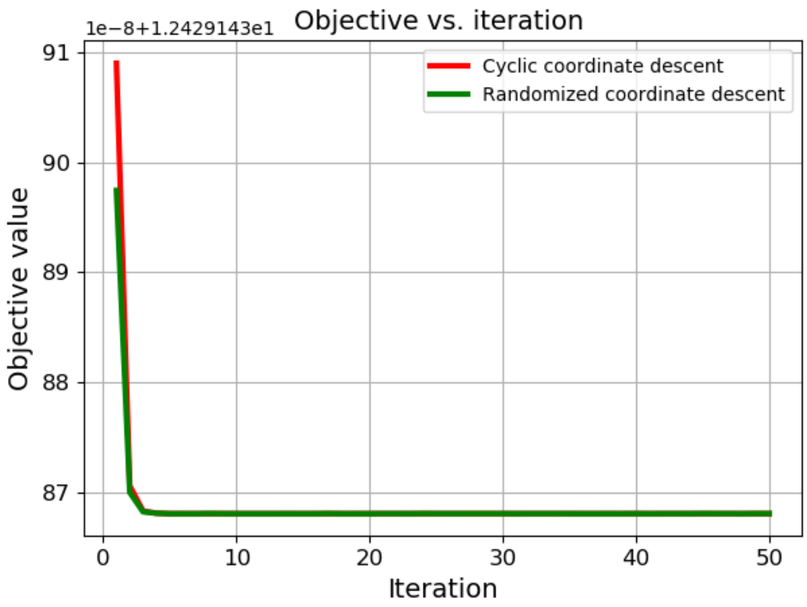
! This class has been made inactive. No posts will be allowed until an instructor reactivates the class.

