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## Adaptive Neuro Fuzzy Inference System for Diagnosing Coronavirus Disease

2019 (COVID-19)

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Received 2020-10-30; Revised 2020-11-6; Accepted 2020-11-9  
Available online 2020-12-26

### Abstract

*Coronaviruses which are positively sensed single-stranded Ribonucleic Acid (RNA) viruses are causing serious threat to global public health due to the widespread of the virus and no one having immunity to the virus. Timely diagnosis of the disease has become a major challenge due to the limitation associated with the present methods used in diagnosing of COVID-19 and a limited number of COVID-19 test kits available in hospitals due to the increasing number of cases daily. There is a need to propose a model that can provide timely, differential and alternative diagnosis option to prevent COVID-19 spreading among people. In this study an ANFIS based model was proposed for diagnosing COVID-19, the model was trained and tested*

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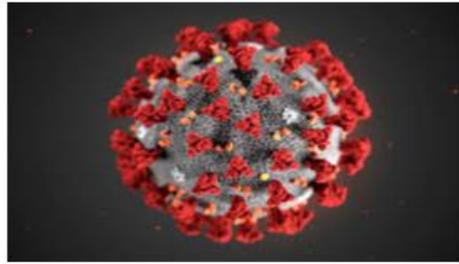
*using 600 COVID-19 dataset. The ANFIS model had accuracy of 96.6% for predicting and diagnosing COVID-19.*

**Keywords:** *Coronavirus; COVID-19; Diagnose; ANFIS*

## **1.0 Introduction**

The world has experienced several wide spread diseases causing serious threat to global public health affecting a large proportion of the population, including the 2002 Severe Acute Respiratory Syndrome (SARS) epidemic that caused 774 deaths out of about 8000 cases, the 2009 H1N1 influenza virus pandemic with 18500 deaths, the 2012 Middle East Respiratory Syndrome (MERS) epidemic that caused 800 deaths out of 2500 cases, the 2014 Ebola virus outbreak with 28616 cases and 11310 deaths, and the recent Coronavirus Disease 2019 (COVID-19) pandemic [1].

Coronaviruses (CoVs) are positively sensed single-stranded Ribonucleic Acid (RNA) viruses that belong to the order Nidovirales, family Coronaviridae, and subfamily Orthocoronavirinae with four (4) species; alpha, beta, delta and gamma coronaviruses [2]. Alpha CoVs and beta CoVs originated from bats and rodents while delta CoVs and gamma CoVs have their origins from avian species [3]. COVID-19 can be transmitted from human-to-human by respiratory droplets from sneezing, coughing and aerosols, with symptomatic people being the major source of transmission. It has a dynamic incubation period of about 5 to 14 days [4].



**Figure 1: Coronavirus**

Source: [www.newscientist.com](http://www.newscientist.com)

CoVs have been reported to be the major causes of about 5% to 10% acute respiratory infections [5]. The first outbreak of COVID-19 was reported in Wuhan, China in December, 2019 with the reported confirmed cases standing at over 29.9 million and recorded deaths 942,735 worldwide which is still counting day by day. COVID-19 diseases continuing to infect and reduce human populations which is due to the fact that no one has immunity to COVID-19, which means thousands to millions of people are likely to be more vulnerable to this viral infection and severe disease. COVID-19 affects different people in different ways, the World Health Organization (WHO) listed the symptoms of COVID-19 from the less common symptoms to serious symptoms [6]. The listed symptoms of COVID-19 is tabulated in Table 1:

**Table 1: COVID-19 Symptoms**

S/N	Less common	Most common	Serious symptoms
1	Aches and pains	Fever	Difficulty breathing or shortness of breath
2	Sore throat	Dry cough	Chest pain or pressure
3	Diarrhoea	Tiredness	Loss of speech or movement
4	Conjunctivitis		
5	Headache		
6	Loss of taste or smell		
7	Rash on skin, or discolouration of fingers or toes.		

**Source: WHO, 2020**

For the diagnosis of COVID-19, detection of viral RNA in the secretions from the respiratory tract of infected patients by Reverse Transcription-Polymerase Chain Reaction (RT-PCR) test is currently the standard method for diagnosis of COVID-19. This method have some weaknesses ranging from long turnaround time usually around 2–4 hour to the requirement of specialized facilities to carry out the test. Scientists around the world have been devoting effort to developing improved nucleic acid-based, simpler and faster methods. The United States (US) FDA issued an emergency-use authorization to Cepheid’s Xpert Xpress SARS-CoV-2 test, which became the first point-of- care COVID-19 diagnostic test to receive this designation in the US. The test is designed to use the company’s automated GeneXpert Systems and has a turnaround time of approximately 45 min [7]. Timely and differential diagnosis of disease are today becoming a necessity in medicine and health systems [8], [9]. In this regard, proposing and developing expert systems based on machine learning method for accurate prediction, efficient diagnosis and effective management of diseases has drawn significant research attention among

researchers and physicians [8-14]. However, this study is to propose a model based on Adaptive Neuro-Fuzzy Inference System (ANFIS) for diagnosing COVID-19.

ANFIS is a branch of Artificial Intelligence (AI) which plays a major role in prediction, modeling and inference. ANFIS is a Fuzzy Inference System (FIS) implemented in the framework of adaptive networks. It integrates both Neural Networks (NN) And Fuzzy Logic (FL) principles into a single framework with learning capability to approximate non-linear functions and works as a universal estimator [15]. It is based on the Takagi–Sugeno FIS, developed in the early 1990s. The learning networks in this model are based on mathematical computations capable of solving complex problems. ANFIS based predicting models which contains the knowledge and experience of an expert can accurately predict diseases [11], [16].

## **2.0 Related Works**

There are number of numerous studies which have been carry out on detecting, predicting, classifying and diagnosing of COVID-19 using Artificial Intelligence (AI).

Alile and Otokiti, proposed and simulated a Bayesian Belief Network (BBN) model to predict COVID-19 using 47 disease ailments dataset and each ailment has a value which represents the probability of such disease ailment causing COVID-19. The proposed model was trained and tested and it was reported to have an accuracy of 99% in predicting COVID-19 with its symptoms [17].

Narin et al. proposed a three different Convolutional Neural Network (CNN) based models (ResNet50, InceptionV3 and Inception-ResNetV2) for the detection of coronavirus pneumonia infected patient using 100 chest X-ray radiographs. The chest X-ray radiographs consists of 50 normal healthy people and 50 COVID-19 patients. The three CNN models; ResNet50,

InceptionV3 and Inception-ResNetV2 were evaluated using five-fold cross validation and it was reported that ResNet50 model had the best detection accuracy of 98% in detection of COVID-19. While the other two models reported 97% accuracy for InceptionV3 and 87% accuracy for Inception-ResNetV2 [18].

Sethy and Behera proposed a model for detecting COVID-19 by extracting features from chest X-ray images using a deep-learning algorithm and classified the images as either infected or non-infected using a Support Vector Machine (SVM). 11 deep-learning models was employed; AlexNet, VGG16, VGG19, GoogLeNet, ResNet18, ResNet50, ResNet101, InceptionV3, Inception-ResNetV2, DenseNet201, and XceptionNet. Two categories of dataset was collected; the first containing chest X-ray images of 25 infected patients and 25 non-infected patients and the other containing chest X-ray images of 133 infected patients (e.g. MERS, SARS and Acute Respiratory Distress Syndrome (ARDS) patients) and 133 non-infected patients. They performed separate feature extractions on each dataset using various models and achieved a 95.38% accuracy with ResNet50 and SVM [19].

Gozes et al. proposed a system to automatically identify COVID-19 patients and examine the disease burden quantification by employing a deep-learning approach on Computed Tomography (CT) scans using a dataset of CT scans from 157 foreign patients from China and the United States of America (USA). The proposed system analyses the CT scan at two distinct levels; subsystems A and B. Subsystem A performs a 3D analysis and subsystem B performs a 2D analysis of each segment of the scan to identify and locate broader diffuse opacities including ground-glass infiltrates which have been clinically identified as representative of COVID-19. For the system evaluation ResNet50 was applied to subsystem B and reported an accuracy of 98.2% and specificity of 92.2% respectively [20].

Fatima and Samy designed and implemented an expert system to detect and diagnose symptoms of COVID-19 using Clips and Delphi expert system languages. The main sources of the knowledge for this expert system are medical and specializes websites for COVID-19. The knowledge captured are converted into the Knowledge Base (KB) using CLIPS shell. The diagnosis of COVID-19 by the expert system was accomplished by displaying all symptoms of COVID-19 and selecting from the symptoms in the list and then analyze to diagnosis the day of recognizing symptoms, survival and spread, favorable conditions and snapshot of the status. The expert system was assessed by doctors and they were satisfied and accepted with its quality of performance [21].

Fu et al. proposed a classification system based on ResNet50 to detect COVID-19 and some other infectious lung diseases (pulmonary tuberculosis and bacterial pneumonia). 60,427 CT scans from 918 patients were dataset collected for the proposed system. 14,944 of these CT scans were from 150 COVID-19 patients and 15,133 from 154 non-COVID-19 viral pneumonia patients. Several tests was carried out for numerous number of lung diseases. The achieved accuracy, sensitivity and specificity of the system were 98.8%, 98.2% and 98.9% respectively [22].

### **3.0 Research Methodology**

#### **3.1 Dataset**

In this study, the dataset used in training, testing and diagnosing COVID-19 are 600 data from patients who visited Hospital Israelita Albert Einstein, Sao Paulo, Brazil who samples were collected to perform the COVID-19 test. The data was retrieved from Kaggle dataset open source repository. The chest dataset consists of 300 negative cases and 300 positive cases of COVID-19 patients. In Figure 2 and Figure 3 the sample dataset are shown:

