Cardiovascular Risk Prediction using machine learning.

Introduction:

Cardiovascular diseases (CVDs) remain a leading cause of global morbidity and mortality, necessitating effective predictive models for timely intervention and prevention. This study presents a novel approach to cardiovascular risk prediction using machine learning algorithms, aiming to enhance the accuracy and precision of risk assessments. Leveraging a diverse dataset encompassing demographic information, lifestyle factors, medical history, and clinical parameters, our model employs advanced machine learning techniques to identify subtle patterns and relationships indicative of cardiovascular risk.

The methodology integrates feature selection, dimensionality reduction, and ensemble learning to optimize model performance. We evaluate the predictive power of the model on a large, multi-center dataset, comparing its results with traditional risk assessment methods. The outcomes demonstrate the superiority of our machine learning-based approach in accurately stratifying individuals at risk for cardiovascular events. Moreover, the model provides interpretable insights into the influential factors driving predictions, facilitating personalized interventions and risk mitigation strategies.

This research contributes to the evolving landscape of cardiovascular risk prediction by harnessing the potential of machine learning to refine risk stratification, ultimately aiding clinicians in making informed decisions for early intervention and preventive care. The findings underscore the significance of incorporating advanced computational techniques in cardiovascular risk assessment, paving the way for more effective and personalized strategies to combat heart diseases.

Literature Review:

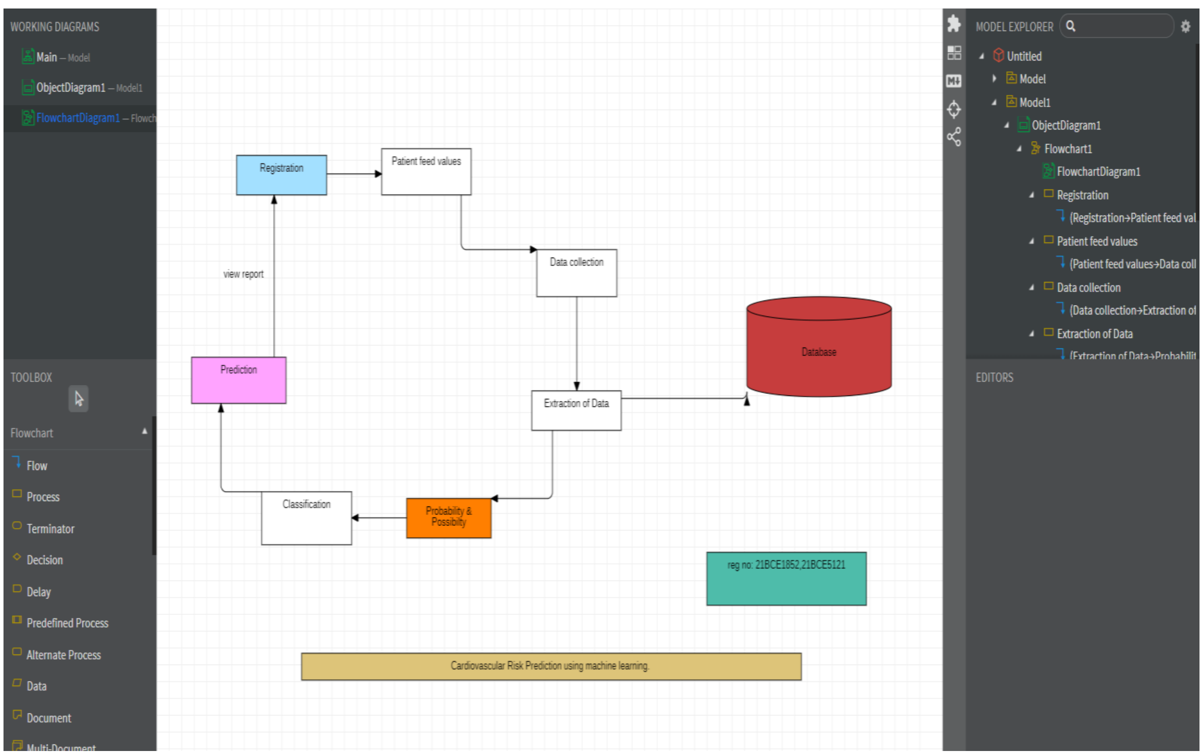
Currently, there are over 100 CV risk-assessment tools being developed and used. These risk-assessment tools differ in more than one way, and there is still no reliable, comprehensive and universal CV risk-assessment tool for medical professionals to accurately predict CV risk in a given population. Due to the numerous ethnic groups with unique genetic characteristics among the Asian population, the weighting of the RFs used in existing CV risk-assessment tools may not be applicable to this population.

