Dataset and Learning

Variable	Description
1. nim	Unique identifier
2. sex	(1 = L; 2 = P)
3. kota_asal	(1 = Semarang; 2 = Luar Semarang)
4. jml_ajuan_cuti	(1 = Pernah Cuti, 2 = Tidak Pernah Cuti)
5. jml_tunggakan	(1 = Pernah Ada Tunggakan, 2 = Tidak Pernah Ada Tunggakan)
6. usia	(1 = kurang dari sama dengan 21 tahun, 2 = 22 sampai 25 tahun, 3 = diatas usia 25 tahun)
7. beasiswa	(1 = Menerima beasiswa, 2 = Tidak Pernah Menerima Beasiswa)
8. marital	(1 = sudah menikah, 2 = belum menikah)
9. jml_aktivitas_kemahasiswaan	(1 = aktif mengikuti , 2 = tidak memiliki aktivitas kemahasiswaan)
10. jml_prestasi	(1 = mempunyai piagam penghargaan, 2 = tidak punya piagam)
11. ips	(Nilai Index Prestasi semester >>> 1 = IPS kurang dari 2, 2 = IPS >2 dan kurang dari 3, 3 = IPS lebih dari 3)
12. label	(1 = Lulus kurang dari sama dengan 8 Semester, 2 = Lulus lebih dari 8 Semester)

Dataset : 2293 Records (Data Mahasiswa Lulus Prodi A11 Tahun masuk 2012 – 2017)

Label 1 : 1356 (Tahun Masuk 2012 – 2017; Masa Studi 38 – 50 Bulan)
Label 2 : 937 (Tahun masuk 2012 – 2016; Masa Studi 52 – 88 Bulan)

Data lengkap : ***siadin.xlsx***
Data terfilter : ***siadin_a11-fs.csv***
Dump SQL : ***siadin_klasifikasi.sql***

Catatan lain-lain
Percobaan 1 atribut IPS hanya sampai dengan IPS 4

Lampiran

Catatan : ditemukan beberapa anomaly lulus kurang dari 2 tahun
(dilakukan proses filter data hanya diambil data minimal 38 bulan masa studi), indikasi adanya salah input operator SIADIN.

StatistikLulusanTahunMasuk

tgl_yud	thn_masuk	masa_studi_bulan	masa_studi_tahun	jml_mhs
2014-03-10	2012	18	1	1
2015-08-11	2013	23	1	1
2014-11-03	2012	26	2	1
2021-01-01	2018	28	2	1
2019-03-01	2016	30	2	4
2017-03-30	2014	31	2	2
2019-06-28	2016	33	2	1
2015-07-29	2012	34	2	1
2020-08-26	2017	35	2	4
2019-11-12	2016	38	3	3
2021-01-01	2017	40	3	71
2020-02-14	2016	41	3	96
2019-03-01	2015	42	3	123
2017-03-30	2013	43	3	43
2019-05-27	2015	44	3	2
2019-06-28	2015	45	3	36
2020-07-24	2016	46	3	144
2020-08-12	2016	47	3	518
2019-11-12	2015	50	4	320
2021-01-01	2016	52	4	135
2020-02-26	2015	53	4	40
2019-03-01	2014	54	4	100
2017-03-30	2012	55	4	83
2019-05-27	2014	56	4	1
2019-06-28	2014	57	4	8
2020-07-24	2015	58	4	11
2020-08-12	2015	59	4	125
2019-11-12	2014	62	5	90
2021-01-01	2015	64	5	16
2020-02-26	2014	65	5	23
2019-03-08	2013	66	5	43
2019-06-28	2013	69	5	9
2020-07-24	2014	70	5	5
2020-08-12	2014	71	5	47
2019-11-12	2013	74	6	38
2021-01-01	2014	76	6	15
2020-02-26	2013	77	6	18
2019-03-08	2012	78	6	28
2019-06-28	2012	81	6	4
2020-07-24	2013	82	6	2
2020-08-26	2013	83	6	67
2019-11-12	2012	86	7	28
2021-01-01	2013	88	7	1

#1 Feature Selection

Hasil Eksperimen seleksi fitur :

Dari penelitian yang dilakukan proses seleksi fitur tidak menambah nilai akurasi, atribut lengkap (**13** Atribut) tetap memiliki nilai akurasi yang lebih baik.