COVID-19 Dataset (Negative Cases)												
S/N	fever	dry cough	tiredness	aches & pains	sore throat	diarrhoea	conjunctivitis	headache	loss of taste	difficulty breathing	chest pain	rash on skin
1	3.356192	2.21142343	0.017197	8.080519969	9.348362338	7.438448	9.529350677	0.38212	0.545666197	5.531750695	9.633530723	9.980803183
2	2.86606	5.59830122	6.056773	2.735570081	8.445204796	7.480207	3.323889643	9.989759	8.190461635	5.930374715	1.149107175	0.544740961
3	0.023118	7.4346026	4.726612	2.2056898	0.862378551	8.576355	1.195635118	3.692319	6.597661295	5.465890274	7.820979624	8.533884062
4	3.282366	1.6392956	6.750087	7.930725888	8.076149198	3.872717	4.801095932	5.807428	0.089315696	7.475201618	1.850609441	9.733860642
5	1.874368	2.99335597	6.148718	0.186144102	1.017632764	6.180857	2.305469807	9.122435	4.787946419	4.069935919	0.845397813	9.667886595
6	1.155034	4.66534294	1.190278	5.90988	9.926664575	5.436939	2.835097389	3.185295	4.68909451	7.122081751	0.798426613	8.772283894
7	1.252459	2.73768514	0.351108	8.564615429	9.46307026	8.635129	5.027158737	1.30886	0.838919878	8.074206773	9.616357426	3.81907864
8	3.461292	8.0638508	3.149146	0.092273166	8.838341211	0.613613	4.397325396	7.579402	5.2022914	1.733942208	7.655930082	1.483294275
9	0.803365	1.41540272	7.541408	3.427420367	8.773708275	4.389826	2.791551952	6.02471	9.366045911	1.757715988	4.635859666	8.893708592
10	1.186591	6.91665078	0.655248	0.123896138	7.816668715	3.323884	7.448487443	2.464871	0.616353322	5.943789797	5.645502373	7.181174506
11	1.06173	4.72508304	5.764021	1.50199212	3.499469695	9.7714	0.444484524	1.023077	3.082668797	0.80382196	9.179952745	3.891518112
12	7.826105	8.41589004	2.360213	2.855563812	2.940497194	5.222751	6.591545995	7.085994	8.308467033	9.055198667	3.43989527	9.244799393
13	0.338983	7.04977127	2.206344	5.20022107	6.973386445	0.207066	1.971270306	6.089622	2.087571638	1.362260913	9.675026068	2.570049285
14	2.312584	0.38340886	5.041337	3.684764143	7.413136008	2.047271	0.950697854	3.682168	4.518317608	5.628686547	9.631521376	8.741107318
15	2.081544	8.59929681	2.221247	1.165001464	1.355857881	9.288406	5.370964759	1.916047	2.965897628	2.063593943	1.443073868	0.15516669
16	7.03189	1.0447512	6.848124	2.728060739	3.734454522	8.220609	8.538993626	9.126569	4.435091251	5.213346943	3.996127943	5.70449885
17	1.218691	6.91665078	5.130591	4.988541206	7.613462545	1.621048	9.607116948	2.508699	6.240593115	1.867174743	2.972397053	1.278255502
18	6.745355	7.40925491	1.090489	6.667677508	7.248439269	9.650459	8.343980953	2.285766	3.290800454	6.11902538	6.495690754	3.576467971
19	8.022133	7.22257052	9.476761	4.581970363	8.397184238	7.871425	3.97482921	1.740935	9.060558215	7.560222333	7.564317709	1.846819807
20	2.960656	0.70132102	6.845965	0.470872536	5.363939954	9.310562	4.021467553	9.209169	3.629061852	3.952462214	6.939220423	2.686583353
21	7.263113	0.3916695	3.528114	9.907299317	8.769660256	9.106519	5.437446632	8.658288	1.384545898	3.309138432	6.405829864	0.387727939
22	5.98054	2.92989104	2.77179	7.598780748	8.818709957	6.92618	9.537280602	0.786408	9.514975706	7.779556812	0.32243354	0.483787082
23	3.974978	9.42069521	4.47389	9.236100659	9.705167257	5.387456	7.336025483	3.350479	0.551634479	1.38862963	4.078863699	6.571039307
24	6.428481	4.05280869	8.786417	7.352649751	8.578645431	4.904799	0.94506573	8.736112	5.370296636	9.576332201	1.478694343	1.18432611
25	0.055215	2.92215554	7.201691	9.754246354	7.992910784	1.133312	4.115105395	6.1877	2.009615845	6.376821677	8.116889649	6.807343284
26	7.547218	1.31105242	5.801856	5.097103563	2.546016345	2.024231	0.628066989	6.129087	7.159446483	7.113419434	9.820552865	7.002882598
27	9.069703	4.51681061	5.101977	0.319859779	4.118153676	3.528439	0.828337978	6.63499	2.21187512	3.751095757	5.849330776	4.740805718
28	7.1619358	5.63619059	7.542461	3.317743087	3.86590673	6.49E-04	0.511300811	2.256925	8.550028517	9.890313242	4.987951687	0.604115034
29	2.020771	1.03768411	2.375772	8.675963266	6.943457422	2.040231	8.680526173	3.61455	2.181581849	7.631758418	7.122245588	0.042674678
30	4.763885	3.01628308	4.921706	2.517262976	9.419268402	8.866724	9.61307567	6.643655	8.593966964	6.80760985	0.32162979	0.88649369
31	7.969316	9.05723545	7.71413	4.36353792	0.92303801	0.42498	7.660425983	8.291947	9.576012405	4.477152426	9.104342636	4.006653007
32	0.974987	5.15299984	7.946764	8.693150167	4.513654547	8.929129	2.802242661	4.211459	2.790592836	4.813088205	2.35701673	5.65890117
33	3.74223	2.86251371	5.487489	5.613293664	3.50962662	0.287866	6.623495774	9.658775	2.134608298	3.123717903	7.634916819	1.709233023
34	6.825284	5.82268872	8.835951	2.794847346	5.029420471	6.680931	5.990474627	9.476799	7.388354215	3.182540017	7.164324386	2.142270101
35	3.921099	6.46787394	1.725696	5.536205295	3.461501981	6.327849	3.33764527	7.952747	0.06631859	9.003327714	0.704714328	7.574886706
36	7.088758	3.70725328	1.366155	2.772161922	2.426981182	1.163573	0.693910682	4.803228	6.925576167	9.540765749	0.679879946	5.10876079
37	7.13935	0.13755756	8.568331	8.854196236	3.32977999	7.193377	7.028723581	6.557352	4.151730837	6.939837997	0.22422557	2.413987912
38	4.544086	5.67134013	1.822837	6.171257541	0.249343876	1.350787	8.723109613	0.276391	2.120561923	1.572561336	3.102290098	5.650417108
39	5.134917	9.20171931	5.444624	5.202276921	4.557123908	4.73412	8.029860169	1.635748	0.3011047371	0.713289325	9.274122005	0.419985587
40	0.91711	0.5349138	2.346717	9.575820646	0.199232128	4.459363	4.320798398	6.64451	9.436300413	1.24701729	7.235867457	9.69792119
41	0.198339	8.82291223	7.908488	0.47338899	1.080739767	4.537807	9.923415081	1.717355	7.709290584	6.430795761	8.86447011	5.528836287
42	0.816827	0.26426886	6.601383	2.99965184	5.955373675	4.512469	9.849753196	9.048322	1.732703224	1.992041541	9.901922478	0.321093112
43	5.165223	3.63567122	7.965111	5.378516418	1.303216387	6.663507	4.877103452	5.725591	7.372601926	0.394164337	8.167180685	2.24871206
44	9.115719	5.02559192	3.323646	1.489960104	0.698451169	2.82966	3.280860058	2.918816	8.303451454	5.545758381	9.411082845	3.34923254
45	8.991622	1.82600335	6.445745	9.624848169	8.62681939	1.753378	7.304300883	1.622862	3.262641435	7.998289168	6.450974242	6.248506927
46	7.696337	8.96259778	6.918573	0.481223114	2.079042569	7.83946	5.242814409	5.8261	1.85528886	5.110244658	0.95810677	9.47694476
47	5.753807	2.8828937	5.987377	0.297775232	4.305121531	4.710439	0.6460093	0.72171	0.495722484	5.78018749	1.166551232	0.172842378
48	9.661803	0.05733318	2.435088	5.037074176	5.9720967	1.657493	7.225095975	0.501515	4.161255831	7.249914139	3.682243006	2.87511259
49	9.676343	0.73918606	6.330903	6.248326544	5.943140463	3.812763	6.91549127	6.692839	0.381348956	4.271270069	1.30534621	1.348614011
50	8.974777	8.47970066	4.773401	9.128009683	7.871628969	8.883673	1.286151486	6.417149	5.598524251	2.932971706	6.20493660	5.055867038
51	5.766426	9.77935424	4.748429	3.772647036	3.691737176	3.793573	5.055740949	7.97166	7.19950157	0.146383906	6.524560337	6.291284214
52	9.689832	6.04033808	8.256206	9.017693989	0.892375531	0.110522	8.076671667	5.787962	0.114964063	0.836729485	2.5426102	1.988815841
53	5.044346	7.23656395	4.178831	1.742624206	0.577399259	0.533229	8.55246238	8.067653	2.614376125	4.761009015	0.608253086	4.835960492
54	4.72574	7.72104664	6.479767	6.756744901	6.944474225	9.630039	0.43079125	4.544153	8.604644305	7.801229883	9.555618491	3.1610773607
55	9.916913	5.85855155	1.933229	8.344294048	0.084197643	6.490153	0.452436987	5.071741	1.465223744	4.655501048	2.241343903	9.120840771
56	1.346622	4.65617181	0.638641	6.998724551	6.68043515	3.413008	3.517831461	0.284216	0.080606391	7.81319792	8.328407631	6.862598789
57	4.971668	6.19539432	6.951045	0.439562441	9.847846906	6.172685	1.738019471	8.004918	5.457925638	6.166708692	6.666866226	8.927787396
58	2.900346	6.05503165	4.947319	1.184782126	9.06526319	7.913435	2.585753531	6.907384	8.84476862	6.525485763	3.232960209	9.612200288
59	3.253646	4.37706763	1.734696	2.48499186	1.937542667	9.409218	7.068173058	3.197816	9.505394955	5.632058022	4.007607554	9.29649602
60	9.270092	5.22444746	8.250329	7.493193272	6.581420495	9.994891	0.77624066	2.235401	6.57155086	0.238372955	7.69826048	8.727675612
61	9.520427	8.90666556	8.842179	5.79019256	4.238538575	8.103294	7.902244333	7.518265	1.060267671	9.523707543	6.817201535	8.097317447
62	4.050407	1.33542118	1.355797	6.048756841	1.240710916	3.460098	1.38337672	3.979205	4.107974018	6.60918729	3.015396974	8.498382613
63	7.235682	2.86381564	3.465477	5.334274276	5.264960755	8.205919	9.565498517	6.477609	5.151090465	0.0152317	8.004501201	5.143726431
64	8.061062	5.00494228	3.551322	8.307061458	5.567525955	8.125846	1.298965243	6.411698	9.150857565	2.725580465	9.296115545	9.621281396
65												

