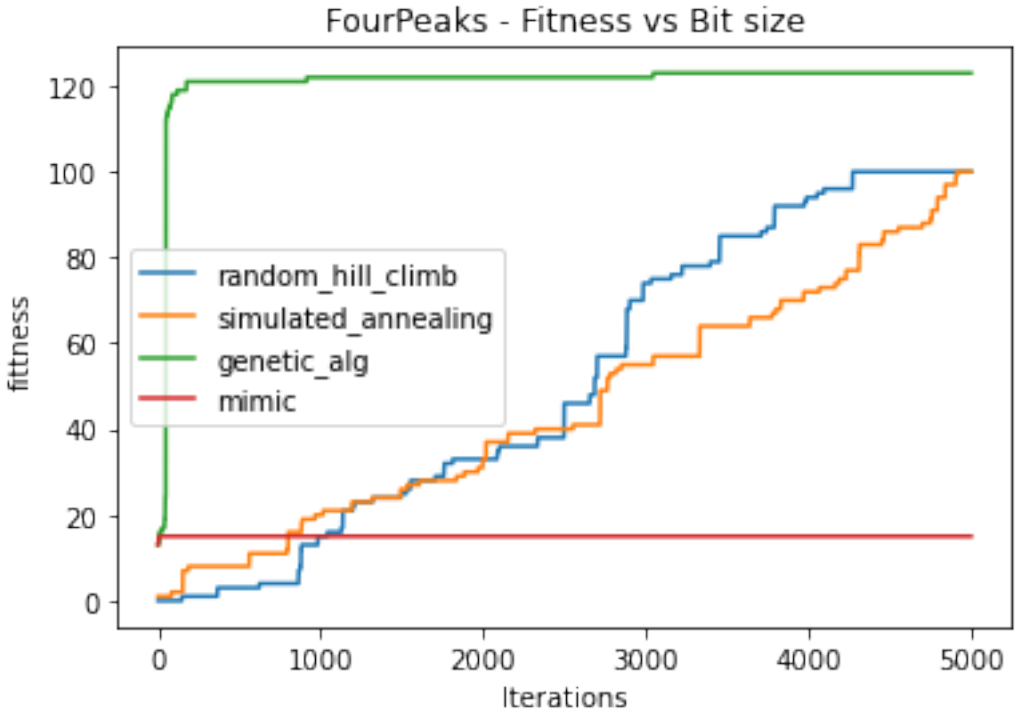



```
<Figure size 432x288 with 0 Axes>
```

[7]:
```
__length = 100
__max_iter = 5000
__max_attempt=5000

__fitness_vals = train_discrete_iteration_problem('fourpeaks',__length,␣
↪__max_iter,__max_attempt)
```

```
random_hill_climb
simulated_annealing

C:\Dev\Anaconda3\envs\VitrualEnv\lib\site-packages\mlrose\algorithms.py:311:
RuntimeWarning: overflow encountered in exp
  prob = np.exp(delta_e/temp)

genetic_alg
mimic
```

[8]:
```
plot_discrete_iteration('fitness_curve',__fitness_vals,'Iterations','fittness','FourPeaks␣
↪- Fitness vs Bit size','fourpeaks_fitness_iterations2.png')
```




```
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```
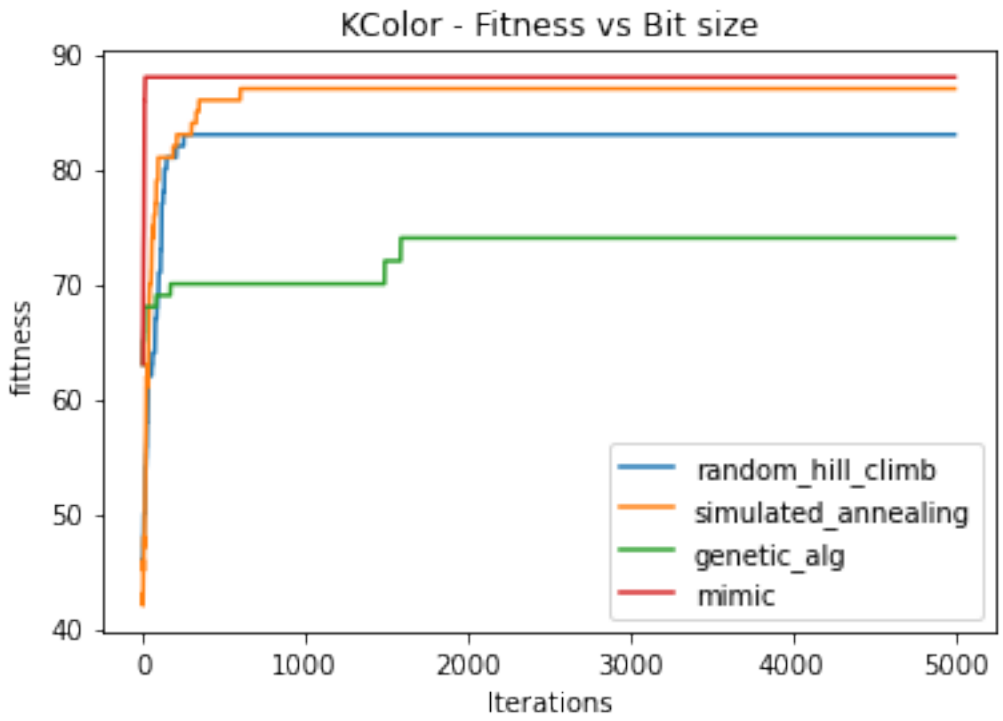

[9]:
```
__length = 100
__max_iter = 5000
__max_attempt=5000