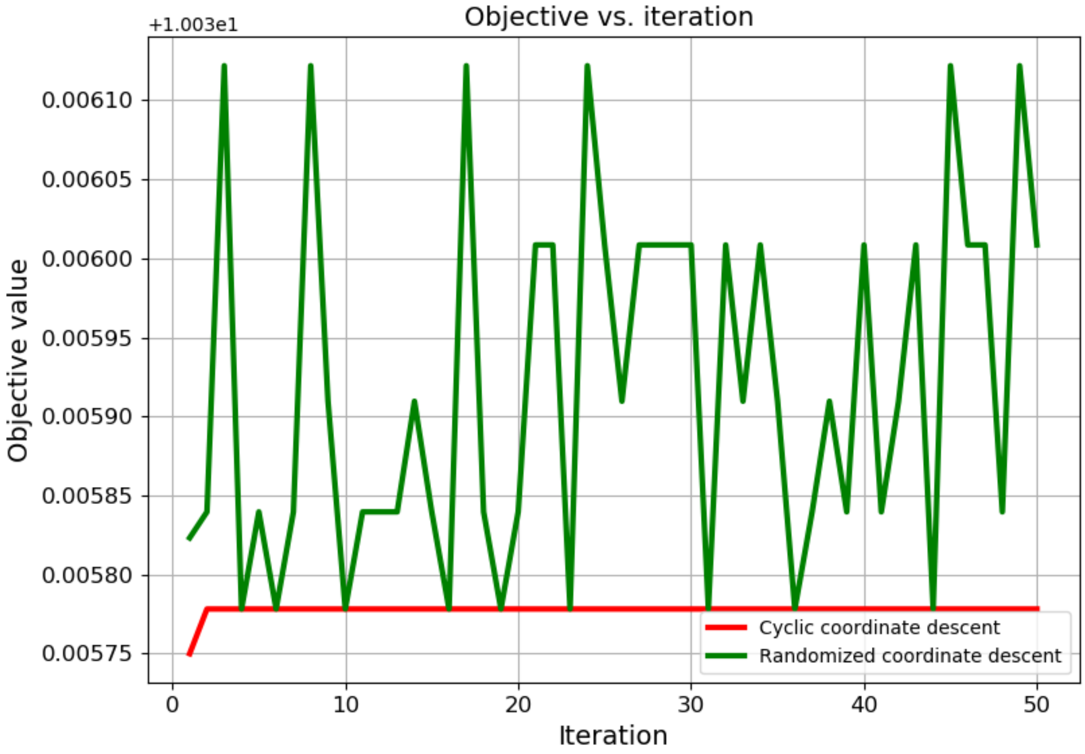
private note @424 5 views

Final Project--CVXPY- 2017310936_Md_Shirajum_Munir

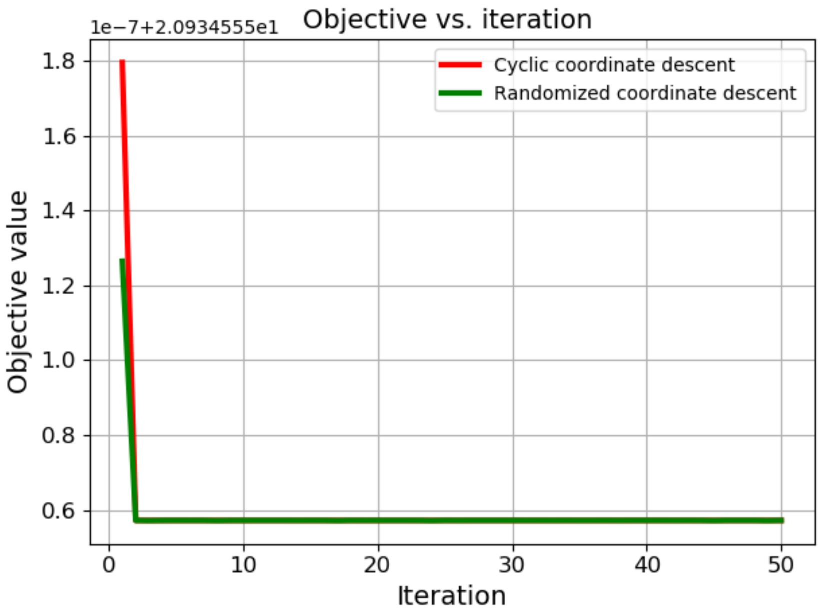
CVXOPT Solver
alpha = 1.0



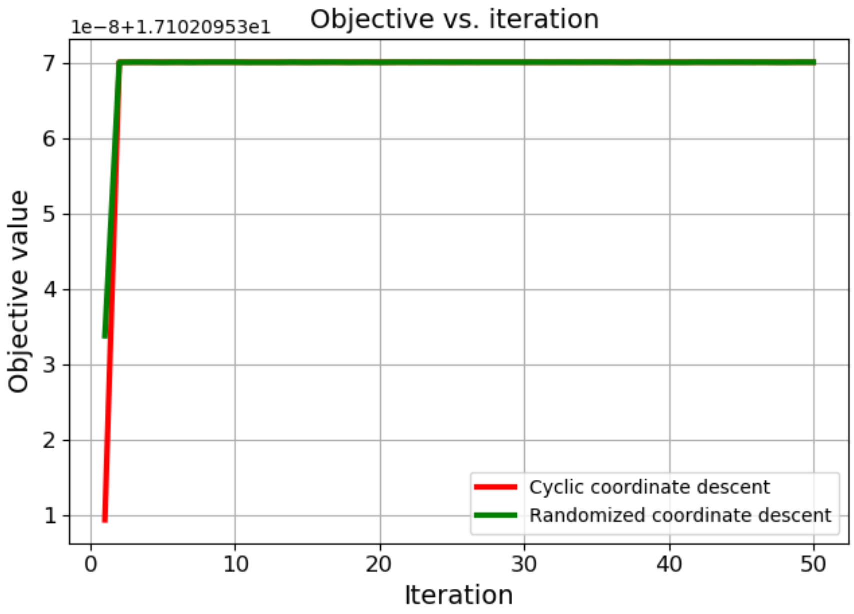
SCS Solver
alpha = 1.0



CVXOPT Solver
alpha = 0.5



CVXOPT Solver
alpha = 0.8



CVXPY Code:

```
import numpy as np
import cvxpy as cvx
import random

random.seed(0)
dim = 50
alpha = 0.5
max_iters = 50

def bsum_main(objective, x, y, block, op_var="x", x_init=None, y_init=None,):

    if op_var == "x":
        constraints = [y == y_init]
        for i in range(len(x_init)):
            if i not in block:
                constraints.append(x[i] == x_init[i])
    else:
        constraints = [x == x_init]
        for i in range(len(y_init)):
            if i not in block:
                constraints.append(y[i] == y_init[i])
    problem = cvx.Problem(objective=objective, constraints=constraints)
    problem.solve("CVXOPT")
    for i in block:
        if op_var == "x":
            x_init[i] = x.value[i]
        else:
            y_init[i] = y.value[i]

    return x, y, problem.objective.args[0].value

x_init = np.zeros((dim, 1), dtype=np.float32)
y_init = np.random.randn(dim, 1)
x = cvx.Variable(dim)
y = cvx.Variable(dim)
x.value = x_init
y.value = y_init
#         minimize    1/2 ||y||^2
#               s.t.    Ax - b = y
ObjectiveFn = (1/(2*alpha)) * cvx.square(cvx.norm(x-y)) +  0.5 * cvx.norm ( x )**2
objective = cvx.Minimize(ObjectiveFn)

block_size = 10
no_of_blocks = int(dim / block_size)
blocks = []
for i in range(no_of_blocks):
    blocks.append([j for j in range(i*block_size, (i*block_size+block_size))])

cyclicObj = []
randomObj = []

for it in range(max_iters):
    for block in blocks:
        x, y, cur_obj = bsum_main(objective, x, y, block, op_var="x", x_init=x_init, y_init=y_init)
    cyclicObj.append(cur_obj)
    print("cyclic iter: " + str(it) + ", obejctive: " + str(cur_obj))
    for j in range(5):
        r = random.randint(0, 4)
        block = blocks[r]
        x, y, cur_obj = bsum_main(objective, x, y, block, op_var="x", x_init=x_init, y_init=y_init)
    randomObj.append(cur_obj)
    print("random iter: " + str(it) + ", obejctive: " + str(cur_obj))

print "cyclicObj = ",cyclicObj
print "randomObj = ",randomObj
```

Figure Code:

```
import matplotlib.pyplot as plt
import numpy as np
t = np.arange(0, 110, 10)
fig, ax = plt.subplots()
ax.plot( range(1, max_iters + 1), cyclicObj, color='r',  lw=3.0, label='Cyclic coordinate descent')
ax.plot(range(1, max_iters + 1), randomObj, color='g', lw=3.0, label='Randomized coordinate descent')
plt.ylabel('Objective value', fontsize = 14)
plt.xlabel('Iteration', fontsize = 14)
plt.legend(loc='best',fontsize = 14)
plt.title('Objective vs. iteration ',fontsize = 14)
ax.grid(True)
ticklines = ax.get_xticklines() + ax.get_yticklines()
gridlines = ax.get_xgridlines()
ticklabels = ax.get_xticklabels() + ax.get_yticklabels()

for line in ticklines:
    line.set_linewidth(3)

for line in gridlines:
    line.set_linestyle('-')

for line in gridlines:
    line.set_linestyle('-')

for label in ticklabels:
    label.set_color('black')
    label.set_fontsize('large')

plt.legend()
plt.show()
```

Sample Output:

```
Output:
CVXOPT Solver
alpha = 1.0
C:\Python27\python.exe "E:/WorkStation/CourseStation/2017/Semester_2/Optimization Theory_CSE710200/Project/pycharm/OPT_Final_Project_Munir.py"
cyclic iter: 0, obejctive: 12.429143909
random iter: 0, obejctive: 12.4291438975
cyclic iter: 1, obejctive: 12.4291438706
```

```
random iter: 1, obejctive: 12.42914387
cyclic iter: 2, obejctive: 12.4291438683
random iter: 2, obejctive: 12.4291438682
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cyclic iter: 4, obejctive: 12.4291438681
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```

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SCS Solver
alpha = 1.0
C:\Python27\python.exe "E:/WorkStation/CourseStation/2017/Semester_2/Optimization Theory_CSE710200/Project/pycharm/OPT_Final_Project_Munir.py"
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Process finished with exit code 0
```

project

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Updated 2 years ago by MD SHIRAJUM MUNIR

followup discussions *for lingering questions and comments*