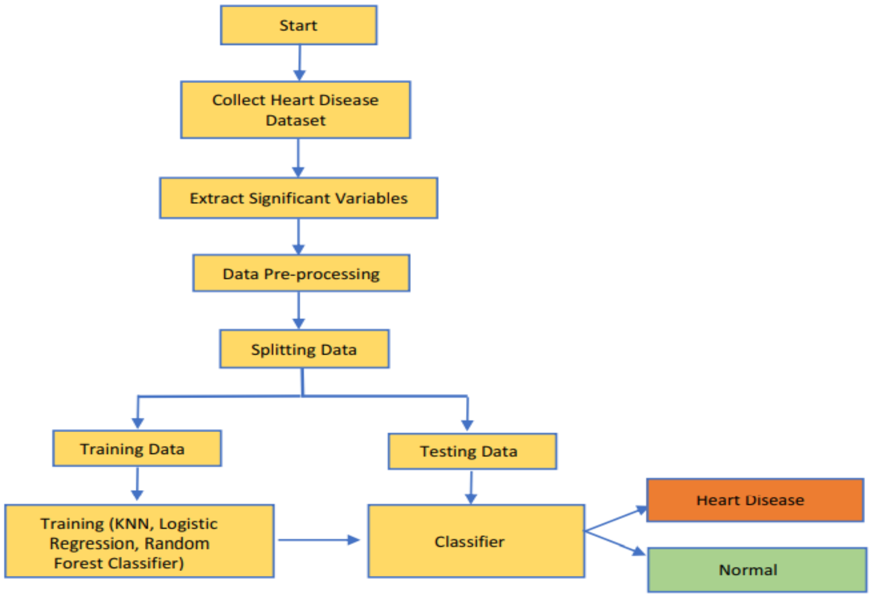
Methodology:

This study pioneers a machine learning-based cardiovascular risk prediction model, utilizing a comprehensive dataset encompassing demographic details, lifestyle factors, medical history, and clinical parameters. Employing advanced techniques such as feature selection, dimensionality reduction, and ensemble learning, the model optimizes performance. Assessment on a large, multi-center dataset reveals its superior accuracy in identifying individuals at risk for cardiovascular events, surpassing traditional methods. Notably, the model elucidates interpretable insights into the factors influencing predictions, facilitating personalized interventions.

This research significantly contributes to cardiovascular risk prediction by harnessing the potential of machine learning, refining risk stratification, and emphasizing the need for advanced computational techniques in assessment. The outcomes underscore the model's efficacy in early intervention and preventive care. By providing clinicians with a powerful tool for accurate risk assessment and personalized insights, this research advocates for the integration of innovative computational approaches in the evolving landscape of cardiovascular health, paving the way for more effective and tailored strategies to combat heart diseases.