76	2.499982	4.67597905	9.628048	0.832201942	3.198602389	9.561105	2.114500265	6.410738	3.499438286	6.746231761	3.278016193	2.491032941
77	6.17195	4.5277907	0.773615	5.049682618	2.126441067	9.523509	4.177556727	4.401564	2.266319522	1.920051694	0.92796519	4.742993918
78	3.208152	8.71980027	7.660642	1.864302333	9.127824182	1.80429	3.149403547	4.081267	1.668861915	7.141534431	6.2918201	7.247333314
79	6.934701	6.61107862	0.034563	7.75102698	9.735744904	5.718093	8.979681953	5.057219	5.989801953	4.478394492	2.536212089	2.36045818
80	9.90367	9.73845556	5.278782	4.077196529	1.334868647	2.17343	1.387791686	6.690751	4.786031977	5.706476447	5.031689967	3.889054727
81	9.160685	0.45294092	7.029188	8.821374175	8.702242355	6.178125	0.488059895	8.312152	3.997443325	2.91303932	3.872297971	8.048594945
82	6.594573	9.21573076	9.390816	5.261668351	7.175626612	7.765349	2.835653322	8.40755	7.125523243	6.981269078	6.044008004	5.077705456
83	7.672699	7.11436836	9.700073	9.401445582	8.34251093	4.960034	2.325475794	7.786349	6.109994389	8.305925964	0.621913021	5.794408515
84	7.526082	0.78627939	7.47974	5.524847221	2.124320538	3.284492	0.014490301	3.727707	9.059809873	8.46589485	1.772424089	2.561288352
85	8.889708	7.12785183	8.309382	5.067341863	4.164080976	7.19779	2.102155546	9.510573	1.325258523	6.88399593	8.228039177	6.546001727
86	6.530542	1.18001034	5.083775	4.82118537	6.447482202	6.05872	2.556094543	9.645775	6.727223645	1.259774221	5.635342491	9.257365444
87	4.352924	0.56206202	5.210397	4.224448687	8.467921977	3.937862	8.794726687	4.414539	9.933298854	8.042405975	5.846463734	5.846463734
88	6.015627	6.80458562	6.021757	0.074056304	3.07554561	1.146247	2.85974704	3.865399	9.86598579	7.967427253	3.165197156	2.917883969
89	4.926284	5.42897612	1.930545	3.807390038	1.247948976	5.760989	8.070981887	2.571649	1.587439475	6.744682601	9.53846496	9.922918981
90	6.542565	7.43134804	5.449049	5.328131743	9.681391071	2.602105	4.107752018	4.666025	5.39895576	5.963731325	3.724122182	6.576923083
91	6.404419	3.62279378	8.15986	0.154602902	6.149070467	4.651681	1.600177619	9.575102	3.16343886	8.594571271	7.02002073	3.378224856
92	5.226204	1.83854724	7.636807	7.516853816	3.223489296	6.007053	7.415157462	7.361301	3.251758387	5.329923819	1.103753246	5.560104929
93	0.727712	3.74211864	5.321542	3.07852048	9.922356756	8.67182	8.067337099	6.663655	5.561459642	5.059367631	3.38176053	9.865183179
94	7.092746	7.11748999	2.766273	9.397913364	0.509860173	1.432633	4.03774752	0.544354	0.37886422	1.385699798	9.388757948	3.850426736
95	6.455489	1.73134053	4.302876	8.74228196	8.029635488	9.573626	9.751458545	1.808511	8.140594158	7.641412262	2.439170548	2.125043417
96	6.938268	0.31641728	9.85193	5.104141862	2.745337189	4.713618	6.586617317	3.496754	5.363605062	5.513344437	6.910668	2.692672169
97	7.072959	1.63388245	0.943856	9.535036838	9.4411777541	4.621266	0.011925487	9.642062	7.374235251	0.645487537	7.810639906	4.123623273
98	3.427889	7.32720371	3.43011	5.28886523	6.226254986	1.603186	6.575367203	7.650249	9.976343251	0.786191648	4.887074189	4.132144665
99	6.157119	5.7634487	0.500151	1.373480293	1.617702187	9.175789	4.191335185	8.524117	0.66598816	6.224730919	0.292166439	3.91459603
100	3.862073	2.75232414	1.285758	7.415261389	4.322138715	2.681979	0.079483443	4.436124	1.809017882	6.536310074	1.555746914	0.628528975
101	4.735765	0.1639204	4.713891	6.546527713	0.605076252	9.332707	0.732979277	4.024197	9.856282227	8.286839752	6.249462966	4.857292844
102	0.715164	9.24348747	2.611611	5.023286237	4.98619644	2.75314	6.553383232	0.579992	1.332495174	3.820591954	4.197109306	7.741955759
103	5.471623	8.77152857	4.868836	6.509876146	0.164747521	5.661601	5.773544143	7.277689	4.640319814	9.596580863	0.98245153	5.029484664
104	2.216022	1.18015889	7.812069	7.300919081	3.961363995	5.305306	6.809107933	5.379086	2.044833658	7.142512247	7.218368471	4.669273484
105	3.810866	0.05976339	2.564024	5.128693161	7.345742187	6.683075	9.827309743	3.434303	3.937547417	0.924704236	9.105713361	9.328764354
106	8.703433	5.35212279	0.427484	1.738084478	3.013553861	2.410479	8.246740362	7.009956	1.323499776	3.668773547	3.785409961	7.275412287
107	1.097663	7.25299264	2.454196	3.066278274	9.265165793	4.843986	9.723849486	0.451512	4.957793169	8.025788237	3.1189115	7.409845626
108	8.896091	2.74201974	6.487522	2.465110793	1.231515281	2.597063	8.597635588	7.671908	8.208007304	9.336050694	4.26449209	6.892401299
109	8.030245	6.35318078	6.826786	1.292734083	6.898250518	0.158644	2.420594219	0.606107	1.930085803	0.586810776	9.32905272	6.624882492
110	1.558855	8.96943938	7.051076	2.927266205	7.086318651	7.969399	2.688962881	9.712583	3.296917965	1.914331491	3.676411276	8.880882241
111	3.360395	2.14212606	8.004032	8.241825422	8.482390147	5.673642	4.038195682	7.845996	1.383680669	9.029774709	7.442323877	6.458011299
112	5.244438	6.9408677	1.506789	2.777882443	4.162446986	0.156804	5.907559118	5.605623	4.119550772	1.359953438	0.879301108	0.160344534
113	1.203864	6.98671147	9.51743	5.947015953	4.609100933	0.575421	3.446771089	1.012361	3.675189591	8.284867043	5.646604837	4.778829545
114	1.769608	7.18879335	7.050858	9.396146734	9.382788838	5.717039	4.984643392	5.211381	4.521776212	9.88971322	4.079048552	1.32745162
115	0.980603	7.95188854	6.099093	6.916074143	8.799533718	9.571965	8.607020301	3.206514	4.108795876	6.807747144	2.335826766	6.94377111
116	3.806368	7.72363855	9.691816	6.019381293	9.983191137	1.286085	8.598743796	0.761549	9.796380128	8.029940663	4.419177189	8.227057181
117	1.539396	2.29678562	1.725699	5.840880014	6.068766686	5.286445	9.442503904	2.976135	3.563935303	7.741358393	2.463019532	4.366692599
118	6.939483	2.11619842	4.126237	3.04739628	9.167505784	7.931077	5.666694363	7.734896	5.386667818	8.490023027	1.41088274	6.417785546
119	5.505554	9.83812417	1.346934	0.174544918	0.074201536	7.098087	9.738326324	0.415025	6.365904052	1.870315427	8.364718819	7.835317611
120	4.90577	8.27310601	0.261596	1.208338349	6.435242802	0.1604867	0.532468622	0.657889	7.402427892	9.783595399	9.321943768	7.972045122
121	5.044346	7.23656395	4.178831	1.742624206	0.577399259	0.533229	8.55246238	8.067653	2.614376125	4.761009015	0.608253086	4.835960492
122	4.72574	7.17204646	6.479767	6.756744901	6.944474225	9.630039	0.43079125	4.544153	8.604644305	7.801229883	9.556184891	3.616773607
123	9.196913	5.85855155	1.933229	8.344294048	6.084197643	6.490153	0.452436987	5.071441	1.465237444	4.655501048	2.241343903	9.120840771
124	1.346622	4.65617181	0.638641	6.998724551	6.684043515	3.413008	3.517831461	0.284216	0.080660391	7.81319792	3.328407631	6.862598789
125	4.971668	6.19539432	6.951045	0.439562441	9.847846296	6.172685	1.738019471	8.004918	5.457925638	6.166708692	6.668668266	8.92777396
126	2.900346	6.05903165	4.947319	1.184782126	9.06526319	7.913435	2.585753531	6.907384	8.84476862	6.525485763	3.232960209	9.612002888
127	3.253646	4.37706763	1.734696	2.48499186	1.937542667	9.409218	7.068173058	3.197816	9.505394955	5.632058022	4.087065567	9.29649602
128	9.270092	5.22444746	8.250329	7.493193272	6.581420495	9.994891	0.77624066	2.235401	6.57155086	0.238372955	7.69826048	8.727675612
129	9.520427	8.90066556	9.842179	5.79019256	4.238538575	8.103294	7.902244333	7.518265	1.060267671	9.523707543	6.817201535	8.097317447
130	4.050407	1.33542118	1.355797	6.048756841	1.240710916	3.460098	1.38337672	3.979205	4.107974018	6.60918729	3.015396974	8.498382613
131	7.235682	2.86381564	3.465477	5.334274276	5.264960755	8.205919	9.565498517	6.477690	5.151090465	0.0152317	8.004501201	5.143726431
132	8.061062	5.00494228	3.551322	8.307061458	5.567525955	8.125846	1.298965243	6.411698	9.150857565	2.725580465	9.296115545	9.621281936
133	8.984339	7.15736252	2.146642	0.694847571	4.598381636	8.048111	8.011923263	2.42131	1.838133262	1.027093465	4.42227195	4.604665117
134	5.460002	5.13350298	7.760925	4.615070528	6.688135331	1.311842	4.79539921	1.308808	1.11854162	6.267888487	6.040917963	4.482485823
135	6.466383	1.956714	0.938818	4.909611876	2.359353865	5.79361	6.513355993	8.619996	2.496809182	7.039119144	9.20089922	7.672774125
136	7.50668	3.7963108	4.951079	5.238277035	5.000026445	2.249325	0.376991978	6.023371	2.151685199	5.356157621	9.516667084	7.162423679
137	2.269919	4.63214928	6.859791	5.128297413	9.662512308	8.170989	1.637505405	5.39515	3.119721216	8.726867814	9.451696104	7.258546367
138	3.499049	3.23009789	1.789677	0.169267447	2.49594662	1.680917	3.735125595	2.918211	2.601417756	6.874368103	9.058797202	7.171888844
139	8.196275	7.43192946	6.874297	4.580952291	1.81353348	1.443722	8.075894445	3.617314	5.061205359	0.042032494	6.999135416	8.131031188
140	5.98054	2.92899104	2.77179	7.598780748	8.							