Library :

```
import numpy as np
import pandas as pd
from sklearn.ensemble import RandomForestClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score as acc
from mlxtend.feature_selection import SequentialFeatureSelector as sfs
```

Data training dan testing:

```
Training dataset shape: (1719, 13) (1719,)
Testing dataset shape: (574, 13) (574,)
```

Atribut:

```
Data columns (total 14 columns):
 #   Column                        Non-Null Count  Dtype
---  ------                        --------------  -----
 0   sex                           2293 non-null   int64
 1   kota_asal                     2293 non-null   int64
 2   jml_ajuan_cuti                2293 non-null   int64
 3   jml_tunggakan                 2293 non-null   int64
 4   usia                          2293 non-null   int64
 5   beasiswa                      2293 non-null   int64
 6   marital                       2293 non-null   int64
 7   jml_aktivitas_kemahasiswaan   2293 non-null   int64
 8   jml_prestasi                  2293 non-null   int64
 9   ips1                          2293 non-null   int64
 10  ips2                          2293 non-null   int64
 11  ips3                          2293 non-null   int64
 12  ips4                          2293 non-null   int64
 13  label                         2293 non-null   int64
dtypes: int64(14)
memory usage: 250.9 KB
```

Akurasi (Data Testing 25%) – Full Atribut

```
Training accuracy on all features: 0.741
Testing accuracy on all features: 0.774
```

Setting

Random Forest (random_state = 1, max_depth=4)

Proses Klasifikasi

`RandomForestClassifier`

Seleksi Atribut

`SequentialFeatureSelection`

Direction

`forward` (*Sequential Forward Selection*)

Cross Validator

`cv=5`

Kombinasi 5 Atribut Terbaik :

```
[2, 5, 6, 7, 12]
Training accuracy on selected features: 0.724
Testing accuracy on selected features: 0.709
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    2.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  13 out of  13 | elapsed:    9.0s finished

[2021-10-15 11:11:33] Features: 1/5 -- score: 0.7097159129432503[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
```

```
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  12 out of  12 | elapsed:    6.5s finished

[2021-10-15 11:11:39] Features: 2/5 -- score: 0.716121431961489[Parallel(n_jobs=1)]: Using backen
d SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  11 out of  11 | elapsed:    6.0s finished

[2021-10-15 11:11:46] Features: 3/5 -- score: 0.7178622279476575[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  10 out of  10 | elapsed:    5.6s finished

[2021-10-15 11:11:51] Features: 4/5 -- score: 0.7184436232964948[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   9 out of   9 | elapsed:    5.4s finished

[2021-10-15 11:11:56] Features: 5/5 -- score: 0.7190233236151603
```

Kombinasi 6 Atribut Terbaik :

```
[1, 2, 4, 6, 7, 12]
Training accuracy on selected features: 0.721
Testing accuracy on selected features: 0.735
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  13 out of  13 | elapsed:    8.0s finished

[2021-10-15 11:23:18] Features: 1/6 -- score: 0.7097159129432503[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  12 out of  12 | elapsed:    6.9s finished

[2021-10-15 11:23:25] Features: 2/6 -- score: 0.7155400366126518[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  11 out of  11 | elapsed:    6.4s finished

[2021-10-15 11:23:31] Features: 3/6 -- score: 0.7178605329174859[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  10 out of  10 | elapsed:    5.7s finished

[2021-10-15 11:23:37] Features: 4/6 -- score: 0.7184419282663231[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   9 out of   9 | elapsed:    5.4s finished

[2021-10-15 11:23:42] Features: 5/6 -- score: 0.7207692046918435[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   8 out of   8 | elapsed:    4.7s finished

[2021-10-15 11:23:47] Features: 6/6 -- score: 0.7207692046918435
```

