

Heart Disease Prediction and Analysis

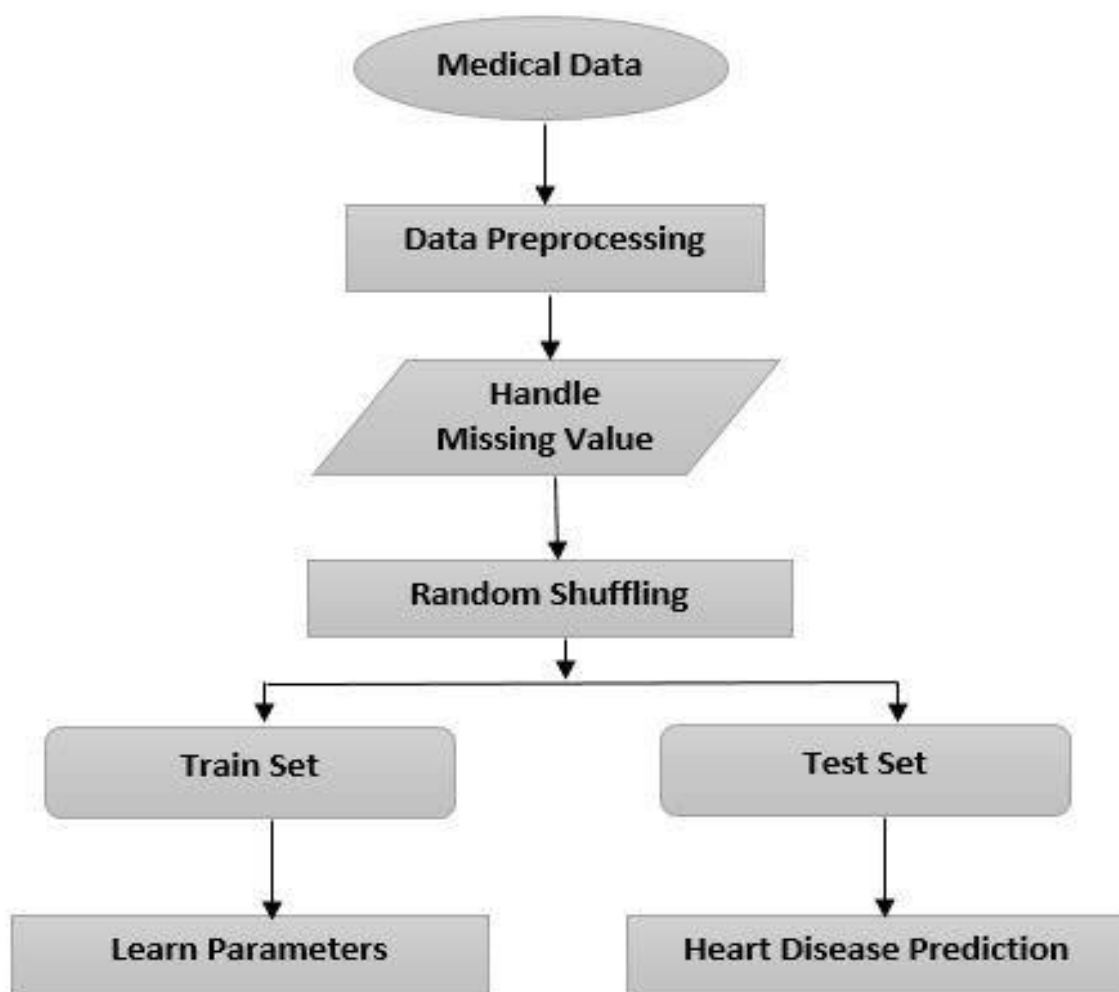
Introduction :

- ❖ Heart attack is one of the main sources of death around the world and it is imperative to predict the disease at a premature phase. The computer aided systems help the doctor as a tool for predicting and diagnosing heart disease.
- ❖ Clinicians and patients need reliable information about an individual's risk of developing Heart Disease. Ideally, they would have entirely accurate data and would be able to use a perfect model to estimate risk. Such a model would be able to categorize people with heart disease and others.

Problem Statement:

- ❖ The objective of this project is to widespread about Heart related cardiovascular disease and to brief about existing decision support systems for the prediction of heart disease supported by data mining and machine learning techniques.