156	4.544086	5.67134013	1.822837	6.171257541	0.249934876	1.350787	8.723109613	0.276391	2.120561923	1.572561336	3.102290098	5.650417108
157	5.134917	9.20171931	5.444624	5.202276921	4.557123908	4.73412	8.029860169	1.635748	0.301047371	0.713289325	9.274120205	1.049985587
158	0.91711	0.5349138	2.346717	9.575820646	0.199223128	4.459363	4.320798398	6.64451	9.436300413	1.24701729	7.235867457	6.967992119
159	0.198339	0.82291223	7.908488	0.47338899	1.080739767	4.537807	9.923415081	1.717355	7.709290584	6.430795761	8.86447011	5.528836287
160	0.816827	0.26426886	6.601383	2.99965184	5.955373675	4.512469	8.849753196	9.048322	1.732703224	1.992041541	9.901922478	0.321093112
161	5.165223	3.63567122	7.965111	5.378516418	1.303216387	6.663507	4.877103452	5.725591	3.727601926	0.394164337	8.167180685	2.24871206
162	9.115719	5.02559192	3.323646	1.489960104	0.698451169	2.82966	3.280860058	2.918816	8.303451454	5.545758381	9.411082845	3.34923254
163	8.991622	1.82600435	6.445745	9.624848169	6.862681939	1.753378	7.304300883	1.622862	3.262641435	7.998289168	6.450974242	6.248506927
164	7.965337	8.96529778	6.918573	0.481223114	2.079042569	7.83946	5.242814409	5.8261	1.85528886	5.110244658	9.95810667	9.476694476
165	5.753807	2.88289937	5.987377	0.297775232	4.305121531	4.710439	0.6460093	0.72171	0.495722484	5.78018749	1.166551232	0.172842378
166	9.661803	2.05873318	2.435088	5.037074176	5.9720967	1.657493	7.225095975	0.501515	4.361255831	7.249914139	3.682243006	2.875171259
167	6.376343	0.73918602	6.330903	6.248326544	5.943140463	3.812763	6.91549127	6.692839	0.381348956	4.271270069	1.335034621	1.348614011
168	8.974777	8.46790066	4.273401	9.128009683	7.871628969	3.883673	1.286151486	6.417149	5.98524351	2.932971706	6.20493603	5.055867038
169	5.766426	9.77935424	4.748429	3.772647036	3.691737176	3.793573	5.055740949	7.97166	7.19950157	0.146383906	6.524560337	6.291284214
170	9.689382	6.04033808	8.256206	9.017693989	0.892375531	0.110522	0.876671667	5.787962	0.114964063	0.836729485	2.5426102	1.988815841
171	5.226204	1.83854724	7.636807	7.516853816	3.223489296	6.007053	7.415157462	7.361301	3.251758387	5.329923819	1.103753246	5.560104929
172	0.277102	3.74211864	5.321542	3.07852048	9.922356756	6.87182	0.867337099	6.663655	5.561459642	5.059367631	3.38176053	9.865183179
173	7.092746	7.11748999	2.766273	9.397913364	0.509860173	1.432633	0.43774752	0.544354	0.378866422	1.385699798	9.388757948	8.358426736
174	6.455489	1.73134053	4.302876	8.74226196	0.029635488	9.573626	9.751458545	1.808511	8.140594158	7.641412262	2.439170548	2.125044311
175	6.938268	0.31641728	9.85193	5.104141862	2.74537189	4.713618	6.586617317	3.496754	5.363650562	5.513344337	6.910668	2.692672169
176	7.072959	1.63388245	0.943856	9.535036838	9.44177541	4.621266	0.101925487	9.642062	7.374235251	0.645487537	7.810639806	4.123623273
177	3.427889	7.32707971	3.43011	5.28886523	6.226254986	1.603186	6.575367203	7.650249	9.97634251	0.786191648	4.887074189	4.132144665
178	6.15719	5.47634885	0.500151	1.373480293	1.671702187	9.175789	4.191335185	8.852417	0.656598816	6.224730919	0.292166439	3.91459603
179	8.862073	2.75323414	1.285758	7.415261389	4.322138715	2.681979	0.079483443	6.436214	1.809017882	6.536310074	1.555746914	0.628528975
180	4.735765	0.1639204	4.713891	6.546527713	0.605076252	9.337207	0.732979277	4.024197	8.965628227	8.286839752	6.249462969	4.857292844
181	0.715164	9.24348747	2.611611	5.023286237	4.98619644	2.75314	6.53383232	0.579992	1.332495174	3.820591954	4.197109306	7.741955759
182	5.47143	8.77152857	8.468836	6.509876146	0.164747521	5.661601	5.773544143	7.277689	4.640319814	5.956508463	0.98254153	5.029484664
183	2.216022	1.18015889	7.812069	7.300919081	3.96136995	5.305306	6.809107933	5.379086	2.044833658	7.142512247	7.218368471	4.669273484
184	3.810866	0.05976329	2.564024	5.128693161	7.345742187	6.683075	9.827309743	3.434303	3.937547417	0.924704236	9.105713361	9.328764354
185	8.703433	5.35212279	0.427484	1.738084478	3.01353861	2.140479	8.246740362	7.009956	1.323499776	3.668773547	3.785409961	2.170412287
186	1.097663	7.25299264	2.454196	3.066278274	9.265165793	4.843986	9.723849486	0.451512	4.957793169	8.025788237	3.3198115	7.409845626
187	8.936091	2.74201974	6.487522	2.465110793	2.135152381	2.597063	6.597635588	7.671908	8.208007304	9.336050694	4.26449209	6.892401299
188	8.000425	6.35318078	6.826786	1.292734083	6.898250518	0.158644	2.420594219	6.060107	1.930085803	0.586101776	9.32905272	6.624882492
189	1.558855	8.96943638	7.051076	2.927266205	7.086318651	7.969939	2.688962881	9.712583	3.296917965	1.914331491	3.676411276	8.880882241
190	3.360395	2.14212906	8.004032	8.241825422	8.482390147	5.673642	4.038195682	7.845996	1.383680669	9.029774709	7.44232387	6.458011299
191	5.244438	6.9408677	1.506789	2.777882443	4.162446986	0.156804	5.907559118	5.605262	4.119550772	1.359953438	0.879301108	0.160344534
192	2.030864	6.98671147	9.51743	5.947015953	4.609100933	5.075421	3.446731089	1.012361	3.675189591	8.284867043	5.646604837	4.778289545
193	1.769608	7.18879335	7.050858	9.396146734	9.382788838	5.717039	4.984643392	5.211381	4.521776212	9.88971322	4.079048552	1.327455162
194	0.980603	7.95188854	6.099093	6.916074143	8.799533718	9.571965	8.607020301	3.206514	4.108795876	6.807477144	2.353826366	6.943741321
195	3.480638	7.72363855	9.691816	6.019381293	9.983191137	1.286085	8.598743796	0.761549	7.976308128	8.029940663	4.419177189	4.22375111
196	1.539396	2.29678562	1.725699	5.840880014	6.068766686	5.286445	9.442503904	2.976135	3.563935303	7.741358393	2.463019532	4.366692599
197	5.693483	2.14212906	4.126237	3.04739628	9.167505784	7.931077	5.66694363	7.734896	5.386667818	8.490023027	1.14188274	6.417785456
198	5.505554	8.831211	1.346934	0.174544918	0.074201536	7.098087	9.738326324	0.415025	6.365904052	1.870315427	8.364718819	7.833317611
199	4.905777	9.2770607	0.261596	1.208338349	6.435242802	1.604867	0.532468622	0.657889	7.402427892	9.783595399	9.331943768	7.972045122
200	7.399385	3.97725438	8.29924	6.737430255	9.46280732	2.307726	4.046820298	9.558455	7.992011813	7.720911974	8.71810497	3.395736309
201	1.022124	9.91919981	8.316159	4.70772057	2.77225937	1.004404	0.44789194	3.950906	7.909652715	3.933835371	1.214897733	4.917265265
202	5.575562	6.37265397	9.071096	9.839030813	1.185761986	1.256964	3.090074206	0.188325	2.150173459	7.920777239	5.583301963	1.052446169
203	0.769735	2.26952825	9.990192	6.607567034	3.787242325	7.020785	9.551111943	1.484319	9.019086868	2.869595511	3.261896708	6.308134053
204	2.499882	4.67597905	9.628048	0.832201942	3.198602389	9.561105	2.114500265	6.410738	3.499438286	6.746231761	3.278016193	2.491032941
205	6.17145	4.5277907	0.73615	5.049682618	1.264441067	9.523509	4.177556727	4.401564	2.266319522	1.920051694	0.92796519	4.742993918
206	3.208192	8.71980027	7.660642	1.864302333	9.127824182	1.80429	3.149403547	4.081267	1.668861915	7.141534431	6.2918201	7.247333314
207	6.324701	6.61107862	0.034563	7.75102698	9.735744904	5.718093	9.879681953	5.057219	5.989801953	4.478394492	2.536212089	2.36045818
208	9.90367	9.73845556	5.278782	4.077196529	1.334686647	2.17343	1.387791686	3.690751	4.786031977	5.706476447	5.031689967	3.889054727
209	1.916085	0.45294092	7.029188	8.821374175	8.702242355	6.178125	0.488059895	8.312152	3.997443325	2.913039232	3.872297971	8.048594945
210	6.594573	5.21573076	9.390816	5.261668351	7.175626612	7.765349	2.835653322	8.40755	7.125523243	6.981269078	6.044008044	5.077705456
211	7.672899	7.11436836	9.700073	9.401445582	8.34251093	4.960034	3.254575794	7.86349	6.109994389	8.305925964	0.621913021	5.794048515
212	5.726082	0.78627939	7.47974	5.524847221	2.124320538	3.284492	0.014490301	3.727707	9.059089873	8.46589485	1.772424089	2.561288352
213	8.899708	7.12785183	8.309382	5.067341863	4.164080976	7.19779	2.102155546	9.510573	1.325258523	6.88399593	8.28039177	6.546001727
214	6.530542	1.18001034	5.083775	4.82118537	6.447482202	0.05872	2.556094543	9.645775	6.727236445	1.259774221	5.635342491	9.257365444
215	4.352924	0.56206202	5.210397	4.224448687	8.467921977	9.37862	8.794726687	4.414539	9.933298854	8.042405975	8.34763054	5.846463734
216	6.015627	6.80458562	6.021757	0.074056304	3.07554561	1.146247	2.85974704	3.865399	9.86598579	7.967422753	3.165197156	2.917883969
217	4.926284	5.42897612	1.930545	3.807390038	1.249798976	5.760989	0.870981887	2.571649	1.587439475	6.744682601	9.53846496	9.922918981
218	6.542563	7.43134804	5.449049	5.328131743	9.681391071	2.602105	4.107752018	4.666025	5.398957576	5.963731325	3.724121282	6.576923083
219	6.404419	3.62279378	8.15986	0.154602902	6.149070467	4.651681	1.600177619	9.575102	3.16343886	8.594571271	2.70200273	3.378224856
220	3.356192	2.21142343	0.017197	8.080519969	9.348362338	7.4384						

236	1.218691	6.91665078	5.130591	4.988541206	7.613462545	1.621048	9.607116948	2.508699	6.240953115	1.867174743	2.972397053	1.278255502
237	6.745355	7.40925491	1.090489	6.667677508	7.248439269	9.650459	8.343980953	2.285766	3.290800454	6.11902538	6.495690754	3.576467971
238	3.022133	7.22257052	9.476761	4.581970363	8.397184238	7.871425	3.97482921	1.740935	9.060558215	7.560222333	7.564317709	1.846819807
239	2.906056	0.70132102	6.845965	4.070872536	5.363939954	9.130562	4.021467553	9.209169	3.629061852	3.952462214	6.939220423	2.686583353
240	7.263113	0.3916695	3.528114	9.907299317	8.769660256	9.106519	5.437446632	6.658288	1.384545898	3.309138432	6.405829864	0.387727939
241	3.526192	2.21142343	0.017197	8.080519969	9.348362338	7.438448	9.529350677	0.38212	0.545666197	5.531750695	9.63350723	9.980803183
242	2.869606	5.59830122	6.056773	2.735570081	8.445204796	7.480207	3.323889643	9.989759	8.190461635	5.930374715	1.149107175	0.544740961
243	0.023118	7.4346026	4.726612	2.2056898	0.862378551	8.576355	1.195635118	3.692319	6.597661295	5.465890274	7.820979624	8.533884062
244	3.282366	1.6392956	6.750087	7.930725888	8.076149198	3.872717	4.801095932	5.807428	0.089315696	7.475201618	1.850609441	9.733860642
245	1.874368	2.99335597	6.148718	0.186144102	1.017632764	6.180857	2.305469807	9.122435	4.787946419	4.069935919	0.845397813	9.667886595
246	1.155034	4.66534294	1.190278	5.90988	9.926664575	5.436939	2.835097389	3.185295	4.68909451	7.122081751	0.798426613	8.772283894
247	1.252459	2.27368514	0.351108	8.564615429	9.46307026	8.635129	5.027158737	1.30886	0.838919878	8.074206773	9.616357426	3.81907864
248	3.461292	8.06385078	3.149146	0.092273166	8.838341211	0.613613	4.397325396	7.579402	5.2022914	1.733942208	7.655930082	1.483294275
249	0.803365	1.41540272	7.541408	3.4274020367	8.773708275	4.389826	2.791551952	6.02471	9.366045911	1.757175988	4.635885966	8.893708592
250	1.861533	0.65675478	6.655248	0.123896138	7.166668715	3.323884	7.448487443	2.464871	0.616353322	5.943789797	5.645502373	7.181774506
251	1.06173	4.72580304	5.764021	1.50199212	3.499469695	9.7714	0.444484524	1.023077	3.082668797	0.80382196	9.179952745	3.891518112
252	7.826105	8.41589004	2.360213	2.85563812	2.940497194	5.222751	6.591545995	7.085994	8.308467033	9.055198667	3.439889527	9.244799393
253	0.338983	7.04977127	2.206344	5.20021207	6.973386445	0.207066	1.971270306	6.089622	2.087571638	1.362260913	9.675026068	2.570049285
254	2.312584	0.38340886	5.041337	3.684764143	7.413136008	2.047271	0.950697854	3.682168	4.518317608	5.628686547	9.631521376	8.741107318
255	2.081544	8.59929681	2.221247	1.165001464	1.355857881	2.888406	5.370964759	1.916047	2.969897628	2.063593943	1.443073868	0.15516669
256	7.043192	1.0047512	6.848124	2.728060739	3.734455282	8.220609	8.538993626	9.126569	4.435091251	5.213449643	4.962172943	5.70449885
257	1.218691	6.91665078	5.130591	4.988541206	7.613462545	1.621048	9.607116948	2.508699	6.240953115	1.867174743	2.972397053	1.278255502
258	6.745355	7.40925491	1.090489	6.667677508	7.248439269	9.650459	8.343980953	2.285766	3.290800454	6.11902538	6.495690754	3.576467971
259	3.022133	7.22257052	9.476761	4.581970363	8.397184238	7.871425	3.97482921	1.740935	9.060558215	7.560222333	7.564317709	1.846819807
260	2.906056	0.70132102	6.845965	4.070872536	5.363939954	9.130562	4.021467553	9.209169	3.629061852	3.952462214	6.939220423	2.686583353
261	7.263113	0.3916695	3.528114	9.907299317	8.769660256	9.106519	5.437446632	6.658288	1.384545898	3.309138432	6.405829864	0.387727939
262	5.98054	2.92989104	2.77179	7.598780748	8.818709957	9.62618	9.537280602	0.786408	9.514975706	7.779556812	0.322423354	0.483378082
263	3.974978	9.42069521	4.47389	9.236100659	9.705167257	5.387456	7.336025483	3.350479	5.051634479	1.38862963	4.868969369	6.571039307
264	6.942841	4.05280869	8.786417	7.352649751	8.578645431	4.904799	0.94506573	8.736112	5.370296636	9.576332201	1.478694343	1.18432611
265	0.055215	2.92215554	7.201691	9.754246354	7.992910784	1.133312	4.115105395	6.1877	2.009615845	6.376821677	8.116889649	6.807343284
266	7.547218	1.31105242	5.801856	5.097103563	2.546016345	2.024231	0.628066989	6.129087	7.159446483	7.113419344	9.820552865	7.002882598
267	0.069703	4.51681061	5.101977	0.319859779	4.118153676	3.528439	0.828337978	6.63499	2.211782512	3.751095757	5.849330776	4.74080571
268	7.619358	5.63619059	7.542461	3.317743087	3.86590673	6.49E-04	0.511300811	2.256925	8.550028517	9.890313242	4.987951687	0.043115034
269	2.020071	1.03768411	2.375772	8.675963266	6.943457422	2.040231	6.680526173	3.61455	2.181581849	7.631758418	7.122245578	6.602674678
270	4.763885	3.01628308	4.921706	2.517262976	9.419268402	9.886724	9.634655	8.593966964	6.807060985	6.712229979	0.888649369	6.602674678
271	7.969316	9.05723545	7.71413	4.36353792	0.92303881	0.42498	7.660425983	8.291947	9.576012405	4.477152426	9.104342636	4.024653007
272	0.749877	5.15299984	7.946764	8.693150167	4.513654547	8.929129	2.802242661	4.211459	2.790592836	4.813088205	2.35701673	5.658690117
273	4.74223	2.86251371	5.487489	5.613293664	3.509662662	0.287866	6.623495774	9.658775	2.134608298	3.123717903	7.634916819	1.709233023
274	6.825284	8.26682788	8.583951	2.794847346	5.029420471	6.680931	5.990474627	9.476799	7.388354215	3.182540017	7.164324386	2.142270101
275	3.921095	6.46787394	1.725696	5.536205295	3.461501989	6.327849	3.337364527	7.952747	0.06631859	9.003327714	0.704714328	7.574886706
276	7.088758	3.70725328	1.366155	2.772161922	2.426981281	7.163573	0.693910682	4.803228	6.925576167	9.540765749	0.679879946	7.510870679
277	7.18935	0.13755756	8.568331	8.854196236	3.32977999	7.193377	7.028723581	6.557352	4.151730837	6.939837997	0.22422257	2.213987912
278	4.544086	5.67134013	1.822837	6.171257541	0.249343876	1.350787	8.723109613	0.276391	2.120561923	1.572561336	1.572561336	5.650417108
279	5.134917	9.20171931	5.444624	5.202276921	4.557123908	4.73412	8.029860169	1.635748	0.301047371	0.713289325	9.274120205	0.149985587
280	0.91711	0.5349138	2.346717	9.575820646	0.199223128	4.459363	4.320798398	6.64451	9.436300413	1.24701729	7.235867457	9.69792119
281	0.198339	0.82291223	7.908488	0.47338899	1.080739767	4.537807	9.923415081	1.717355	7.709290584	6.430795761	8.86447011	5.528836287
282	0.816827	0.26426886	6.601383	2.99965184	5.955373675	4.512469	9.849753196	9.048322	1.732703224	1.992041541	9.901922478	0.321093112
283	5.165223	3.63567122	7.965111	5.378516418	1.303216387	6.663507	4.877103452	5.725591	7.372601926	0.394164337	8.167180685	2.24871206
284	9.115719	5.02559192	3.323646	1.489960104	0.698451169	2.82966	3.280860058	2.918816	8.303451454	5.545758381	9.411082485	3.34923254
285	8.991622	1.82600435	6.445745	9.624848169	6.862681939	1.753378	7.304300883	1.622862	3.262641435	7.998289168	6.450974242	6.248506927
286	7.696337	8.96529778	6.918573	0.481223114	2.079042569	7.83946	2.542814409	5.8261	1.85528886	5.110244658	0.95810667	9.476694476
287	5.753807	2.88289937	5.987377	0.297775232	4.305121531	4.710439	0.6460093	0.72171	0.495722484	5.78018749	1.166551232	0.0172842378
288	9.661803	2.05873318	2.435088	5.037074176	5.9720967	1.657493	7.225095975	0.501515	4.361255831	7.249914139	3.682243006	2.875171259
289	6.976343	0.73918602	6.330903	6.248326544	5.943140463	3.812763	6.91549127	6.692839	0.381348956	4.271270069	1.335034621	1.348614011
290	8.974777	8.46790066	4.273401	9.128009683	7.871628969	3.886373	1.286151486	6.417149	5.598524351	2.932971706	6.20493603	5.055867038
291	5.766426	9.77935424	4.748429	3.772647036	3.691737176	3.793573	5.055740949	7.97166	7.19950157	0.146383906	6.524560337	6.291284214
292	9.689832	6.04033808	8.256206	9.017693989	0.892375531	0.110522	8.076671667	5.787962	0.114964063	0.836729485	2.5426102	1.988815841
293	5.044346	7.23656395	4.178831	1.742624206	0.577399259	0.533229	8.55246238	8.067653	2.614376125	4.761009015	0.608253086	4.835960492
294	4.72574	7.72104646	6.479767	7.756744901	6.944474225	9.630039	0.43079125	4.544153	8.604644305	7.801229883	9.555618491	3.616773607
295	9.916913	5.85855155	1.933229	8.344294048	0.084197643	6.490153	0.452436987	5.017141	1.465223744	4.655501048	2.241343903	9.120840771
296	9.916913	5.85855155	1.933229	8.344294048	0.084197643	6.490153	0.452436987	5.017141	1.465223744	4.655501048	2.241343903	9.120840771
297	1.346622	4.65617181	0.638641	6.998724551	6.684043515	3.413008	3.517831461	0.284216	0.080606391	7.81319792	8.328407631	6.862598789
298	4.971668	6.19539432	6.951045	0.439562441	9.847846906	6.172685	1.738019471	8.004918	5.457925638	6.166708692	6.666866226	8.927787396
299	2.900346	6.05503165	4.947319	1.184782126	9.06526319	7.913435	2.585753531	6.907384	8.84476862	6.525485763	3.232960209	9.612200288
300	2.523646	4.37706763	1.73469									

COVID-19 Dataset: Symptom Diagnosed Cases

S/N	fever	dry cough	tiredness	aches & pains	sore throat	diarrhoea	conjunctivitis	headache	loss of taste	difficulty breathing	chest pain	rash on skin
1	5.044345647	7.2365639	4.1788309	1.742624206	0.577399259	0.53322873	8.55246238	8.06765299	2.614376125	4.761009015	0.60825309	4.83596049
2	4.72574012	7.7210465	6.4797668	6.756744901	6.944474225	9.63003905	0.43079125	4.54415289	8.604644305	7.801229883	9.55561849	3.61677361
3	9.916913432	5.8585515	1.9332285	8.344294048	6.084197643	6.4901534	0.452436987	5.01714078	1.465223744	4.655501048	2.2413439	9.12084077
4	1.346621773	4.6561718	0.6386411	6.998724551	6.684043515	3.41300765	3.517831461	0.2842164	0.080606391	7.81319792	8.32840763	6.86259879
5	4.971668411	6.1953943	6.9510447	0.439562441	9.847846906	6.17268544	1.738019471	8.00491842	5.457925638	6.166708692	6.66686623	8.9277874
6	2.900346258	6.0550316	4.9473191	1.184782126	9.06526319	7.91343542	2.585753531	6.9073843	8.84476862	6.525485763	3.23296021	9.61220029
7	3.253646014	4.3770676	1.7346956	2.48499186	1.937542667	9.40921829	7.068173058	3.19781567	9.505394955	5.632058022	4.00760755	9.29649602
8	9.270092429	5.2244475	8.2503285	7.493193272	6.581420495	9.99489084	0.77624066	2.23540135	6.57155086	0.238372955	7.69826048	8.27267561
9	9.52042692	8.9006656	9.8421789	5.79019256	4.238538575	8.1032901	7.902244333	5.1826518	1.060267671	9.523707543	6.81720153	8.09731745
10	4.050406986	1.3354212	1.3557973	6.048756841	1.240710916	3.46009797	1.38337672	3.97920539	4.107974018	6.60918729	3.01539697	8.49838261
11	7.235681849	2.8638156	3.4654766	5.334274276	5.264960755	8.20591914	9.565498517	6.47760874	5.151090465	0.0152317	8.0045012	5.14372643
12	8.061062339	5.0049423	3.5513223	8.307061458	5.567525955	8.12584609	1.298965243	6.41169781	9.150857565	2.725580625	9.29611555	9.6212814
13	9.894338971	7.1573625	2.1466417	0.694847571	4.598381636	8.04811143	8.011923263	2.42130971	1.838133262	1.027093465	4.42227195	6.60466512
14	5.460001673	5.133503	7.7609252	4.615070528	0.688135331	1.31184162	4.79539921	1.30880813	1.11854162	6.267888487	6.04091796	4.48248582
15	6.466382939	1.9956714	0.9388178	4.909611876	2.359353865	5.79361045	6.513359593	8.61999614	2.496809182	7.039119144	9.20089922	7.67277412
16	7.506680493	3.7396311	4.9510788	5.238277035	5.00026445	2.42932534	0.376991978	6.0233705	2.151685199	5.356157621	9.51606708	7.16242368
17	2.269919497	4.6321493	6.859791	5.128297413	9.662512308	8.17098884	1.637505405	5.39515019	3.119721216	8.726867814	9.4516961	7.25854637
18	3.499048923	3.2300979	1.7896772	0.169267447	2.49594662	6.18091697	3.735125595	2.91821147	2.601417756	6.874368103	9.0587972	7.11788884
19	8.196274757	7.4319295	6.8742971	4.580952291	1.81353348	1.44372217	8.075894445	3.61731404	5.061205359	0.042032494	6.99913542	8.13103119
20	5.980540211	2.929891	2.7717897	7.598780748	8.818709957	6.92617964	9.537280602	0.78640829	9.514975706	7.779556812	0.32224335	0.48378708
21	3.974977636	9.4206952	4.4738901	9.236100659	9.705167257	5.38745632	7.336025483	3.35047903	5.051634479	1.38862263	4.0788637	6.57103931
22	6.942841374	4.0528087	8.7864172	7.352649751	8.578645431	4.90479924	0.94506573	8.73611173	5.370296636	9.576332201	1.47869434	1.18432611
23	0.055215249	2.9221555	7.2016915	9.754246354	7.992910784	1.13331201	4.115105395	6.18770014	2.009615845	6.376821677	8.11688965	6.80734328
24	7.547218306	1.3110524	5.8018561	5.097103563	2.546016345	2.02423136	0.628069899	6.12908699	7.159446483	7.113419434	9.82055286	7.0028826
25	9.069702512	4.5168106	5.1019769	0.319859779	4.118153676	3.52843919	0.828337978	6.63498957	2.211782512	3.751095757	5.84933078	4.74080572
26	7.619357726	5.6361906	7.5424607	3.317743087	3.86590673	6.49E-04	0.511300811	2.25692514	8.550028517	9.890313242	4.98795169	0.04311503
27	2.020071474	1.0376841	2.3757722	8.675963266	6.943457422	0.24023113	8.680526173	3.61454975	2.181581849	7.631758418	7.12224558	6.60267468
28	4.763884917	3.0162831	4.9217058	2.517262976	9.419268402	9.88672388	9.61307567	6.6436551	8.593966964	6.807060985	0.32162979	0.88864937
29	7.969316247	9.0572354	7.7141297	4.36353792	0.92303881	0.42498005	7.660425983	8.29194672	9.576012405	4.477152426	9.10434264	0.02465301
30	0.974987267	5.1529998	7.9467639	8.693150167	4.513654547	8.92912895	2.802242661	4.211459	2.790592836	4.813088205	2.35701673	5.65869012
31	4.742230435	2.8625137	5.4874886	5.613293664	3.509662662	0.28786559	6.623495774	9.65877455	2.134608298	3.123717903	7.63491682	1.70923302
32	6.825283902	5.8226887	5.8359508	2.794847346	5.029420471	6.68093122	5.990474627	9.47679942	7.388354215	3.182540017	7.16432439	2.1422701
33	3.921098551	6.4678739	1.7256964	5.536205295	3.461501981	6.32784858	3.337364527	7.95274749	8.06631859	9.003327714	0.70471433	7.57488671
34	7.088757502	3.7072533	1.3661549	2.772161922	2.426981281	7.16357286	0.693910682	4.8032277	6.925576167	9.540765749	0.67987995	7.51087068
35	7.189350056	0.1375576	8.5683309	8.854196236	3.32977999	7.19337672	7.028723581	6.55735199	4.151730837	6.939837997	0.22422257	2.41398791
36	4.544085818	5.6713401	1.8228371	6.171257541	0.249343876	1.35078693	8.723109613	0.27639059	2.120561923	1.572561336	3.1022901	5.65041711
37	5.134916512	9.2017193	5.4446239	5.202276921	4.557123908	4.73411955	8.029860169	1.6357483	0.301047371	0.713289325	9.2741202	0.14998559
38	0.917110197	0.5349138	2.3467175	9.575820646	0.199223128	4.45936264	4.320798398	6.64451009	9.436300413	1.24701729	7.23586746	6.96799212
39	0.198338736	0.8229122	7.9084875	0.47338899	1.080739767	4.53780687	9.923415081	1.71735512	7.709290584	6.430795761	8.86447011	5.52883629
40	0.816826625	0.2642689	6.6013833	2.99965184	5.955373675	4.51246888	9.849753196	9.04832239	1.732703224	1.992041541	9.90192248	0.32109311
41	5.165222688	3.6356712	7.9651106	5.378516418	1.303216387	6.66350682	4.877103452	5.72559084	7.372601926	0.394164337	8.16718068	2.24871206
42	9.115719183	5.0255919	3.3236456	1.489960104	0.698451169	2.82965967	3.280860058	2.91881559	8.303451454	5.545758381	9.41108284	3.34923254
43	8.991622428	1.8260043	6.445745	9.624848169	6.862681939	1.75337828	7.304300883	1.62286209	3.262641435	7.998289168	6.45097424	6.24850693
44	7.696336529	8.9652978	6.9185729	0.481223114	2.079042569	7.83945988	2.542814409	5.82609987	1.85528886	5.110244658	0.95810667	9.47669448
45	5.753807329	2.8828994	5.9873767	0.297775232	4.305121531	4.71043944	0.6460093	0.72170996	0.495722484	5.78018749	1.16655123	0.17284238
46	9.66180268	2.0587332	2.4350877	5.037074176	5.9720967	1.65749258	7.225095975	0.50151499	4.361255831	7.249914139	3.68224301	2.87517126
47	6.976342622	0.739186	6.3309028	6.248326544	5.943140463	3.812763	6.91549127	6.69283899	0.381348956	4.271270069	1.33503462	1.34861401
48	8.97477264	8.4679007	4.273401	9.128009683	7.871628699	3.88367321	1.286151486	6.41714922	5.598524351	2.932971706	6.20493603	5.05586704
49	5.766426066	9.7793542	4.7484286	3.772647036	3.691737176	3.7935729	5.055740949	7.97166021	7.19950157	0.146383906	6.52456034	6.29128421
50	9.689831647	6.0403381	8.2562062	9.017693989	0.892375531	0.11052176	8.076671667	5.78796184	0.114964063	0.836729485	2.5426102	1.98881584
51	5.226203523	1.8385472	7.636807	7.516853816	3.223489296	6.0070534	7.415157462	7.36130137	3.251758387	5.329923819	1.10375325	5.56010493
52	0.277101696	3.7421186	5.3215422	3.07852048	9.922356756	8.67181979	8.067337099	6.66365531	5.561459642	5.059367631	3.38176053	9.86518318
53	7.092746422	7.11749	2.7662734	9.397913364	0.509860173	1.43263308	0.43774752	0.54435355	0.378866422	1.385699798	9.38875795	8.35842674
54	6.455488534	1.7313405	4.3028756	8.74228196	8.029635488	9.57362557	9.751458545	1.80851056	8.140594158	7.641412262	2.43917055	2.12504342
55	6.938267908	0.3164173	9.8519301	5.104141862	2.745337189	4.71361769	6.586617317	3.49675437	5.363650562	5.513344437	7.8106668	2.69267217
56	7.07295917	1.6338825	0.9438556	9.535036838	9.441777541	4.62126554	0.011925487	9.6420624	7.374235251	0.645487537	6.91603981	4.12362327
57	3.427889076	7.3272079	3.4301096	5.28886523	6.226254986	1.60318641	6.575367203	7.6502487	9.976343251	0.786191648	4.88707419	4.13214466

58	6.157189925	5.4763487	0.5001507	1.373480293	1.617702187	9.17578944	4.191335185	8.85241749	0.656598816	6.224730919	0.29216644	3.91459603
59	3.862072505	2.7532341	1.2857577	7.415261389	4.322138715	2.681979	0.079483443	6.43612392	1.809017882	6.536310074	1.55574691	0.62852898
60	4.735765265	0.1639204	4.7138913	6.546527713	0.605076252	9.33720742	0.732979277	4.024197	8.965628227	8.286839752	6.24946297	4.85729284
61	0.715163836	9.2434875	2.6116108	5.023286237	4.98619644	2.75314029	6.553383232	0.57999203	1.332495174	3.820591954	4.19710904	7.74195576
62	5.471429721	8.7715286	8.4688364	6.509876146	0.164747521	5.66160137	5.773544143	7.27768883	4.640319814	9.596508463	0.98254153	5.02948466
63	2.216022179	1.1801589	7.8120693	7.300919081	3.961363995	5.30530636	6.809107933	5.37908569	2.044833658	7.142512247	7.21836847	4.66927348
64	3.810866082	0.0597634	2.5640239	5.128693161	7.345742187	6.68307501	9.827309743	3.43430271	3.937547417	0.924704236	9.10571336	9.32876435
65	8.703432705	5.3521228	0.4274845	1.738084478	0.313553861	2.4104786	8.246740362	7.00995636	1.323499776	3.668773547	3.78540996	7.27541229
66	1.097662795	7.2529926	2.4541957	3.066278274	9.265165793	4.84398625	9.732849486	0.45151174	4.957793169	8.025788237	3.3198115	7.40984563
67	8.936090582	2.7420197	6.4897522	2.465110793	2.135152381	2.59706252	8.597635588	7.67190787	8.208007304	9.336050694	4.26449209	6.8924013
68	8.000425086	6.3531808	6.826786	1.292734083	6.898250518	0.15864377	2.420594219	6.06010697	1.930085803	0.586101776	9.32905272	6.62488249
69	1.558855486	8.9694364	7.0510756	2.927266205	7.086316851	7.96993857	2.688962881	9.71258274	3.296917965	1.914331491	3.67641128	8.88088224
70	3.360395423	2.1421291	8.0040322	8.241825422	8.482390147	5.67364157	4.038195682	7.84599584	1.383680696	9.029774709	7.44232387	6.4580113
71	5.244438367	6.9408677	1.5067895	2.777882443	4.162446986	0.1568039	5.907559118	5.60562279	4.119550772	1.359953438	0.87930111	0.16034453
72	2.030864205	6.9867115	9.5174303	5.947015953	4.609100933	5.0754207	3.446731089	1.01236133	3.675189591	8.284867043	5.64660484	4.77882954
73	1.769607938	7.1887933	7.0508584	9.396146734	9.382788838	5.71703922	4.984643392	5.21138094	4.521776212	9.88971322	4.09704855	1.32745516
74	0.980602993	7.9518885	6.0990932	6.916074143	8.799533718	9.57196461	8.607020301	3.20651437	4.108795876	6.807477144	2.35382677	6.94374713
75	3.480638347	7.7236385	9.6918163	6.019381293	9.983191137	1.28608528	8.598743796	0.76154941	7.976308128	8.029940663	4.41917719	4.22375111
76	1.5393959	2.2967856	1.7256994	5.840880014	6.068766686	5.28644549	9.442503904	2.97613455	3.563953503	7.741358393	2.46301953	4.3666926
77	5.693483486	2.1161984	4.1262374	3.04739628	9.167505784	7.93107692	5.666694363	7.73489617	5.386667818	8.490023027	1.14188274	6.41778546
78	5.505553902	9.8381242	1.3469343	0.174544918	0.074201536	7.09808705	9.738326324	0.41502524	6.365904052	1.870315427	8.36471882	7.83531761
79	4.905770431	8.2731061	0.261596	1.208338349	6.435242802	1.60486674	0.532466822	0.65788904	7.402427892	9.783595399	3.3194377	7.97204512
80	7.399385099	3.9772544	8.2992402	6.737430255	9.46280732	2.30772635	4.046820298	9.55845528	7.992011813	7.720911974	8.71810497	3.89573631
81	1.022124423	9.9191998	8.3161591	4.70772057	2.77225937	1.00440375	0.44789194	3.95090632	7.909652715	3.933835371	1.21489773	4.91726526
82	5.575561961	6.372654	9.0710955	9.839030813	1.185761986	1.2569636	3.090074206	0.18832524	2.150173459	7.920777239	5.58330196	1.05424617
83	0.769734694	2.2695283	8.9901917	6.607567034	3.787242325	7.02078504	9.551111943	1.48431944	9.019086868	2.869569551	3.26189608	6.30813405
84	2.499981596	4.6759791	9.6280482	0.832201942	3.198602389	9.56110473	2.114500265	6.41073844	3.499438286	6.746231761	3.27801619	2.49103294
85	6.171950329	4.5277907	0.773615	5.049682618	2.126441067	5.92350874	4.177556727	4.40156441	2.266319522	1.920051694	0.92796519	4.74299392
86	3.20815208	8.7198003	7.6606416	1.864302333	9.127824182	1.80428966	3.149403547	4.0812668	1.668861915	7.141534431	6.2912801	7.24733331
87	6.324701141	0.6110786	0.0345631	7.75102698	9.735744904	5.71809313	9.879681953	5.05721857	5.989801953	4.478394492	2.53621209	2.36045818
88	9.903669662	9.7384556	5.2787815	4.077196529	1.334868647	2.17342977	1.387791686	3.69075129	4.786031977	5.706476447	5.03168997	3.88905473
89	9.160685041	0.4529409	0.0291881	8.821374175	8.702242355	6.178125	0.488059895	8.3121525	3.997443325	2.913039232	3.87229797	8.04859494
90	6.594572879	5.2157308	9.3908165	5.261668351	7.175626612	7.76534888	2.835653322	8.40754978	7.125523243	6.981269908	6.0440084	5.07770546
91	7.672698956	7.1143684	9.7000733	9.401445582	8.34251093	4.96003411	2.325475794	7.78634901	6.109994389	8.305925964	0.62191302	5.79440852
92	7.526081542	0.7862794	7.4797404	5.524847221	2.124320538	3.2844916	0.014490301	3.7277071	9.059809873	8.46589485	1.77242409	2.56128835
93	8.889707614	7.1278515	8.3093822	4.164080976	7.19790939	2.102155546	9.51057331	1.325258523	6.88399593	8.22803918	6.54900173	
94	6.530541533	1.1800103	5.0837751	4.82118537	6.447482202	6.05872048	2.556094543	9.64577503	6.727223645	1.259774221	5.63534249	9.25736544
95	4.352924081	0.562062	5.210397	4.224448687	8.467921977	3.93786234	8.794726687	4.41453941	9.933298854	8.042405975	8.34763054	5.84646373
96	6.015626714	6.8045856	6.0217574	0.074056304	3.07554561	1.14624722	2.85974704	3.8653989	9.86598579	7.967422753	3.16519716	2.91788397
97	4.926283667	5.4289761	1.9305445	3.807390038	1.247948976	5.76098881	8.070981887	2.57164919	1.587439475	6.744682601	9.53846496	9.92291898
98	4.926283667	5.4289761	1.9305445	3.807390038	1.247948976	5.76098881	8.070981887	2.57164919	1.587439475	6.744682601	9.53846496	9.92291898
99	6.542563261	7.431348	5.4490495	5.328131743	9.681391071	2.60210469	4.107752018	4.66602528	5.398957576	5.963731325	3.72412218	6.57692308
100	6.404419464	3.6227938	8.1598601	0.154602902	6.149070467	4.65168075	1.600177619	9.57510208	3.16343886	8.594571271	2.70200273	3.37822486
101	3.356191817	2.2114234	0.0171969	8.080519969	9.348362338	7.43844773	9.529350677	0.38211968	0.545666197	5.531750695	9.63353072	9.98080318
102	2.866060335	5.5983012	6.0567727	2.735570081	8.445204796	7.48020666	3.323889643	9.98975915	8.190461635	5.930374715	1.14910717	0.54474096
103	0.023117537	7.4346026	4.726612	2.2056898	0.862378551	5.57635502	1.195635118	3.6923191	6.597661295	5.465890274	7.82097962	8.53388406
104	3.282365591	1.6392956	6.7500873	7.930725888	8.076149198	3.8721713	4.801095932	5.80742757	0.089315696	7.475201618	1.85060944	9.73386064
105	1.874367908	2.993356	6.1487181	0.186144102	1.017632764	6.18085722	2.305469807	9.12243457	4.787946419	4.069935919	0.84539781	9.66788659
106	1.155033567	4.6653429	1.1902779	5.90988	9.926664575	5.43693897	2.835097389	3.18529535	4.68909451	7.122081751	0.79842661	8.77223889
107	1.252458813	2.2736851	0.3511081	8.564615429	9.46307026	8.635129	5.027158737	1.30885982	0.838919878	8.074206773	9.61635743	3.81907864
108	3.461292308	8.0638508	3.1491456	0.092273166	8.838341211	0.61361288	4.397325396	7.5794016	5.2022914	1.733942208	7.65593008	1.48329427
109	0.80336546	1.4154027	7.5414083	3.427420367	8.773708275	4.38982622	2.791551952	6.02471029	9.366045911	1.757715988	4.63588597	8.89370859
110	1.861532872	0.6567548	0.6552477	0.123896138	7.816668715	3.32388445	7.448487443	2.46487112	0.616353322	5.943789797	5.64550237	7.18177451
111	1.061729959	4.725083	5.7640208	1.50199212	3.499469695	9.77140042	0.444484524	1.0230772	3.082668797	0.80382196	9.17995274	3.89151811
112	7.826104538	8.41589	2.3602133	2.855563812	2.940497194	5.22275118	6.591545995	7.08599426	8.308467033	9.055198667	3.43988953	9.24479939
113	0.338982502	7.0497713	2.206344	5.20022107	6.973386445	0.20706646	1.971270306	6.08962199	2.087571638	1.362260913	9.67502607	2.57004929
114	2.312584393	0.3834089	5.0413366	3.684764143	7.413136008	2.04727136	0.950697854	3.68216838	4.518317608	5.628686547	9.63152138	8.74110732
115	2.081543501	8.5992968	2.2212475	1.165001464	1.355857881	9.28840639	5.370964759	1.91604654	2.969897628	2.063593943	1.44307387	0.15516669
116	7.031889853	1.0447512	6.8481239	2.728060739	3.734454522	8.2206088	8.538993626	9.12656895	4.435091251	5.213346943	3.99612794	5.70449885
117	1.218691301	6.9166508	5.1305912	4.988541206	7.613462545	1.62104779	9.607116948	2.50869879	6.240953115	1.867174743	2.97239705	1.2782555
118	6.745354945	7.4092549	1.0904888	6.667677508	7.248439269	9.65045893	8.343980953	2.28576631	3.290800454	6.11902538	6.49569075	3.57646797