__fitness_vals = train_discrete_iteration_problem('kcolor',__length,␣
↪__max_iter,__max_attempt)
```

```
random_hill_climb
simulated_annealing
genetic_alg
mimic
```

[10]:
```
plot_discrete_iteration('fitness_curve',__fitness_vals,'Iterations','fittness','KColor␣
↪- Fitness vs Bit size','kcolor_fitness_iterations2.png')
```




```
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```
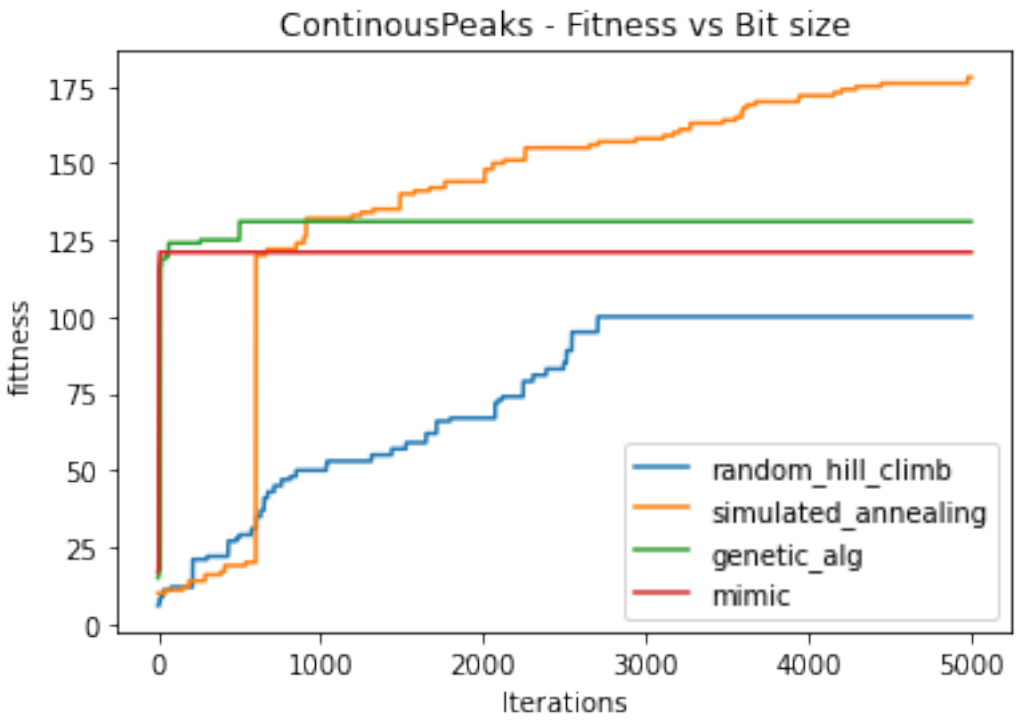

[11]:
```
__length = 100
__max_iter = 5000
__max_attempt=5000

__fitness_vals = train_discrete_iteration_problem('continouspeaks',__length,␣
↪__max_iter,__max_attempt)
```

```
random_hill_climb
simulated_annealing

C:\Dev\Anaconda3\envs\VitrualEnv\lib\site-packages\mlrose\algorithms.py:311:
RuntimeWarning: overflow encountered in exp
  prob = np.exp(delta_e/temp)

genetic_alg
mimic
```

[12]:
```
plot_discrete_iteration('fitness_curve',__fitness_vals,'Iterations','fittness','ContinousPeaks
↪- Fitness vs Bit size','continouspeaks_fitness_iterations2.png')
```




```
<Figure size 432x288 with 0 Axes>
```

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[ ]: