

Stroke risk stratification using neural networks

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- Current primary stroke preventive strategies seem insufficient in light of the increased prevalence of stroke, the steady or increasing death rates from cardiovascular illnesses, and the expanding list of stroke risk factors. A class of computer algorithms known as machine learning (ML) can learn from data without having to be explicitly programmed.
- To predict stroke and its effects, a number of physiological and clinical indicators have been used. A cyber-physical stroke rehabilitation system (CP-SRS) as well as the modified Rankin Scale (mRS90) and National Institutes of Health Stroke Scale (NIHSS24) have both been predicted using ANN models.
- The results of this study indicate that neural networks might create a new and efficient way to categorize stroke patients' risk.

From total 1560 patients, 1153 subjects had stroke, 895 had ischemic type, 259 had hemorrhagic type, 473 had one side face affected, 965 had one side arm affected, 840 had one side leg affected, 1163 had asymmetry, 587 were not ambulating, 762 were not able to speak, 243 were not able to grasp, 22 had visual disturbances, 218 had abnormal sensation, and 349 had mental changes. Approximately, 74% subjects were affected with stroke, this number matched with remaining non-stroke subjects is a reasonable training size to generate neural network on.

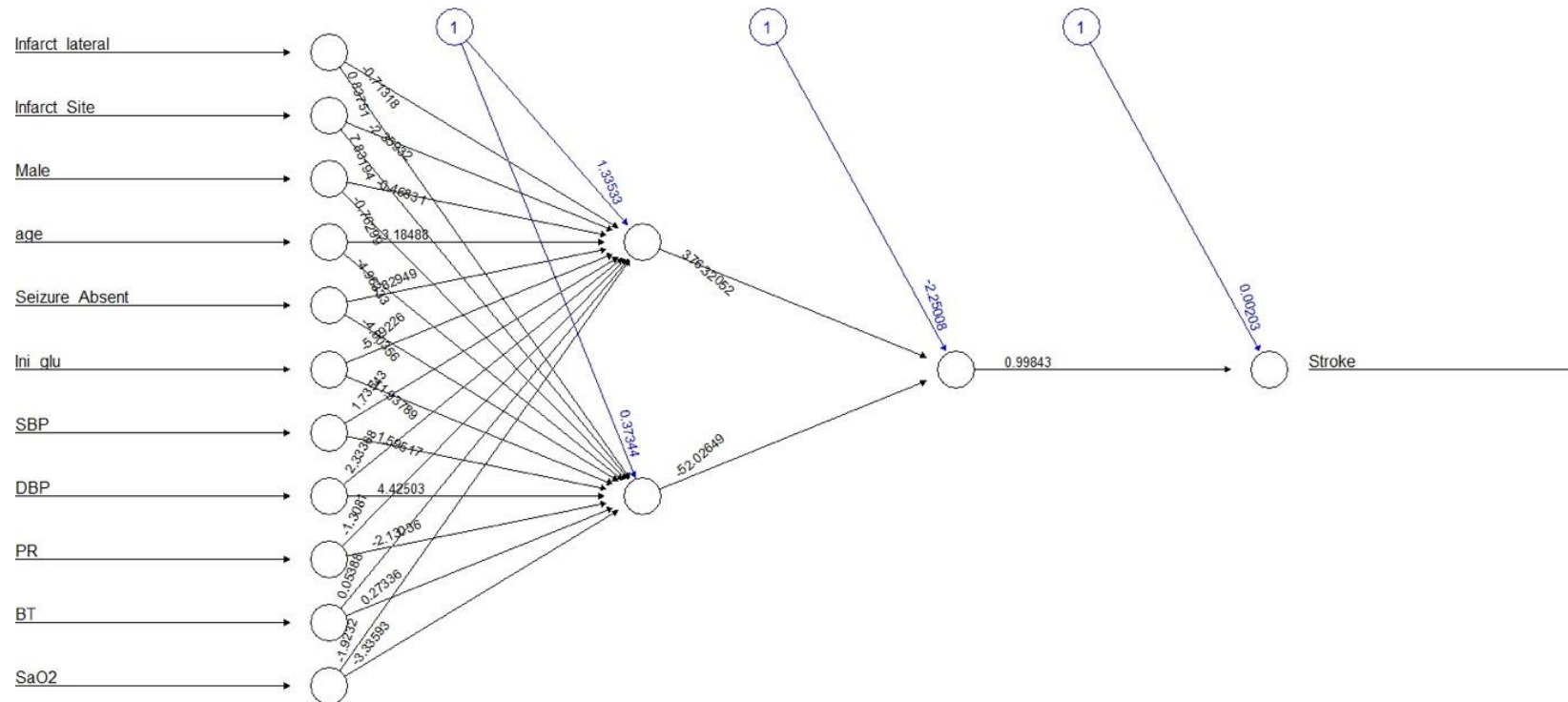


Table 1: Distribution of different training variables.

Table 2: 3-, 5-, and 10-fold validation evaluation metrics for stroke prediction.

Table 3: 3-fold validation evaluation metrics for 12 outcome predictions.

Metric	3-fold stroke	5-fold stroke	10-fold stroke
sensitivity	0.95	0.94	0.94
specificity	0.70	0.71	0.74
fscore	0.92	0.93	0.93
precision	0.90	0.91	0.92
accuracy	0.89	0.89	0.89

	Age			Initial Glucose			Systolic Blood Pressure				Diastolic Blood Pressure			Pulse Rate				Body Temperature			SaO2		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max		
Male (n=900)	61.83537	15	94	149.9021	30	1065	147.9455	60	300	85.5228	33	140	83.1733	32	180	36.48022	34.4	40.2	99.55061	50	100		
Female (n=660)	66.62424	18	99	144.5591	32	518	147.2045	70	263	85.48333	36	687	83.31152	33	162	36.52424	31.4	40	99.32879	50	100		

Metric	Hemorrhagic	Ischemic	One sided face	One sided arm	One sided leg	Asymmetry	Not ambulatory	Not able to speak	Visual disturbances	Abnormal sensation	Mental change	Not able to grasp
sensitivity	0.32	0.51	0.42	0.70	0.61	0.83	0.45	0.50	0.50	0.30	0.57	0.04
specificity	0.89	0.31	0.71	0.54	0.59	0.41	0.66	0.55	0.99	0.85	0.86	0.84
fscore	0.41	0.42	0.06	0.73	0.67	0.78	0.42	0.41	0.50	0.06	0.46	0.03
precision	0.59	0.36	0.03	0.76	0.75	0.74	0.39	0.35	0.50	0.03	0.39	0.03
accuracy	0.71	0.40	0.70	0.65	0.60	0.69	0.59	0.53	0.99	0.84	0.82	0.73

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