Block Diagram :



Dataset :

age	sex	cp	trtbps	chol	fbs	restecg	thalachh	exng	oldpeak	slp	caa	thall	output
63	1	3	145	233	1	0	150	0	2.3	0	0	1	1
37	1	2	130	250	0	1	187	0	3.5	0	0	2	1
41	0	1	130	204	0	0	172	0	1.4	2	0	2	1
56	1	1	120	236	0	1	178	0	0.8	2	0	2	1
57	0	0	120	354	0	1	163	1	0.6	2	0	2	1
57	1	0	140	192	0	1	148	0	0.4	1	0	1	1
56	0	1	140	294	0	0	153	0	1.3	1	0	2	1
44	1	1	120	263	0	1	173	0	0	2	0	3	1
52	1	2	172	199	1	1	162	0	0.5	2	0	3	1
57	1	2	150	168	0	1	174	0	1.6	2	0	2	1
54	1	0	140	239	0	1	160	0	1.2	2	0	2	1
48	0	2	130	275	0	1	139	0	0.2	2	0	2	1
49	1	1	130	266	0	1	171	0	0.6	2	0	2	1
64	1	3	110	211	0	0	144	1	1.8	1	0	2	1
58	0	3	150	283	1	0	162	0	1	2	0	2	1
50	0	2	120	219	0	1	158	0	1.6	1	0	2	1
58	0	2	120	340	0	1	172	0	0	2	0	2	1
66	0	3	150	226	0	1	114	0	2.6	0	0	2	1
43	1	0	150	247	0	1	171	0	1.5	2	0	2	1
69	0	3	140	239	0	1	151	0	1.8	2	2	2	1
59	1	0	135	234	0	1	161	0	0.5	1	0	3	1
44	1	2	130	233	0	1	179	1	0.4	2	0	2	1
42	1	0	140	226	0	1	178	0	0	2	0	2	1
61	1	2	150	243	1	1	137	1	1	1	0	2	1
40	1	3	140	199	0	1	178	1	1.4	2	0	3	1
71	0	1	160	302	0	1	162	0	0.4	2	2	2	1
59	1	2	150	212	1	1	157	0	1.6	2	0	2	1
51	1	2	110	175	0	1	123	0	0.6	2	0	2	1
65	0	2	140	417	1	0	157	0	0.8	2	1	2	1
53	1	2	130	197	1	0	152	0	1.2	0	0	2	1
41	0	1	105	198	0	1	168	0	0	2	1	2	1
65	1	0	120	177	0	1	140	0	0.4	2	0	3	1
44	1	1	130	219	0	0	188	0	0	2	0	2	1
54	1	2	125	273	0	0	152	0	0.5	0	1	2	1
51	1	3	125	213	0	0	125	1	1.4	2	1	2	1
46	0	2	142	177	0	0	160	1	1.4	0	0	2	1
54	0	2	135	304	1	1	170	0	0	2	0	2	1
54	1	2	150	232	0	0	165	0	1.6	2	0	3	1
65	0	2	155	269	0	1	148	0	0.8	2	0	2	1
65	0	2	160	360	0	0	151	0	0.8	2	0	2	1
51	0	2	140	308	0	0	142	0	1.5	2	1	2	1
48	1	1	130	245	0	0	180	0	0.2	1	0	2	1
45	1	0	104	208	0	0	148	1	3	1	0	2	1
53	0	0	130	264	0	0	143	0	0.4	1	0	2	1
39	1	2	140	321	0	0	182	0	0	2	0	2	1
52	1	1	120	325	0	1	172	0	0.2	2	0	2	1
44	1	2	140	235	0	0	180	0	0	2	0	2	1
47	1	2	138	257	0	0	156	0	0	2	0	2	1
53	0	2	128	216	0	0	115	0	0	2	0	0	1
53	0	0	138	234	0	0	160	0	0	2	0	2	1
51	0	2	130	256	0	0	149	0	0.5	2	0	2	1
66	1	0	120	302	0	0	151	0	0.4	1	0	2	1
62	1	2	130	231	0	1	146	0	1.8	1	3	3	1
44	0	2	108	141	0	1	175	0	0.6	1	0	2	1
63	0	2	135	252	0	0	172	0	0	2	0	2	1
52	1	1	134	201	0	1	158	0	0.8	2	1	2	1
48	1	0	122	222	0	0	186	0	0	2	0	2	1
45	1	0	115	260	0	0	185	0	0	2	0	2	1
34	1	3	118	182	0	0	174	0	0	2	0	2	1
57	0	0	128	303	0	0	159	0	0	2	1	2	1
71	0	2	110	265	1	0	130	0	0	2	1	2	1

Rapid Miner Design :

Corelation Matrix

Local Repository\processes\Correlation Matrix - RapidMiner Studio Educational 9.8.000 @ DESKTOP-E81PGD0

File Edit Process View Connections Settings Extensions Help

Views: Design Results Turbo Prep Auto Model Deployments

Find data, operators, etc. All Studio

Repository

- Local Repository (Local)
 - Connections
 - data
 - processes
 - Correlation Matrix (5/10/21 11:09 AM - 2 KB)
 - Decision Tree (5/11/21 9:08 AM - 7 KB)
 - k-NN (5/10/21 12:14 PM - 7 KB)
 - Logistic Regression (5/10/21 12:23 PM - 7 KB)
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 - Random Forest (5/10/21 12:10 PM - 7 KB)
 - Random Tree (5/10/21 6:26 PM - 7 KB)
 - test (5/10/21 11:09 AM - 3 KB)
 - test1 (5/10/21 11:09 AM - 8 KB)
 - Titanic-Data (5/0/21 9:12 AM - 185 KB)
 - Temporary Repository (Local)
 - DB (Legacy)

Operators

Search for Operators

- Data Access (58)
- Blending (82)
- Cleansing (28)
- Modeling (167)
- Scoring (14)
- Validation (30)
- Utility (85)
- Extensions (2)

Get more operators from the Marketplace

Process

Process

Retrieve heart

Correlation Matrix

Parameters

Process

logverbosity: init

logfile:

resuffle:

random seed: 2001

send mail: never

Hide advanced parameters

Change compatibility (9.9.000)

Help

Process

RapidMiner Studio Core

Synopsis

The root operator which is the outer most operator of every process.

