runTime

September 1, 2021

[4]:
```
import time
from datasets import *
from tqdm.notebook import tqdm
from matplotlib import pyplot as plt
from ftl import FairDecisionTreeClassifier as FDTC
from sklearn.model_selection import StratifiedKFold as SKF
```

[2]:
```
X, y, s  = get_adult_gender()

n_splits = 10
splitter = SKF(n_splits=10, random_state=n_splits, shuffle=True)
ys = [str(y[i]) + str(s[i]) for i in range(len(y))]

tests = []
for train_index, test_index in splitter.split(X, ys):
    tests.append(test_index.tolist())

time_idxs = []
for i in range(len(tests)):
    time_idx = np.array([value for test in tests[:i+1] for value in test])
    time_idxs.append(time_idx)
```

```
        9    0                 1         2          3     4  \
0    Male  2.0         State-gov   77516.0  Bachelors  13.0
1    Male  3.0  Self-emp-not-inc   83311.0  Bachelors  13.0
2    Male  2.0           Private  215646.0    HS-grad   9.0
3    Male  3.0           Private  234721.0       11th   7.0
4  Female  1.0           Private  338409.0  Bachelors  13.0

                    5                  6              7   10   11   12  \
0       Never-married       Adm-clerical  Not-in-family  1.0  0.0  2.0
1  Married-civ-spouse    Exec-managerial        Husband  0.0  0.0  0.0
2           Divorced  Handlers-cleaners  Not-in-family  0.0  0.0  2.0
3  Married-civ-spouse  Handlers-cleaners        Husband  0.0  0.0  2.0
4  Married-civ-spouse     Prof-specialty           Wife  0.0  0.0  2.0

              13  class
```

```
0  United-States  <=50K
1  United-States  <=50K
2  United-States  <=50K
3  United-States  <=50K
4           Cuba  <=50K
```

```
X shape: (45222, 12)
X_dummy shape: (45222, 97)
y dist: [0.75215603 0.24784397]
s dist: [0.67504754 0.32495246]
```

[11]:
```
methods = ["auc_sub", "kamiran_sub"]
methods_times = []
for method in methods:
    method_times = []
    for time_idx in tqdm(time_idxs, desc=method):

        clf = FDTC(
            n_bins = 10,
            max_depth = 4,
            bootstrap=False,
            criterion=method,
            max_features=1.0,
        )

        time_start = time.perf_counter()
        clf.fit(X[time_idx], y[time_idx], s[time_idx])
        timer = time.perf_counter() - time_start

        method_times.append(timer)
    methods_times.append(np.array(method_times))
```

```
auc_sub:   0%|          | 0/10 [00:00<?, ?it/s]
```

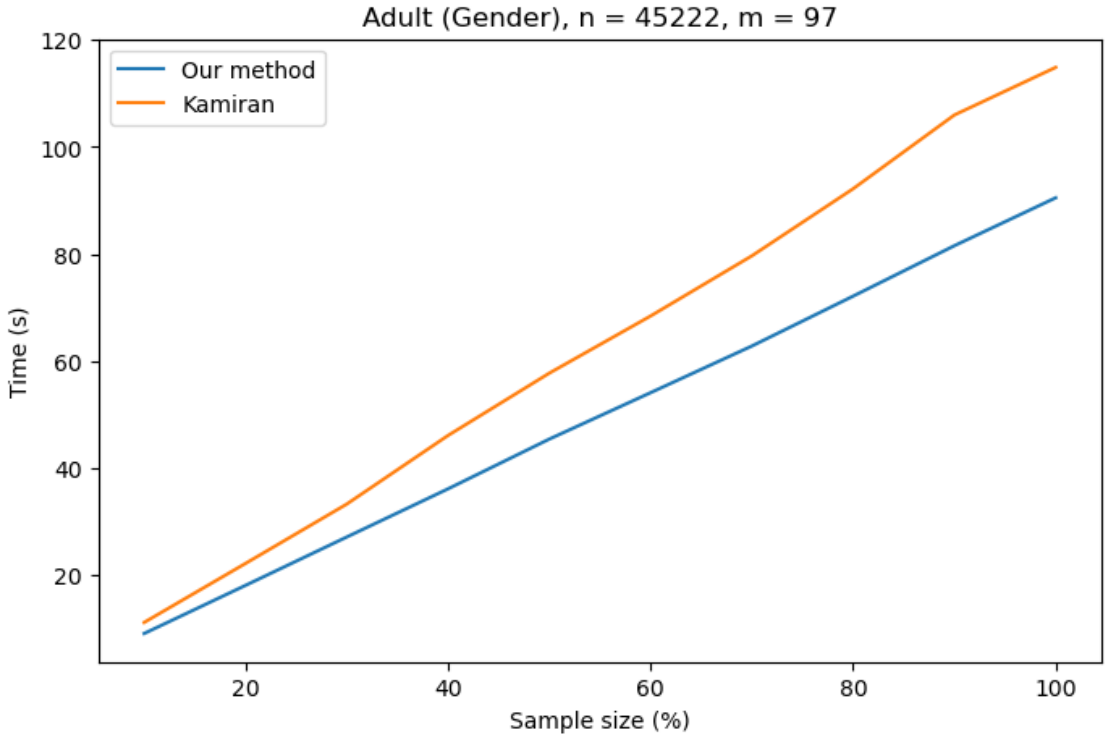
```
kamiran_sub:   0%|          | 0/10 [00:00<?, ?it/s]
```

[13]:
```
fig, ax = plt.subplots(1,1, dpi=100, figsize=(8,5))

ax.plot(
    np.array(range(1,11))*10,
    methods_times[0],
)

ax.plot(
    np.array(range(1,11))*10,
    methods_times[1],
)
```

```
ax.set_ylabel("Time (s)")
ax.set_xlabel("Sample size (%)")
ax.legend(["Our method", "Kamiran"])
ax.set_title("Adult (Gender), n = 45222, m = 97")
plt.show()
```



[16]:
```
methods = ["auc_sub", "kamiran_sub"]
methods_times = []
for method in methods:
    method_times = []
    for d in tqdm(range(1,11), desc=method):

        clf = FDTC(
            n_bins = 10,
            max_depth = d,
            bootstrap=False,
            criterion=method,
            max_features=1.0,
        )

        time_start = time.perf_counter()
        clf.fit(X[time_idxs[0]], y[time_idxs[0]], s[time_idxs[0]])
        timer = time.perf_counter() - time_start
```

```
        method_times.append(timer)
    methods_times.append(np.array(method_times))
```

```
auc_sub:   0%|          | 0/10 [00:00<?, ?it/s]
```

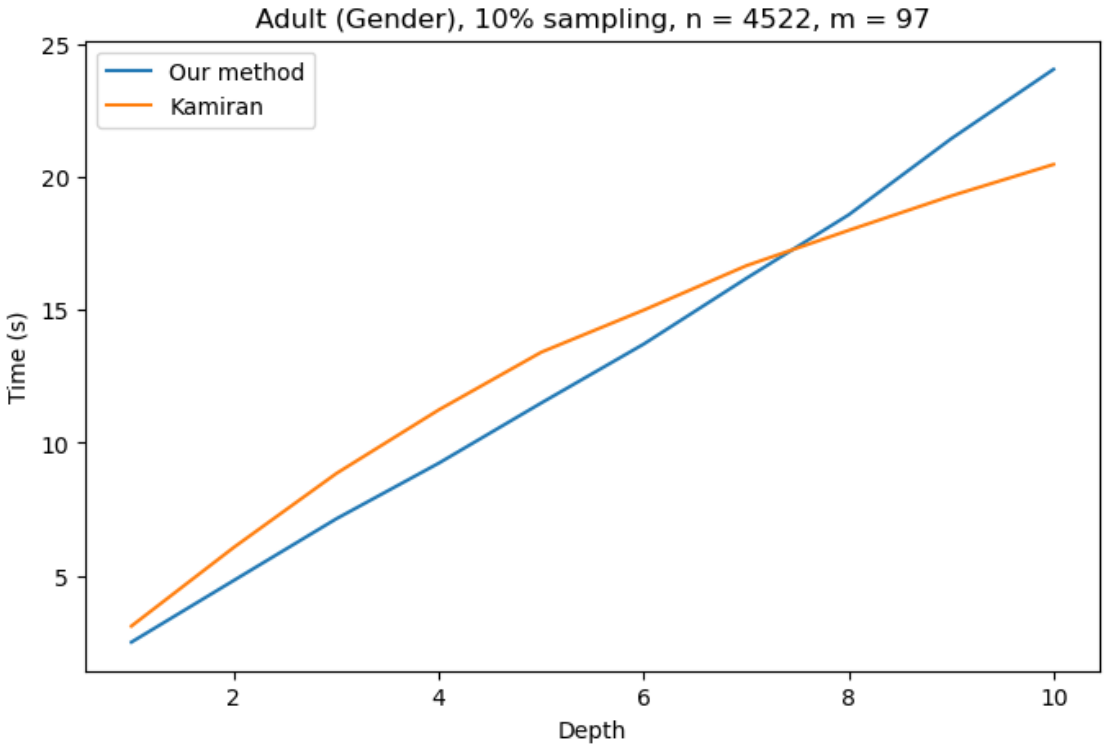
```
kamiran_sub:   0%|          | 0/10 [00:00<?, ?it/s]
```

[18]:
```
fig, ax = plt.subplots(1,1, dpi=100, figsize=(8,5))

ax.plot(
    np.array(range(1,11)),
    methods_times[0],
)

ax.plot(
    np.array(range(1,11)),
    methods_times[1],
)

ax.set_ylabel("Time (s)")
ax.set_xlabel("Depth")
ax.legend(["Our method", "Kamiran"])
ax.set_title("Adult (Gender), 10% sampling, n = 4522, m = 97")
plt.show()
```



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