Kombinasi 7 Atribut Terbaik :

```
[1, 2, 3, 5, 6, 7, 12]
Training accuracy on selected features: 0.725
Testing accuracy on selected features: 0.713
```

```
Training accuracy on selected features: 0.725
Testing accuracy on selected features: 0.713
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  13 out of  13 | elapsed:    7.0s finished

[2021-10-15 11:27:27] Features: 1/7 -- score: 0.7097159129432503[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  12 out of  12 | elapsed:    6.4s finished

[2021-10-15 11:27:34] Features: 2/7 -- score: 0.716121431961489[Parallel(n_jobs=1)]: Using backen
d SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  11 out of  11 | elapsed:    6.0s finished

[2021-10-15 11:27:40] Features: 3/7 -- score: 0.7184436232964948[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  10 out of  10 | elapsed:    5.4s finished

[2021-10-15 11:27:45] Features: 4/7 -- score: 0.717863922977829[Parallel(n_jobs=1)]: Using backen
d SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n jobs=1)]: Done   9 out of   9 | elapsed:    4.9s finished

[2021-10-15 11:27:50] Features: 5/7 -- score: 0.7201895043731779[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
```

```
[Parallel(n_jobs=1)]: Done   8 out of   8 | elapsed:    4.3s finished

[2021-10-15 11:27:54] Features: 6/7 -- score: 0.7201878093430063[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   7 out of   7 | elapsed:    3.8s finished

[2021-10-15 11:27:58] Features: 7/7 -- score: 0.7213522950708522
```

Kombinasi 8 Atribut Terbaik :

```
[1, 2, 3, 4, 5, 6, 7, 12]
Training accuracy on selected features: 0.720
Testing accuracy on selected features: 0.728
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    2.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  13 out of  13 | elapsed:   10.2s finished

[2021-10-15 14:14:11] Features: 1/8 -- score: 0.7097159129432503[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  12 out of  12 | elapsed:    7.8s finished

[2021-10-15 14:14:18] Features: 2/8 -- score: 0.716121431961489[Parallel(n_jobs=1)]: Using backen
d SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  11 out of  11 | elapsed:    7.4s finished

[2021-10-15 14:14:26] Features: 3/8 -- score: 0.7184436232964948[Parallel(n jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  10 out of  10 | elapsed:    6.5s finished

[2021-10-15 14:14:32] Features: 4/8 -- score: 0.7213489050105092[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   9 out of   9 | elapsed:    5.8s finished

[2021-10-15 14:14:38] Features: 5/8 -- score: 0.7190233236151603[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   8 out of   8 | elapsed:    5.0s finished

[2021-10-15 14:14:43] Features: 6/8 -- score: 0.7207675096616719[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   7 out of   7 | elapsed:    4.5s finished

[2021-10-15 14:14:48] Features: 7/8 -- score: 0.7201861143128349[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   6 out of   6 | elapsed:    4.0s finished

[2021-10-15 14:14:52] Features: 8/8 -- score: 0.7178605329174859
```

Kombinasi 9 Atribut Terbaik :

```
[1, 2, 3, 4, 5, 6, 7, 9, 12]
Training accuracy on selected features: 0.722
Testing accuracy on selected features: 0.740
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  13 out of  13 | elapsed:    7.1s finished

[2021-10-15 14:00:58] Features: 1/9 -- score: 0.7097159129432503[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  12 out of  12 | elapsed:    7.2s finished

[2021-10-15 14:01:06] Features: 2/9 -- score: 0.716121431961489[Parallel(n_jobs=1)]: Using backen
d SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  11 out of  11 | elapsed:    6.8s finished

[2021-10-15 14:01:12] Features: 3/9 -- score: 0.7184436232964947[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.8s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  10 out of  10 | elapsed:    7.7s finished

[2021-10-15 14:01:20] Features: 4/9 -- score: 0.7207658146315005[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n jobs=1)]: Done   9 out of   9 | elapsed:    5.5s finished

[2021-10-15 14:01:25] Features: 5/9 -- score: 0.7196064139941691[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.8s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   8 out of   8 | elapsed:    6.0s finished

[2021-10-15 14:01:31] Features: 6/9 -- score: 0.7213506000406806[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   7 out of   7 | elapsed:    4.8s finished
```

```
[2021-10-15 14:01:36] Features: 7/9 -- score: 0.7225133907383551[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   6 out of   6 | elapsed:    4.6s finished

[2021-10-15 14:01:41] Features: 8/9 -- score: 0.7178605329174859[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.8s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   5 out of   5 | elapsed:    3.5s finished

[2021-10-15 14:01:44] Features: 9/9 -- score: 0.7178520577666282
```