Description

Each process must contain exactly one operator of this class, and it must be the root operator of the process. This operator provides a set of parameters that are of global relevance to the process like logging and initialization parameters of the random number generator.

Parameters

logverbosity (optional)

Log verbosity level.

Type: selection

Range: all, io, status, init, notes, warnings, error, fatal, almost_name, off

Default: init

Leverage the Wisdom of Crowds to get operator recommendations based on your process design!

Activate Wisdom of Crowds

Type here to search

Local Repository\processes\Correlation Matrix - RapidMiner Studio Educational 9.8.000 @ DESKTOP-E81PGD0

File Edit Process View Connections Settings Extensions Help

Views: Design Results Turbo Prep Auto Model Deployments

Find data, operators, etc. All Studio

Result History

Correlation Matrix (Correlation Matrix)

Data

Pairwise Table

Matrix Visualization

Annotations

Repository

Import Data

Training Resources (connected)

Samples

Community Samples (connected)

Local Repository (Local)

Connections

data

processes

- Correlation Matrix (5/10/21 11:09 AM - 2 KB)
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Temporary Repository (Local)

DB (Legacy)

Attribut...	age	sex	cp	trtbps	chol	fbs	restecg	thalachh	exng	oldpeak	slp	caa	thal	output
age	1	-0.098	-0.069	0.279	0.214	0.121	-0.116	-0.399	0.097	0.210	-0.169	0.276	0.068	-0.225
sex	-0.098	1	-0.049	-0.057	-0.198	0.045	-0.058	-0.044	0.142	0.096	-0.031	0.118	0.210	-0.281
cp	-0.069	-0.049	1	0.048	-0.077	0.094	0.044	0.296	-0.394	-0.149	0.120	-0.181	-0.162	0.434
trtbps	0.279	-0.057	0.048	1	0.123	0.178	-0.114	-0.047	0.068	0.193	-0.121	0.101	0.062	-0.145
chol	0.214	-0.198	-0.077	0.123	1	0.013	-0.151	-0.010	0.067	0.054	-0.004	0.071	0.099	-0.085
fbs	0.121	0.045	0.094	0.178	0.013	1	-0.084	-0.009	0.026	0.006	-0.060	0.138	-0.032	-0.028
restecg	-0.116	-0.058	0.044	-0.114	-0.151	-0.084	1	0.044	-0.071	-0.059	0.093	-0.072	-0.012	0.137
thalachh	-0.399	-0.044	0.296	-0.047	-0.010	-0.009	0.044	1	-0.379	-0.344	0.387	-0.213	-0.096	0.422
exng	0.097	0.142	-0.394	0.068	0.067	0.026	-0.071	-0.379	1	0.288	-0.258	0.116	0.207	-0.437
oldpeak	0.210	0.096	-0.149	0.193	0.054	0.006	-0.059	-0.344	0.288	1	-0.578	0.223	0.210	-0.431
slp	-0.169	-0.031	0.120	-0.121	-0.004	-0.060	0.093	0.387	-0.258	-0.578	1	-0.080	-0.105	0.346
caa	0.276	0.118	-0.181	0.101	0.071	0.138	-0.072	-0.213	0.116	0.223	-0.080	1	0.152	-0.392
thal	0.068	0.210	-0.162	0.062	0.099	-0.032	-0.012	-0.096	0.207	0.210	-0.105	0.152	1	-0.344
output	-0.225	-0.281	0.434	-0.145	-0.085	-0.028	0.137	0.422	-0.437	-0.431	0.346	-0.392	-0.344	1

Type here to search

11:31 PM 5/18/2021

Naïve-Bayes Algorithm Design:

Local Repository/processes/Naive Bayes - RapidMiner Studio Educational 9.0.00 @ DESKTOP-631PGDD

File Edit Process View Connections Settings Extensions Help

Views: Design Results Turbo Prep Auto Model Deployments

Find data, operators, etc. All Studio

Repository

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- DB (Loggly)

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- Modeling (197)
- Scoring (14)
- Validation (30)
- Utility (85)
- Extensions (2)

Get more operators from the Marketplace

Process

Process

Retrieve heart Select Attributes Numerical to Polyno... Set Role

Split Data

Naive Bayes

Performance

Apply Model

Parameters

Process

logverbosity init

logfile

resultfile

random seed 2001

send mail never

Hide advanced parameters

Change compatibility (9.0.000)

Help

Process

RapidMiner Studio Core

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Parameters

logverbosity (optional)

Log verbosity level.

Type: selection

Range: all, io, status, init, notes, warning, error, fatal, almost_none, off

Default: init

Leverage the Wisdom of Crowds to get operator recommendations based on your process design!

Activate Wisdom of Crowds

Type here to search

11:32 PM 5/18/2021

Output for Naïve Bayes

Local Repository/processes/Naive Bayes - RapidMiner Studio Educational 9.0.00 @ DESKTOP-631PGDD

File Edit Process View Connections Settings Extensions Help

Views: Design Results Turbo Prep Auto Model Deployments

Find data, operators, etc. All Studio

Result History

ExampleSet (Apply Model)

PerformanceVector (Performance)

Filter (51/51 examples): all

Open In Turbo Prep Auto Model

Data

Statistics

Visualizations

Annotations

Repository

- Training Resources (connected)
- Samples
- Community Samples (connected)
- Local Repository (Local)
- Connections
- data
- processes
 - Correlation Matrix (5/10/21 11:09 AM - 2 KB)
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 - test (5/10/21 11:09 AM - 3 KB)
 - test1 (5/10/21 11:06 AM - 8 KB)
 - Titanic-Data (5/0/21 9:12 AM - 185 KB)
- Temporary Repository (Local)
- DB (Loggly)

Row No.	output	prediction(o...	confidence(1)	confidence(0)	age	sex	cp	trtbps	chol	fbs	thalachh	exng	oldpeak	slp
1	1	0	0.000	1.000	63	1	3	145	233	1	150	0	2.300	0
2	1	0	0.000	1.000	56	0	1	140	294	0	153	0	1.300	1
3	1	1	1.000	0.000	44	1	1	120	263	0	173	0	0	2
4	1	0	0.012	0.988	58	0	3	150	283	1	162	0	1	2
5	1	0	0.014	0.986	66	0	3	150	226	0	114	0	2.800	0
6	1	1	0.935	0.065	54	0	2	135	304	1	170	0	0	2
7	1	1	1.000	0.000	65	0	2	155	269	0	148	0	0.800	2
8	1	0	0.042	0.958	45	1	0	104	208	0	148	1	3	1
9	1	0	0.218	0.782	53	0	0	130	264	0	143	0	0.400	1
10	1	1	1.000	0.000	44	1	2	140	235	0	180	0	0	2
11	1	1	0.991	0.009	47	1	2	138	257	0	156	0	0	2
12	1	1	0.992	0.008	53	0	0	138	234	0	160	0	0	2
13	1	1	0.999	0.001	51	0	2	130	256	0	149	0	0.500	2
14	1	1	1.000	0.000	44	0	2	108	141	0	175	0	0.600	1
15	1	1	1.000	0.000	45	0	1	130	234	0	175	0	0.800	1
16	1	1	0.987	0.013	29	1	1	130	204	0	202	0	0	2
17	1	1	1.000	0.000	43	0	2	122	213	0	165	0	0.200	1
18	1	0	0.006	0.994	51	1	2	125	245	1	166	0	2.400	1
19	1	0	0.263	0.737	52	1	3	152	298	1	178	0	1.200	1
20	1	0	0.282	0.738	42	1	3	148	244	0	178	0	0.800	2
21	1	1	0.998	0.002	50	0	1	120	244	0	162	0	1.100	2
22	1	0	0.135	0.865	64	0	2	140	313	0	133	0	0.200	2
23	1	1	1.000	0.000	46	0	1	105	204	0	172	0	0	2
24	1	1	0.926	0.074	52	0	2	136	196	0	169	0	0.100	1
25	1	1	1.000	0.000	54	0	2	160	201	0	163	0	0	2

ExampleSet (51 examples, 4 special attributes, 12 regular attributes)

Type here to search

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Performance for Naïve-Bayes algorithm of accuracy = 65.57%

PerformanceVector (Performance)

Table View | Plot View

accuracy: 65.57%

	true 1	true 0	class precision
pred 1	24	9	72.73%
pred 0	12	16	57.14%
class recall	66.67%	64.00%	

Repository

- Import Data
- Training Resources (connected)
- Samples
- Community Samples (connected)
- Local Repository (Local)
- Connections
- data
- processes
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 - test1 (5/10/21 11:09 AM - 8 MB)
 - Titanic-Data (5/02/21 9:12 AM - 185 MB)
- Temporary Repository (Local)
- DB (Logos)

Decision Tree Algorithm Design :

Decision Tree

Process

Retrieve heart | Select Attributes | Numerical to Polyno... | Set Role

Split Data | Decision Tree | Apply Model | Performance

Parameters

Process

logverbosity: init

logfile: [empty]

reslogfile: [empty]

random seed: 2001

send mail: never

Hide advanced parameters

✓ Chance compatibility (9.9.000)

Help

Process

RapidMiner Studio Core

Synopsis

The root operator which is the outer most operator of every process.

Description

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Parameters

logverbosity (optional)

Log verbosity level.

Type: selection

Range: all, io, status, init, notes, warning, error, fatal, almost_none, off

Default: init

Output for Decision Tree Algorithm:

Local Repository/processes/Decision Tree - RapidMiner Studio Educational 9.0.000 @ DESKTOP-E81PQD0

File Edit Process View Connections Settings Extensions Help

Views: Design Results Turbo Prep Auto Model Deployments

Find data, operators, etc. All Studio

Result History ExampleSet (Apply Model) PerformanceVector (Performance)

Open In Turbo Prep Auto Model Filter (51/51 examples): all

Row No.	output	prediction...	confidence(1)	confidence(0)	age	sex	cp	trtbps	chol	fbs	thalachh	exng	oldpeak	slp
1	1	0	0.267	0.733	63	1	3	145	233	1	150	0	2.300	0
2	1	1	0.835	0.165	56	0	1	140	294	0	153	0	1.300	1
3	1	0	0.429	0.571	44	1	1	120	283	0	173	0	0	2
4	1	1	0.835	0.165	58	0	3	150	283	1	162	0	1	2
5	1	1	0.835	0.165	66	0	3	150	226	0	114	0	2.600	0
6	1	1	0.835	0.165	54	0	2	135	304	1	170	0	0	2
7	1	1	0.835	0.165	65	0	2	155	289	0	148	0	0.800	2
8	1	0	0.250	0.750	45	1	0	104	208	0	148	1	3	1
9	1	1	0.835	0.165	53	0	0	130	264	0	143	0	0.400	1
10	1	1	0.835	0.165	44	1	2	140	235	0	180	0	0	2
11	1	1	0.835	0.165	47	1	2	138	257	0	156	0	0	2
12	1	1	0.835	0.165	53	0	0	138	234	0	160	0	0	2
13	1	1	0.835	0.165	51	0	2	130	256	0	149	0	0.500	2
14	1	1	0.835	0.165	44	0	2	108	141	0	175	0	0.600	1
15	1	1	0.835	0.165	45	0	1	130	234	0	175	0	0.600	1
16	1	1	0.835	0.165	29	1	1	130	204	0	202	0	0	2
17	1	1	0.835	0.165	43	0	2	122	213	0	165	0	0.200	1
18	1	1	0.835	0.165	51	1	2	125	245	1	166	0	2.400	1
19	1	1	0.750	0.250	52	1	3	152	298	1	178	0	1.200	1
20	1	1	0.835	0.165	42	1	3	148	244	0	178	0	0.800	2
21	1	1	0.835	0.165	50	0	1	120	244	0	162	0	1.100	2
22	1	0	0.467	0.533	64	0	2	140	313	0	133	0	0.200	2
23	1	1	0.835	0.165	46	0	1	105	204	0	172	0	0	2
24	1	1	0.835	0.165	52	0	2	136	196	0	169	0	0.100	1
25	1	1	0.835	0.165	54	0	2	160	201	0	163	0	0	2

ExampleSet (51 examples, 4 special attributes, 12 regular attributes)

Repository

Import Data

Training Resources (connected)

Samples

Community Samples (connected)

Local Repository (Local)

Connections

data

processes

Correlation Matrix (5/10/21 11:09 AM - 2 KB)

Decision Tree (5/11/21 9:08 AM - 7 KB)

k-NN (5/10/21 12:14 PM - 7 KB)

Logistic Regression (5/10/21 12:23 PM - 7 KB)

Naive Bayes (5/10/21 12:18 PM - 6 KB)

Random Forest (5/10/21 12:10 PM - 7 KB)

Random Tree (5/10/21 6:26 PM - 7 KB)

test1 (5/10/21 11:09 AM - 3 KB)

test1 (5/10/21 11:08 AM - 8 KB)

Titanic-Data (5/0/21 9:12 AM - 180 KB)

Temporary Repository (Local)

DB (Legacy)

Performance for Decision Tree matrix of Accuracy = 78.69%

Local Repository/processes/Decision Tree - RapidMiner Studio Educational 9.0.000 @ DESKTOP-E81PQD0

File Edit Process View Connections Settings Extensions Help

Views: Design Results Turbo Prep Auto Model Deployments

Find data, operators, etc. All Studio

Result History ExampleSet (Apply Model) PerformanceVector (Performance)

Criterion accuracy

Table View Plot View

accuracy: 78.69%

	true 1	true 0	class precision
pred 1	30	7	81.08%
pred 0	6	18	75.00%
class recall	83.33%	72.00%	

Repository

Import Data

Training Resources (connected)

Samples

Community Samples (connected)

Local Repository (Local)

Connections

data

processes

Correlation Matrix (5/10/21 11:09 AM - 2 KB)

Decision Tree (5/11/21 9:08 AM - 7 KB)

k-NN (5/10/21 12:14 PM - 7 KB)

Logistic Regression (5/10/21 12:23 PM - 7 KB)

Naive Bayes (5/10/21 12:18 PM - 6 KB)

Random Forest (5/10/21 12:10 PM - 7 KB)

Random Tree (5/10/21 6:26 PM - 7 KB)

test1 (5/10/21 11:09 AM - 3 KB)

test1 (5/10/21 11:08 AM - 8 KB)

Titanic-Data (5/0/21 9:12 AM - 180 KB)

Temporary Repository (Local)

DB (Legacy)

Random Forest Design Algorithm :

Process Design Diagram:

```
graph LR; RetrieveHeart[Retrieve heart] --> SelectAttributes[Select Attributes]; SelectAttributes --> NumericalToPolynomial[Numerical to Polynomial]; NumericalToPolynomial --> SetRole[Set Role]; SetRole --> SplitData[Split Data]; SplitData --> RandomForest[Random Forest]; SplitData --> ApplyModel[Apply Model]; RandomForest --> ApplyModel; ApplyModel --> Performance[Performance];
```

Parameters:

- logverbosity: init
- logfile: [empty]
- resultfile: [empty]
- random seed: 2001
- send mail: never

Help:

Process
RapidMiner Studio Core

Synopsis
The root operator which is the outer most operator of every process.

Description
Each process must contain exactly one operator of this class, and it must be the root operator of the process. This operator provides a set of parameters that are of global relevance to the process like logging and initialization parameters of the random number generator.

Parameters
logverbosity (optional)
Log verbosity level.
Type: selection
Range: all, to, status, init, notes, warning, error, fatal, almost_none, off
Default: init

Output for Random Forest Algorithm

Result History: ExampleSet (Apply Model) x PerformanceVector (Performance)