DIAGRAM (FLOWCHART/MODEL)




Start
Collect Heart Disease Dataset
Extract Significant Variables
Data Pre-processing
Splitting Data
Training Data
Testing Data
Training (KNN, Logistic Regression, Random Forest Classifier)
Classifier
Heart Disease
Normal

Dataset:-

POSSIBLE DATA LOSS Some features might be lost if you save this workbook in the comma-delimited (.csv) format. To preserve these features, save it in an Excel file format. Don't show again Save

A1 age

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	age	sex	cp	trtbps	chol	fbs	restecg	thalachh	exng	oldpeak	slp	caa	thall	output
2	63	1	3	145	233	1	0	150	0	2.3	0	0	1	1
3	37	1	2	130	250	0	1	187	0	3.5	0	0	2	1
4	41	0	1	130	204	0	0	172	0	1.4	2	0	2	1
5	56	1	1	120	236	0	1	178	0	0.8	2	0	2	1
6	57	0	0	120	354	0	1	163	1	0.6	2	0	2	1
7	57	1	0	140	192	0	1	148	0	0.4	1	0	1	1
8	56	0	1	140	294	0	0	153	0	1.3	1	0	2	1
9	44	1	1	120	263	0	1	173	0	0	2	0	3	1
10	52	1	2	172	199	1	1	162	0	0.5	2	0	3	1
11	57	1	2	150	168	0	1	174	0	1.6	2	0	2	1
12	54	1	0	140	239	0	1	160	0	1.2	2	0	2	1
13	48	0	2	130	275	0	1	139	0	0.2	2	0	2	1
14	49	1	1	130	266	0	1	171	0	0.6	2	0	2	1
15	64	1	3	110	211	0	0	144	1	1.8	1	0	2	1
16	58	0	3	150	283	1	0	162	0	1	2	0	2	1
17	50	0	2	120	219	0	1	158	0	1.6	1	0	2	1
18	58	0	2	120	340	0	1	172	0	0	2	0	2	1
19	66	0	3	150	226	0	1	114	0	2.6	0	0	2	1
20	43	1	0	150	247	0	1	171	0	1.5	2	0	2	1
21	69	0	3	140	239	0	1	151	0	1.8	2	2	2	1
22	59	1	0	135	234	0	1	161	0	0.5	1	0	3	1
23	44	1	2	130	233	0	1	179	1	0.4	2	0	2	1
24	42	1	0	140	226	0	1	178	0	0	2	0	2	1
25	61	1	2	150	243	1	1	137	1	1	1	0	2	1

heart

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
41	65	0	2	160	360	0	0	151	0	0.8	2	0	2	1
42	51	0	2	140	308	0	0	142	0	1.5	2	1	2	1
43	48	1	1	130	245	0	0	180	0	0.2	1	0	2	1
44	45	1	0	104	208	0	0	148	1	3	1	0	2	1
45	53	0	0	130	264	0	0	143	0	0.4	1	0	2	1
46	39	1	2	140	321	0	0	182	0	0	2	0	2	1
47	52	1	1	120	325	0	1	172	0	0.2	2	0	2	1
48	44	1	2	140	235	0	0	180	0	0	2	0	2	1
49	47	1	2	138	257	0	0	156	0	0	2	0	2	1
50	53	0	2	128	216	0	0	115	0	0	2	0	0	1
51	53	0	0	138	234	0	0	160	0	0	2	0	2	1
52	51	0	2	130	256	0	0	149	0	0.5	2	0	2	1
53	66	1	0	120	302	0	0	151	0	0.4	1	0	2	1
54	62	1	2	130	231	0	1	146	0	1.8	1	3	3	1
55	44	0	2	108	141	0	1	175	0	0.6	1	0	2	1
56	63	0	2	135	252	0	0	172	0	0	2	0	2	1
57	52	1	1	134	201	0	1	158	0	0.8	2	1	2	1
58	48	1	0	122	222	0	0	186	0	0	2	0	2	1
59	45	1	0	115	260	0	0	185	0	0	2	0	2	1
60	34	1	3	118	182	0	0	174	0	0	2	0	2	1
61	57	0	0	128	303	0	0	159	0	0	2	1	2	1
62	71	0	2	110	265	1	0	130	0	0	2	1	2	1
63	54	1	1	108	309	0	1	156	0	0	2	0	3	1
64	52	1	3	118	186	0	0	190	0	0	1	0	1	1
65	41	1	1	135	203	0	1	132	0	0	1	0	1	1