Kombinasi 10 Atribut Terbaik :

```
[1, 2, 3, 4, 5, 6, 7, 8, 9, 12]
Training accuracy on selected features: 0.721
Testing accuracy on selected features: 0.740
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  13 out of  13 | elapsed:    7.2s finished

[2021-10-15 11:30:29] Features: 1/10 -- score: 0.7097159129432503[Parallel(n jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  12 out of  12 | elapsed:    6.9s finished

[2021-10-15 11:30:36] Features: 2/10 -- score: 0.716121431961489[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  11 out of  11 | elapsed:    6.2s finished

[2021-10-15 11:30:43] Features: 3/10 -- score: 0.7178622279476575[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  10 out of  10 | elapsed:    5.8s finished

[2021-10-15 11:30:48] Features: 4/10 -- score: 0.7213489050105092[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n jobs=1)]: Done   9 out of   9 | elapsed:    5.4s finished

[2021-10-15 11:30:54] Features: 5/10 -- score: 0.7207658146315005[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   8 out of   8 | elapsed:    5.1s finished

[2021-10-15 11:30:59] Features: 6/10 -- score: 0.7213506000406806[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   7 out of   7 | elapsed:    4.4s finished

[2021-10-15 11:31:03] Features: 7/10 -- score: 0.7207675096616719[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   6 out of   6 | elapsed:    3.7s finished

[2021-10-15 11:31:07] Features: 8/10 -- score: 0.7207692046918435[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   5 out of   5 | elapsed:    2.8s finished

[2021-10-15 11:31:10] Features: 9/10 -- score: 0.7190148484643026[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   4 out of   4 | elapsed:    2.4s finished

[2021-10-15 11:31:12] Features: 10/10 -- score: 0.713199199945759
```

Kombinasi 11 Atribut Terbaik :

```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 12]
Training accuracy on selected features: 0.725
Testing accuracy on selected features: 0.742
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  13 out of  13 | elapsed:    7.0s finished

[2021-10-15 13:57:06] Features: 1/11 -- score: 0.7097159129432503[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  12 out of  12 | elapsed:    6.5s finished

[2021-10-15 13:57:12] Features: 2/11 -- score: 0.716121431961489[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  11 out of  11 | elapsed:    5.9s finished

[2021-10-15 13:57:18] Features: 3/11 -- score: 0.7184436232964948[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  10 out of  10 | elapsed:    5.7s finished
```

```
[2021-10-15 13:57:24] Features: 4/11 -- score: 0.7207658146315005[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   9 out of   9 | elapsed:    5.1s finished

[2021-10-15 13:57:29] Features: 5/11 -- score: 0.7219319953895178[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   8 out of   8 | elapsed:    4.6s finished

[2021-10-15 13:57:33] Features: 6/11 -- score: 0.7219319953895179[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   7 out of   7 | elapsed:    3.9s finished

[2021-10-15 13:57:37] Features: 7/11 -- score: 0.7225184758288699[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   6 out of   6 | elapsed:    3.4s finished

[2021-10-15 13:57:41] Features: 8/11 -- score: 0.7195979388433115[Parallel(n jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   5 out of   5 | elapsed:    2.9s finished

[2021-10-15 13:57:44] Features: 9/11 -- score: 0.7201776391619772[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   4 out of   4 | elapsed:    2.7s finished

[2021-10-15 13:57:46] Features: 10/11 -- score: 0.715528171401451[Parallel(n jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   3 out of   3 | elapsed:    1.9s finished

[2021-10-15 13:57:48] Features: 11/11 -- score: 0.7132059800664452
```