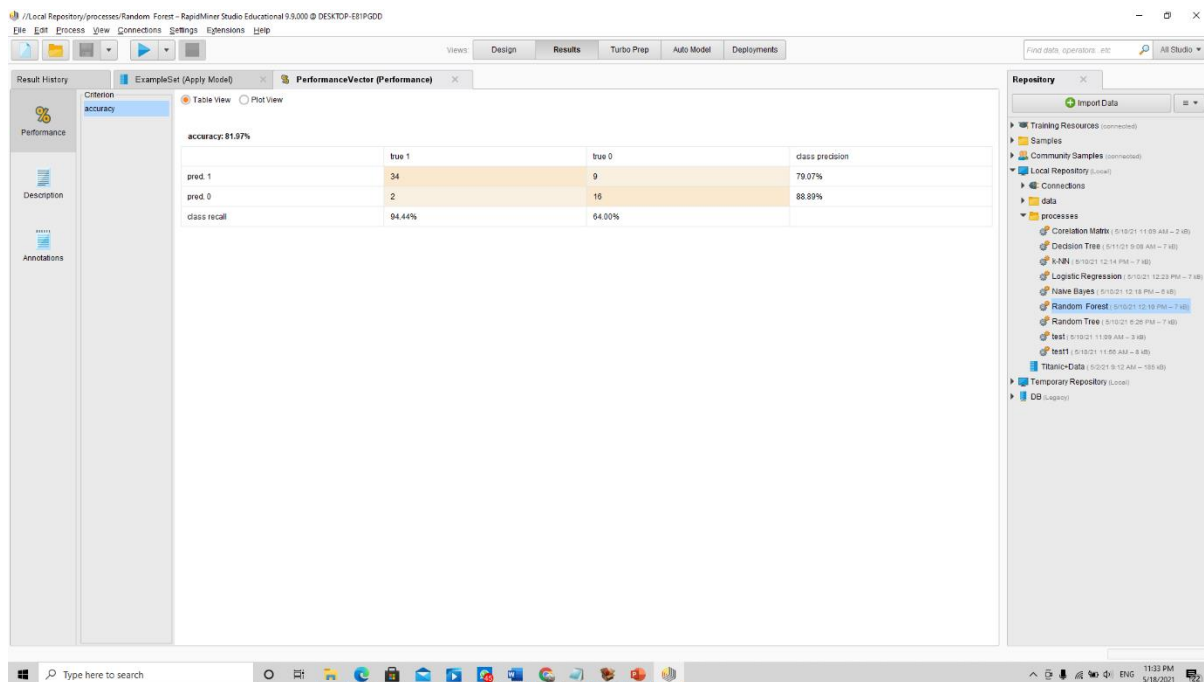
Open In: Turbo Prep | Auto Model

Filter (51/51 examples): all

Row No.	output	prediction(0..)	confidence(1)	confidence(0)	age	sex	cp	trestbps	chol	fbs	thalachh	exng	oldpeak	caa
1	1	0	0.481	0.519	63	1	3	145	233	1	150	0	2.300	0
2	1	1	0.730	0.270	56	0	1	140	294	0	153	0	1.300	0
3	1	1	0.839	0.361	44	1	1	120	283	0	173	0	0	0
4	1	1	0.730	0.270	58	0	3	150	283	1	162	0	1	0
5	1	1	0.627	0.373	66	0	3	150	226	0	114	0	2.600	0
6	1	1	0.975	0.025	54	0	2	135	304	1	170	0	0	0
7	1	1	0.914	0.086	65	0	2	155	269	0	148	0	0.800	0
8	1	1	0.611	0.389	45	1	0	104	208	0	148	1	3	0
9	1	1	0.796	0.234	53	0	0	130	264	0	143	0	0.400	0
10	1	1	0.876	0.124	44	1	2	140	235	0	180	0	0	0
11	1	1	0.836	0.164	47	1	2	138	257	0	156	0	0	0
12	1	1	0.760	0.240	53	0	0	138	234	0	160	0	0	0
13	1	1	0.880	0.120	51	0	2	130	256	0	149	0	0.500	0
14	1	1	0.935	0.065	44	0	2	108	141	0	175	0	0.800	0
15	1	1	0.929	0.071	45	0	1	130	234	0	175	0	0.600	0
16	1	1	0.827	0.173	29	1	1	130	294	0	202	0	0	0
17	1	1	0.918	0.082	43	0	2	122	213	0	165	0	0.200	0
18	1	1	0.648	0.352	51	1	2	125	245	1	166	0	2.400	0
19	1	1	0.676	0.324	52	1	3	152	298	1	178	0	1.200	0
20	1	1	0.563	0.437	42	1	3	148	244	0	178	0	0.800	2
21	1	1	0.945	0.055	50	0	1	120	244	0	162	0	1.100	0
22	1	1	0.580	0.440	64	0	2	140	313	0	133	0	0.200	0
23	1	1	0.918	0.082	46	0	1	105	204	0	172	0	0	0
24	1	1	0.757	0.243	52	0	2	136	196	0	169	0	0.100	0
25	1	1	0.871	0.129	54	0	2	160	201	0	183	0	0	1

ExampleSet (51 examples, 4 special attributes, 12 regular attributes)

Performance for Random Forest Algorithm of accuracy 81.97%



Algorithm / Classifiers which we used for heart disease analysis:

Naive Bayes classifiers are a collection of classification algorithms based on Bayes' Theorem. It is not a single algorithm but a family of algorithms where all of them share a common principle, i.e. every pair of features being classified is independent of each other.

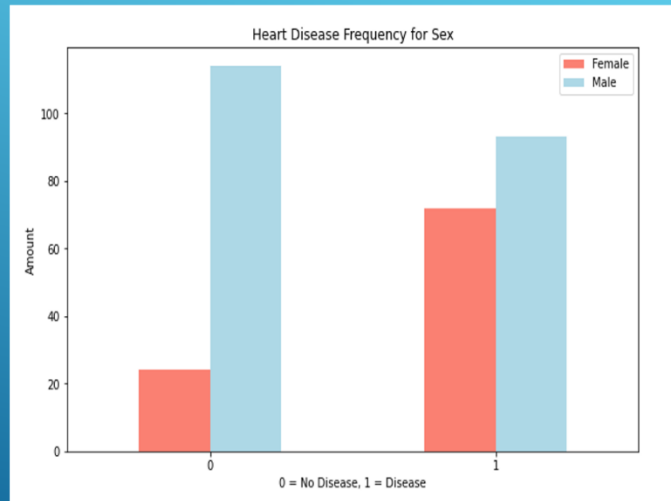
Decision tree is the most powerful and popular tool for classification and prediction. A Decision tree is a flowchart like tree structure, where each internal node denotes a test on an attribute, each branch represents an outcome of the test, and each leaf node (terminal node) holds a class label.

Random forest is a supervised learning algorithm. The "forest" it builds, is an ensemble of decision trees, usually trained with the "bagging" method. The general idea of the bagging method is that a combination of learning models increases the overall result.

Heart Disease Frequency vs Gender:

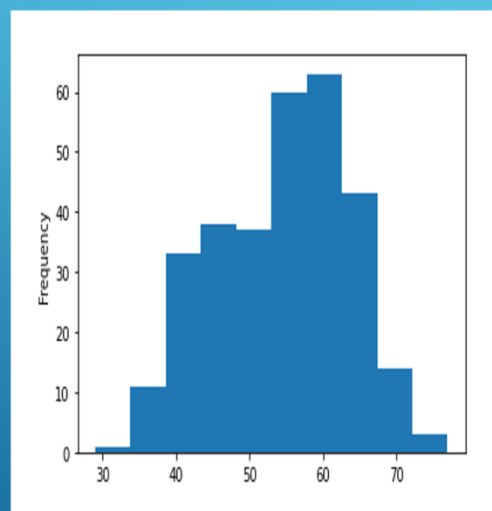
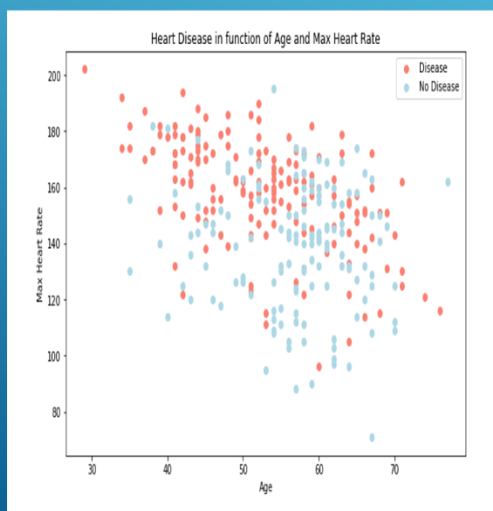
▶ Heart Disease Frequency according to Gender :