heart

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
203	60	1	0	125	258	0	0	141	1	2.8	1	1	3	0	
204	58	1	0	150	270	0	0	111	1	0.8	2	0	3	0	
205	68	1	2	180	274	1	0	150	1	1.6	1	0	3	0	
206	62	0	0	160	164	0	0	145	0	6.2	0	3	3	0	
207	52	1	0	128	255	0	1	161	1	0	2	1	3	0	
208	59	1	0	110	239	0	0	142	1	1.2	1	1	3	0	
209	60	0	0	150	258	0	0	157	0	2.6	1	2	3	0	
210	49	1	2	120	188	0	1	139	0	2	1	3	3	0	
211	59	1	0	140	177	0	1	162	1	0	2	1	3	0	
212	57	1	2	128	229	0	0	150	0	0.4	1	1	3	0	
213	61	1	0	120	260	0	1	140	1	3.6	1	1	3	0	
214	39	1	0	118	219	0	1	140	0	1.2	1	0	3	0	
215	61	0	0	145	307	0	0	146	1	1	1	0	3	0	
216	56	1	0	125	249	1	0	144	1	1.2	1	1	2	0	
217	43	0	0	132	341	1	0	136	1	3	1	0	3	0	
218	62	0	2	130	263	0	1	97	0	1.2	1	1	3	0	
219	63	1	0	130	330	1	0	132	1	1.8	2	3	3	0	
220	65	1	0	135	254	0	0	127	0	2.8	1	1	3	0	
221	48	1	0	130	256	1	0	150	1	0	2	2	3	0	
222	63	0	0	150	407	0	0	154	0	4	1	3	3	0	
223	55	1	0	140	217	0	1	111	1	5.6	0	0	3	0	
224	65	1	3	138	282	1	0	174	0	1.4	1	1	2	0	
225	56	0	0	200	288	1	0	133	1	4	0	2	3	0	
226	54	1	0	110	239	0	1	126	1	2.8	1	1	3	0	
227	70	1	0	145	174	0	1	125	1	2.6	0	0	3	0	

heart

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
279	57	1	1	124	261	0	1	141	0	0.3	2	0	3	0		
280	58	0	1	136	319	1	0	152	0	0	2	2	2	0		
281	61	1	0	138	166	0	0	125	1	3.6	1	1	2	0		
282	42	1	0	136	315	0	1	125	1	1.8	1	0	1	0		
283	52	1	0	128	204	1	1	156	1	1	1	0	0	0		
284	59	1	2	126	218	1	1	134	0	2.2	1	1	1	0		
285	40	1	0	152	223	0	1	181	0	0	2	0	3	0		
286	61	1	0	140	207	0	0	138	1	1.9	2	1	3	0		
287	46	1	0	140	311	0	1	120	1	1.8	1	2	3	0		
288	59	1	3	134	204	0	1	162	0	0.8	2	2	2	0		
289	57	1	1	154	232	0	0	164	0	0	2	1	2	0		
290	57	1	0	110	335	0	1	143	1	3	1	1	3	0		
291	55	0	0	128	205	0	2	130	1	2	1	1	3	0		
292	61	1	0	148	203	0	1	161	0	0	2	1	3	0		
293	58	1	0	114	318	0	2	140	0	4.4	0	3	1	0		
294	58	0	0	170	225	1	0	146	1	2.8	1	2	1	0		
295	67	1	2	152	212	0	0	150	0	0.8	1	0	3	0		
296	44	1	0	120	169	0	1	144	1	2.8	0	0	1	0		
297	63	1	0	140	187	0	0	144	1	4	2	2	3	0		
298	63	0	0	124	197	0	1	136	1	0	1	0	2	0		
299	59	1	0	164	176	1	0	90	0	1	1	2	1	0		
300	57	0	0	140	241	0	1	123	1	0.2	1	0	3	0		
301	45	1	3	110	264	0	1	132	0	1.2	1	0	3	0		
302	68	1	0	144	193	1	1	141	0	3.4	1	2	3	0		
303	57	1	0	130	131	0	1	115	1	1.2	1	1	3	0		

heart