Kombinasi 12 Atribut Terbaik :

```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12]
Training accuracy on selected features: 0.732
Testing accuracy on selected features: 0.765
```

```
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    2.3s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  13 out of  13 | elapsed:    8.8s finished

[2021-10-15 13:49:54] Features: 1/12 -- score: 0.7097159129432503[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  12 out of  12 | elapsed:    7.0s finished

[2021-10-15 13:50:01] Features: 2/12 -- score: 0.716121431961489[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  11 out of  11 | elapsed:    6.4s finished

[2021-10-15 13:50:07] Features: 3/12 -- score: 0.717860532917486[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done  10 out of  10 | elapsed:    5.5s finished

[2021-10-15 13:50:13] Features: 4/12 -- score: 0.7213489050105092[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   9 out of   9 | elapsed:    5.1s finished

[2021-10-15 13:50:18] Features: 5/12 -- score: 0.7225133907383551[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   8 out of   8 | elapsed:    4.9s finished

[2021-10-15 13:50:23] Features: 6/12 -- score: 0.7207692046918435[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.5s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   7 out of   7 | elapsed:    3.8s finished

[2021-10-15 13:50:27] Features: 7/12 -- score: 0.7201861143128347[Parallel(n jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   6 out of   6 | elapsed:    3.6s finished

[2021-10-15 13:50:30] Features: 8/12 -- score: 0.7207692046918435[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   5 out of   5 | elapsed:    3.0s finished

[2021-10-15 13:50:33] Features: 9/12 -- score: 0.7195996338734829[Parallel(n_jobs=1)]: Using back
end SequentialBackend with 1 concurrent workers.
[Parallel(n jobs=1)]: Done   1 out of   1 | elapsed:    0.6s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   4 out of   4 | elapsed:    2.6s finished

[2021-10-15 13:50:36] Features: 10/12 -- score: 0.71843853820598[Parallel(n_jobs=1)]: Using backe
nd SequentialBackend with 1 concurrent workers.
```

```
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   3 out of   3 | elapsed:    1.9s finished

[2021-10-15 13:50:38] Features: 11/12 -- score: 0.7126364499288087[Parallel(n_jobs=1)]: Using bac
kend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done   1 out of   1 | elapsed:    0.7s remaining:    0.0s
[Parallel(n_jobs=1)]: Done   2 out of   2 | elapsed:    1.3s finished

[2021-10-15 13:50:39] Features: 12/12 -- score: 0.702742558817547
```

#2 Metode Klasifikasi

Atribut
feature_cols *= ['sex', 'kota_asal', 'jml_ajuan_cuti', 'jml_tunggakan', 'usia', 'beasiswa', 'marital', 'jml_aktivitas_kemahasiswaan', 'jml_prestasi', 'ips1', 'ips2', 'ips3','ips4']*

Setting Parameter :
- *random_state=1*
- *test_size:0,25 (Data Testing 25%)*

Nilai Akurasi :
- Naïve Bayes : **0.7073**
- Random Forest : **0.7300**
- D.Tree : **0.7247**
- KNN : **0.7177**
- SVM : **0.6637**

Teknik Klasifikasi Terpilih (Sementara)
Random Forest (random_state = 42, max_depth=4) : **0.7735**

#3 Proses Eksekusi Data Mahasiswa Semester 5 (Mahasiswa tahun masuk 2019)

Data Mahasiswa A11 Tahun masuk 2019 = 682 Records (test_final.csv)
Random Forest (random_state = 42, max_depth=4)

Hasil : result-final.csv
[Label, nim]

1, 6542
1, 6546
1, 6547
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2, 6553
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2, 9916
1, 9928
2, 9930

Resume :
Jumlah Records MHS Tahun masuk 2019 : 682 Records
Label 1 : 571
Label 2 : 111

Kesimpulan : perlu dilakukan perhatian khusus untuk 111 mahasiswa yang terprediksi masa studi lebih dari 8 semester pada semester 5 ini.

Catatan : sebelum eksekusi dilakukan sample testing untuk 100 record data training dengan label 1, didapatkan 91 data masuk kelas 1, 9 data masuk kelas 2 (akurasi 91 %)

#4 D.Tree Rules

Eksperimen 1 : Default (DecisionTreeClassifier()) – sklearn
Rule : siadin_2021-Tree-GINI.log & siadin_2021-Tree-GINI-ifelse.log
Tree : siadin_2021-Tree-GINI.png

```
Accuracy: 0.7299651567944251
Confusion matrix:
[[257  73]
 [ 82 162]]
```

Eksperimen 2 : Default (DecisionTreeClassifier(max_depth = 5)) – sklearn

Rule : siadin_2021-Tree-GINI-max_depth-5.log & siadin_2021-Tree-GINI-max_depth-5-ifelse.log
Tree : siadin_2021-Tree-GINI-max_depth-5.png

```
Accuracy: 0.7299651567944251
[[257  73]
 [ 82 162]]
```

Eksperimen 3 : (DecisionTreeClassifier(criterion='entropy')) – sklearn
Rule : siadin_2021-Tree-ENTROPY.log & siadin_2021-Tree-ENTROPY-ifelse.log
Tree : siadin_2021-Tree-ENTROPY.png

```
Accuracy: 0.7229965156794426
Confusion Matrix
[[269  61]
 [ 98 146]]
```

