Test Cases

```
[9] df.sample(10)
```

	PS1	PS3	PS4	PS5	FS1	FS2	TS1	P1	VS1	CE1	CP1	SE1	leakage	valve	cooler	accumulator	rul	label1
1879	160.565385	1.948675	10.098277	9.866102	6.523953	10.176417	36.169700	2553.126133	0.546517	46.979367	2.161217	57.167967	1	100	100	115	0.000000	1
1806	160.894388	1.999104	10.071829	9.839482	6.702407	10.170137	36.321450	2536.757733	0.544217	47.101517	2.155650	59.225083	0	100	100	115	0.333333	1
838	158.277698	1.799744	0.000000	8.998756	6.636357	9.613428	46.788550	2448.512167	0.600250	26.324217	1.710000	59.565217	0	100	20	90	17.500000	0
160	156.951137	1.738583	0.000000	8.564248	6.613407	9.214733	53.898833	2400.569667	0.656833	19.713417	1.545383	60.585850	0	100	3	130	8.500000	0
921	158.406957	1.777062	0.000000	8.998314	6.636820	9.615177	46.422317	2443.548133	0.625067	26.394733	1.716900	59.751300	0	100	20	90	3.666667	0
855	158.308372	1.792338	0.000000	8.993964	6.639383	9.615605	46.649050	2446.103567	0.593900	26.385250	1.713050	59.729733	0	100	20	90	14.666667	0
1639	161.061293	2.002360	2.583576	9.965819	6.684578	10.211078	35.421117	2547.796533	0.547200	46.987233	2.170733	58.742900	0	100	100	90	6.000000	0
1878	160.610177	1.938668	10.093895	9.863730	6.520082	10.177712	36.187783	2553.700133	0.539883	47.163433	2.165833	57.008067	1	90	100	115	0.000000	1
2037	161.097873	2.000081	10.076048	9.846903	6.686412	10.144083	36.221583	2539.788767	0.544283	47.115450	2.171400	58.797633	0	80	100	100	0.000000	1
757	157.830742	1.762823	0.000000	8.906859	6.635380	9.523257	48.255050	2437.580967	0.600233	26.127533	1.744600	59.680617	0	100	20	90	31.000000	0

Row – 855 used as a test case

```
[12] a=np.array([[158.2, 1.799,  0.00, 8.99, 6.63, 9.61, 46.78,  2448.51,  0.600,  26.32,  1.71, 59.56]])
     ac=sc.transform(a)
```

```
failure = np.argmax(stablec.predict(ac), axis=-1)
stab=['stable', 'failure']
print("The Hydraulic pump is {}".format(stab[failure[0]]))
cooler = np.argmax(coolerc.predict(ac), axis=-1)
cool=['3(close to failure)', '20(reduced efficiency)', '100(full efficiency)']
print("Condition of cooler is {}".format(cool[cooler[0]]))
leakage = np.argmax(leakagec.predict(ac), axis=-1)
leak =['0 (No leak)', '1 (weak leak)','2 (severe leak)']
print("Condition of Internal Pump Leakage is {}".format(leak[leakage[0]]))
valve = np.argmax(valvec.predict(ac), axis=-1)
val =['73 (close to total failure)', '80 (Severe lag)', '90 (small lag)', '100 (optimal switching behaviour)']
print("Condition of Valve is {}".format(val[valve[0]]))
accumulator = np.argmax(accumulatorc.predict(ac), axis=-1)
accu= ['90 (close to total failure)', '100 (severely reduced pressure)', '115 (slightly reduced pressure)', '130 (optimal pressure)']
print("Condition of Hydraulic accumulator is {}".format(accu[accumulator[0]]))
rul=rulc.predict([ac])
print("Remaining useful life before failure is {} minutes".format(max(0, rul[0])))
```

```
The Hydraulic pump is stable
Condition of cooler is 20(reduced efficiency)
Condition of Internal Pump Leakage is 0 (No leak)
Condition of Valve is 100 (optimal switching behaviour)
Condition of Hydraulic accumulator is 90 (close to total failure)
Remaining useful life before failure is [20.59646] minutes
```

Row – 1878 used as a test case

```
a=np.array([[160.610177,  1.938668, 10.093895,  9.863730, 6.520082, 10.177712,  36.187783,  2553.700133,  0.539883, 47.163433,  2.165833, 57.008067]])
ac=sc.transform(a)
```

```
[15] failure = np.argmax(stablec.predict(ac), axis=-1)
     stab=['stable', 'failure']
     print("The Hydraulic pump is {}".format(stab[failure[0]]))
     cooler = np.argmax(coolerc.predict(ac), axis=-1)
     cool=['3(close to failure)', '20(reduced efficiency)', '100(full efficiency)']
     print("Condition of cooler is {}".format(cool[cooler[0]]))
     leakage = np.argmax(leakagec.predict(ac), axis=-1)
     leak =['0 (No leak)', '1 (weak leak)','2 (severe leak)']
     print("Condition of Internal Pump Leakage is {}".format(leak[leakage[0]]))
     valve = np.argmax(valvec.predict(ac), axis=-1)
     val =['73 (close to total failure)', '80 (Severe lag)', '90 (small lag)', '100 (optimal switching behaviour)']
     print("Condition of Valve is {}".format(val[valve[0]]))
     accumulator = np.argmax(accumulatorc.predict(ac), axis=-1)
     accu= ['90 (close to total failure)', '100 (severely reduced pressure)', '115 (slightly reduced pressure)', '130 (optimal pressure)']
     print("Condition of Hydraulic accumulator is {}".format(accu[accumulator[0]]))
     rul=rulc.predict([ac])
     print("Remaining useful life before failure is {} minutes".format(max(0, rul[0])))
```

```
The Hydraulic pump is failure
Condition of cooler is 100(full efficiency)
Condition of Internal Pump Leakage is 1 (weak leak)
Condition of Valve is 100 (optimal switching behaviour)
Condition of Hydraulic accumulator is 130 (optimal pressure)
Remaining useful life before failure is [0.01968958] minutes
```