sex	0	1
target		
0	24	114
1	72	93

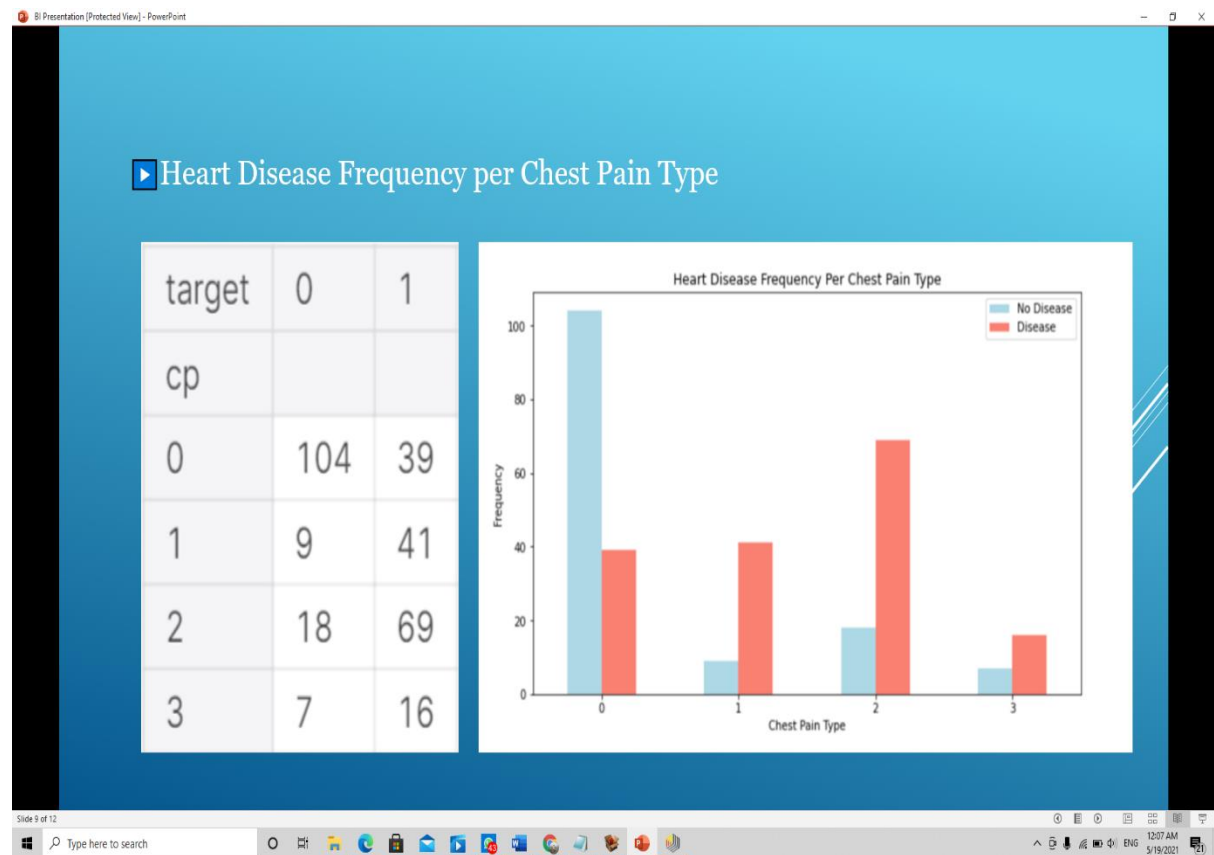


Age vs Max Heart Rate :

▶ Age vs Max Heart rate for Heart Disease



Heart Disease Frequency vs Chest Pain Type:



Dashboard Analysis :



Conclusion:

- ❖ **High Blood Pressure, High Cholestrol and High Heart Rate leads to high chance of heart attack.**
- ❖ **Age from 40-60 years have the high chance of heart attack.**
- ❖ **Male gender has more chance of heart attack compared to female ones.**
- ❖ **Highly Correlated factors in this dataset are :**
 - **Age and trtbps (blood pressure rate)**
 - **Age and chol (cholestrol level)**