Eksperimen 4 : (DecisionTreeClassifier(criterion='entropy' max_depth = 5)) – sklearn
Rule : siadin_2021-Tree-ENTROPI-max_depth-5.log & siadin_2021-Tree-ENTROPI-max_depth-5-ifelse.log
Tree : siadin_2021-Tree-ENTROPI-max_depth-5.png

```
Accuracy: 0.7160278745644599
Confusin Matrix
[[265  65]
 [ 98 146]]
```

#5 Fitur Aplikasi

Variable	Description
1. nim	Unique identifier
2. sex	(1 = L; 2 = P)
3. kota_asal	(1 = Semarang; 2 = Luar Semarang)
4. jml_ajuan_cuti	(1 = Pernah Cuti, 2 = Tidak Pernah Cuti)
5. jml_tunggakan	(1 = Pernah Ada Tunggakan, 2 = Tidak Pernah Ada Tunggakan)
6. usia	(1 = kurang dari sama dengan 21 tahun, 2 = 22 sampai 25 tahun, 3 = diatas usia 25 tahun)
7. beasiswa	(1 = Menerima beasiswa, 2 = Tidak Pernah Menerima Beasiswa)
8. marital	(1 = sudah menikah, 2 = belum menikah)
9. jml_aktivitas_kemahasiswaan	(1 = aktif mengikuti , 2 = tidak memiliki aktivitas kemahasiswaan)
10. jml_prestasi	(1 = mempunyai piagam penghargaan, 2 = tidak punya piagam)
11. ips	(Nilai Index Prestasi semester >>> 1 = IPS kurang dari 2, 2 = IPS >2 dan kurang dari 3, 3 = IPS lebih dari 3)
12. label	(1 = Lulus kurang dari sama dengan 8 Semester, 2 = Lulus lebih dari 8 Semester)

1. Login : Admin (Perumpamaan Login Prodi)
2. Halaman Dashboard (Data Grafis umum : Jumlah MHS A11 per tahun Angkatan dan Status kelulusan – tgl_yud terisi = sudah lulus) > Tahun masuk 2012 - 2021
3. Menu Data Mahasiswa A11 Full Lengkap (dalam bentuk List) pakai nim samara tidak masalah (nim counter), Filter pencarian berdasarkan NIM, Tahun Masuk. > Tahun masuk 2012 - 2021
4. Menu Tampilan Statistik Data dengan rincian sbb :
    a. Jumlah Mahasiswa berdasarkan tahun masuk dan status kelulusan (lulus tidak lulus)
    b. Jumlah mahasiswa berdasarkan tahun masuk dan sex (2)
    c. Jumlah mahasiswa berdasarkan tahun masuk dan kota asal (3)
    d. Jumlah mahasiswa berdasarkan tahun masuk dan jumlah ajuan cuti (4)
    e. Jumlah mahasiswa berdasarkan tahun masuk dan jumlah tunggakan (5)
    f. Jumlah mahasiswa berdasarkan tahun masuk dan usia (6)
    g. Jumlah mahasiswa berdasarkan tahun masuk dan beasiswa (7)
    h. Jumlah mahasiswa berdasarkan tahun masuk dan marital (8)
    i. Jumlah mahasiswa berdasarkan tahun masuk dan jml aktifitas kemahasiswaan (9)
    j. Jumlah mahasiswa berdasarkan tahun masuk dan jml prestasi (10)

k. Jumlah mahasiswa berdasarkan tahun masuk dan ips 1 (11)
l. Jumlah mahasiswa berdasarkan tahun masuk dan ips 2 (12)
m. Jumlah mahasiswa berdasarkan tahun masuk dan ips 3 (13)
n. Jumlah mahasiswa berdasarkan tahun masuk dan ips 4 (14)

Contoh format :

Angka bisa diklik muncul detail nyambung point 2.

No	Thn Masuk	Status Lulus		Jenis kelamin		Kota Asal		Jumlah Cuti		dst…
		Lulus	Belum	L	P	Dalam Kota	Luar Kota	Pernah Cuti	Belum Pernah	
1	2012									
2	2013									
3	2014									
4	2015									
5	2016									
dst…										

5. Menu Prediksi Mahasiswa Tahun masuk 2019
   Angka bisa di klik muncul detail data

Prediksi	Jenis kelamin		Kota Asal		Jumlah Cuti		dst…
	L	P	Dalam Kota	Luar Kota	Pernah Cuti	Belum Pernah	
<= 8 Sm							
> 8 SM							