118	3.022132531	7.2225705	9.4767606	4.581970363	8.397184238	7.87142528	3.97482921	1.74093512	9.060558215	7.560222333	7.56431771	1.84681981
119	2.906056141	0.701321	6.8459653	0.470872536	5.363939954	9.31056199	4.021467553	9.2091693	3.629061852	3.952462214	6.93922042	2.68658335
120	7.263113231	0.3916695	3.5281141	9.907299317	8.769660256	9.106519	5.437446632	8.65828796	1.384545898	3.309138432	6.40582986	0.38772794
121	3.356191817	2.2114234	0.0171969	8.080519969	9.348362338	7.43844773	9.529350677	0.38211968	0.545666197	5.531750695	9.63353072	9.98080318
122	2.866060335	5.5983012	6.0567727	2.735570081	8.445204796	7.48020666	3.323889643	9.98975915	8.190461635	5.930374715	1.14910717	0.54474096
123	0.023117537	7.4346026	4.726612	2.2056898	0.862378551	8.57635052	1.195635118	3.6923191	6.597661295	5.465890274	7.82097962	8.53388406
124	3.282365591	1.6392956	6.7500873	7.930725888	8.076149198	3.8727173	4.801095932	5.80742757	0.089315696	7.475201618	1.85060944	9.73386064
125	1.874367908	2.993356	6.1487181	0.186144102	1.017632764	6.18085722	2.305469807	9.12243457	4.787946419	4.069935919	0.84539781	9.66788659
126	1.155033567	4.6653429	1.1902779	5.90988	9.926664575	5.43693897	2.835097389	3.18529535	4.68909451	7.122081751	0.79842661	8.77223889
127	1.252458813	2.2736851	0.3511081	8.564615429	9.46307026	8.635129	5.027158737	1.30885982	0.838919878	8.074206773	9.61635743	3.81907864
128	3.461292308	8.0638508	3.1491456	0.092273166	8.838341211	0.61361288	4.397325396	7.5794016	5.2022914	1.733942208	7.65599308	1.48329427
129	0.80336546	1.4154027	7.5414083	3.427420367	8.773708275	4.38982622	2.791551952	6.02471029	9.366045911	1.757715988	4.63588597	8.89370859
130	1.861532872	0.6567548	0.6552477	0.123896138	7.816668715	3.32388445	7.448487443	2.46487112	0.616353322	5.943789797	5.64550237	7.18177451
131	1.061729959	4.725083	5.7640208	1.50199212	3.499469695	9.77140042	0.444484524	1.0230772	3.082668797	0.80382196	9.17995274	3.89151811
132	7.826104538	8.41589	2.3602133	2.855563812	2.940497194	5.22275118	6.591545995	7.08599426	8.308467033	9.055198667	3.43988953	9.24479939
133	0.338982502	7.0497713	2.206344	5.20022107	6.973386445	0.20706646	1.971270306	6.08962199	2.087517638	1.362260913	9.67502607	2.57004929
134	2.312584393	0.3834089	5.0413366	3.684764143	7.413136008	2.04721238	0.950697854	3.68216838	4.518317608	5.628686547	9.63152138	8.74110732
135	2.081543501	8.5992968	2.2212475	1.165001464	1.355857881	9.28840639	5.370964759	1.91604654	2.969897628	2.063593943	1.44307387	0.15516669
136	7.031889853	1.0447512	6.8481239	2.728060739	3.734454522	8.2206088	8.538993626	9.12656895	4.435091251	5.213346943	3.99612794	5.70449885
137	1.218691301	6.9166508	5.1305912	4.988541206	7.613462545	1.62104779	9.607116948	2.50869879	6.240953115	1.867147473	2.97239705	1.2782555
138	6.745354945	7.4092549	1.0904888	6.667677508	7.248439269	9.65045893	8.343980953	2.28576631	3.290800454	6.11902538	6.49569075	3.57646797
139	3.022132531	7.2225705	9.4767606	4.581970363	8.397184238	7.87142528	3.97482921	1.74093512	9.060558215	7.560222333	7.56431771	1.84681981
140	2.906056141	0.701321	6.8459653	0.470872536	5.363939954	9.31056199	4.021467553	9.2091693	3.629061852	3.952462214	6.93922042	2.68658335
141	7.263113231	0.3916695	3.5281141	9.907299317	8.769660256	9.106519	5.437446632	8.65828796	1.384545898	3.309138432	6.40582986	0.38772794
142	3.356191817	2.2114234	0.0171969	8.080519969	9.348362338	7.43844773	9.529350677	0.38211968	0.545666197	5.531750695	9.63353072	9.98080318
143	2.866060335	5.5983012	6.0567727	2.735570081	8.445204796	7.48020666	3.323889643	9.98975915	8.190461635	5.930374715	1.14910717	0.54474096
144	0.023117537	7.4346026	4.726612	2.2056898	0.862378551	8.57635052	1.195635118	3.6923191	6.597661295	5.465890274	7.82097962	8.53388406
145	3.282365591	1.6392956	6.7500873	7.930725888	8.076149198	3.8727173	4.801095932	5.80742757	0.089315696	7.475201618	1.85060944	9.73386064
146	1.874367908	2.993356	6.1487181	0.186144102	1.017632764	6.18085722	2.305469807	9.12243457	4.787946419	4.069935919	0.84539781	9.66788659
147	1.155033567	4.6653429	1.1902779	5.90988	9.926664575	5.43693897	2.835097389	3.18529535	4.68909451	7.122081751	0.79842661	8.77223889
148	1.252458813	2.2736851	0.3511081	8.564615429	9.46307026	8.635129	5.027158737	1.30885982	0.838919878	8.074206773	9.61635743	3.81907864
149	3.461292308	8.0638508	3.1491456	0.092273166	8.838341211	0.61361288	4.397325396	7.5794016	5.2022914	1.733942208	7.65599308	1.48329427
150	0.80336546	1.4154027	7.5414083	3.427420367	8.773708275	4.38982622	2.791551952	6.02471029	9.366045911	1.757715988	4.63588597	8.89370859
151	1.861532872	0.6567548	0.6552477	0.123896138	7.816668715	3.32388445	7.448487443	2.46487112	0.616353322	5.943789797	5.64550237	7.18177451
152	1.061729959	4.725083	5.7640208	1.50199212	3.499469695	9.77140042	0.444484524	1.0230772	3.082668797	0.80382196	9.17995274	3.89151811
153	7.826104538	8.41589	2.3602133	2.855563812	2.940497194	5.22275118	6.591545995	7.08599426	8.308467033	9.055198667	3.43988953	9.24479939
154	0.338982502	7.0497713	2.206344	5.20022107	6.973386445	0.20706646	1.971270306	6.08962199	2.087517638	1.362260913	9.67502607	2.57004929
155	2.312584393	0.3834089	5.0413366	3.684764143	7.413136008	2.04721238	0.950697854	3.68216838	4.518317608	5.628686547	9.63152138	8.74110732
156	2.081543501	8.5992968	2.2212475	1.165001464	1.355857881	9.28840639	5.370964759	1.91604654	2.969897628	2.063593943	1.44307387	0.15516669
157	7.031889853	1.0447512	6.8481239	2.728060739	3.734454522	8.2206088	8.538993626	9.12656895	4.435091251	5.213346943	3.99612794	5.70449885
158	1.218691301	6.9166508	5.1305912	4.988541206	7.613462545	1.62104779	9.607116948	2.50869879	6.240953115	1.867147473	2.97239705	1.2782555
159	6.745354945	7.4092549	1.0904888	6.667677508	7.248439269	9.65045893	8.343980953	2.28576631	3.290800454	6.11902538	6.49569075	3.57646797
160	3.022132531	7.2225705	9.4767606	4.581970363	8.397184238	7.87142528	3.97482921	1.74093512	9.060558215	7.560222333	7.56431771	1.84681981
161	2.906056141	0.701321	6.8459653	0.470872536	5.363939954	9.31056199	4.021467553	9.2091693	3.629061852	3.952462214	6.93922042	2.68658335
162	7.263113231	0.3916695	3.5281141	9.907299317	8.769660256	9.106519	5.437446632	8.65828796	1.384545898	3.309138432	6.40582986	0.38772794
163	3.356191817	2.2114234	0.0171969	8.080519969	9.348362338	7.43844773	9.529350677	0.38211968	0.545666197	5.531750695	9.63353072	9.98080318
164	2.866060335	5.5983012	6.0567727	2.735570081	8.445204796	7.48020666	3.323889643	9.98975915	8.190461635	5.930374715	1.14910717	0.54474096
165	0.023117537	7.4346026	4.726612	2.2056898	0.862378551	8.57635052	1.195635118	3.6923191	6.597661295	5.465890274	7.82097962	8.53388406
166	3.282365591	1.6392956	6.7500873	7.930725888	8.076149198	3.8727173	4.801095932	5.80742757	0.089315696	7.475201618	1.85060944	9.73386064
167	1.874367908	2.993356	6.1487181	0.186144102	1.017632764	6.18085722	2.305469807	9.12243457	4.787946419	4.069935919	0.84539781	9.66788659
168	1.155033567	4.6653429	1.1902779	5.90988	9.926664575	5.43693897	2.835097389	3.18529535	4.68909451	7.122081751	0.79842661	8.77223889
169	1.252458813	2.2736851	0.3511081	8.564615429	9.46307026	8.635129	5.027158737	1.30885982	0.838919878	8.074206773	9.61635743	3.81907864
170	3.461292308	8.0638508	3.1491456	0.092273166	8.838341211	0.61361288	4.397325396	7.5794016	5.2022914	1.733942208	7.65599308	1.48329427
171	0.80336546	1.4154027	7.5414083	3.427420367	8.773708275	4.38982622	2.791551952	6.02471029	9.366045911	1.757715988	4.63588597	8.89370859
172	1.861532872	0.6567548	0.6552477	0.123896138	7.816668715	3.32388445	7.448487443	2.46487112	0.616353322	5.943789797	5.64550237	7.18177451
173	1.061729959	4.725083	5.7640208	1.50199212	3.499469695	9.77140042	0.444484524	1.0230772	3.082668797	0.80382196	9.17995274	3.89151811
174	7.826104538	8.41589	2.3602133	2.855563812	2.940497194	5.22275118	6.591545995	7.08599426	8.308467033	9.055198667	3.43988953	9.24479939
175	0.338982502	7.0497713	2.206344	5.20022107	6.973386445	0.20706646	1.971270306	6.08962199	2.087517638	1.362260913	9.67502607	2.57004929
176	2.312584393	0.3834089	5.0413366	3.684764143	7.413136008	2.04721238	0.950697854	3.68216838	4.518317608	5.628686547	9.63152138	8.74110732
177	2.081543501	8.5992968	2.2212475	1.165001464	1.355857881	9.28840639	5.370964759	1.91604654	2.969897628	2.063593943	1.44307387	0.15516669
178	7.031889853	1.0447512	6.8481239	2.728060739	3.734454522	8.2206088	8.538993626	9.12656895	4.435091251	5.213346943	3.99612794	5.70449885
179	1.218691301	6.9166508	5.1305912	4.988541206	7.613462545	1.62104779	9.607116948	2.50869879	6.240953115	1.867147473	2.97239705	1.2782555
180	6.745354945	7.4092549	1.0904888	6.667677508	7.248439269	9.65045893	8.343980953	2.28576631	3.290800454	6.11902538		

178	2.900346258	6.0550316	4.9473191	1.184782126	9.06526319	7.91343542	2.585753531	6.9073843	8.84476862	6.525485763	3.23296021	9.61220029
179	3.253646014	4.3770676	1.7346956	2.48499186	1.937542667	9.40921829	7.068173058	3.19781567	9.505394955	5.632058022	4.00760755	9.29649602
180	9.270092429	5.2244475	8.2503285	7.493193272	6.581420495	9.99489084	0.77624066	2.23540135	6.57155086	0.238372955	7.69826048	8.72767561
181	9.52042692	8.9006656	9.8421789	5.79019256	4.238538575	8.10329457	7.902244333	7.51826518	1.060267671	9.523707543	6.81720153	8.09731745
182	4.050406986	1.3354212	1.3557973	6.048756841	1.240710916	3.46009797	1.38337672	3.97920539	4.107974018	6.60918729	3.01539697	8.49838261
183	7.235681849	2.8638156	3.4654766	5.334274276	5.264960755	8.20591914	9.565498517	6.47760874	5.151090465	0.0152317	8.0045012	5.14372643
184	8.061062339	5.0049423	3.5513223	8.307061458	5.567525955	8.12584609	1.298965243	6.41169781	9.150857565	2.725580465	9.29611555	9.6212814
185	9.894338971	7.1573625	2.1466417	0.694847571	4.598381636	8.04811143	8.011923263	2.42130971	1.838133262	1.027093465	4.42227195	4.60466512
186	5.460001673	5.133503	7.7609252	4.615070528	0.688135331	1.31184162	4.79539921	1.30880813	1.11854162	6.267888487	6.04091796	4.48248582
187	6.466382939	1.9956714	0.9388178	4.909611876	2.359353865	5.79361045	6.513359593	8.61999614	2.496809182	7.039119144	9.20089922	7.67277412
188	7.506680493	3.7396311	4.9510788	5.238277035	5.000026445	2.42932534	0.376991978	6.0233705	2.151685199	5.356157621	9.51606708	7.16242368
189	2.269919497	4.6321493	6.859791	5.128297413	9.662512308	8.17098884	1.637505405	5.39515019	3.119721216	8.726867814	9.4516961	7.25854637
190	3.499048923	3.2300979	1.7896772	0.169267447	2.49594662	6.18091697	3.735125595	2.91821147	2.601417756	6.874368103	9.0587972	7.11788884
191	8.196274757	7.4319295	6.8742721	4.580952291	1.81353348	1.44372217	8.075894445	3.61731404	5.061205359	0.042032494	6.99913542	8.13103119
192	7.399385099	3.9772544	8.2992402	6.737430255	9.46280732	2.30772635	4.046820298	9.55845528	7.992011813	7.720911974	8.71810497	3.39573631
193	1.022124423	9.9191998	8.3161591	4.70772057	2.77225937	1.00440375	0.44789194	3.95090632	7.909652715	3.933835371	1.21489773	4.91726526
194	5.575561961	6.372654	9.0710955	9.839030813	1.185761986	1.2569676	3.090704206	0.18832524	2.150173459	7.920777239	5.83301196	1.05424617
195	0.769734694	2.2695283	8.9901917	6.607567034	3.787242325	7.02078504	9.551111943	1.48431944	9.019086868	2.869569551	3.26189608	6.30813405
196	2.499981596	4.6759791	9.6280482	0.832201942	3.198602389	9.56110473	2.114500265	6.41073844	3.499438286	6.746231761	3.27801619	2.49103294
197	6.171950329	4.5277907	0.773615	5.049682618	2.126441067	5.92350874	4.177556727	4.40156441	2.266319522	1.920051694	0.92796519	4.74299392
198	3.20815208	8.7198003	7.6606416	1.864302333	9.127824182	1.80428966	3.149403547	4.0812668	1.668861915	7.141534431	6.2918201	7.24733331
199	6.324701141	6.6110786	0.0345631	7.75102698	9.735744904	5.71809313	9.879681953	5.05721857	5.989801953	4.478394492	2.53621209	2.36045818
200	9.903669662	9.7384556	5.2787815	4.077196529	1.334868647	2.17342977	1.387791686	3.69075129	4.786031977	5.706476447	5.03168997	3.88905473
201	9.160685041	0.4529409	7.0291881	8.821374175	8.702242355	6.178125	0.488059895	8.3121525	3.997443325	2.913039232	3.87229797	8.04859494
202	6.594572879	5.2157308	9.3908165	5.261668351	7.175626612	7.76534888	2.835653322	8.40754978	7.125523243	6.981269078	6.0440084	5.07770546
203	7.672698956	7.1143684	9.7000733	9.401445582	8.34251093	3.96003411	2.325475794	7.78634901	6.109994389	8.305925964	0.62191302	5.79440852
204	7.526801542	0.7862794	7.4797404	5.524847221	2.124320538	4.844916	0.014490301	3.7277071	9.059809873	8.46589485	1.77242409	2.56128835
205	8.889707614	7.1278518	8.3093822	5.067341863	4.164080976	7.19779039	2.102155546	9.51057331	1.325258523	6.88399593	8.22803918	6.54600173
206	6.530541533	1.1800103	5.0837751	4.82118537	6.447482202	6.05872048	2.556094543	9.64577503	6.727223645	1.259774221	5.63534249	9.25736544
207	4.352924081	0.562062	5.210397	4.224448687	8.467921977	3.93786234	8.794726687	4.41453941	9.933298854	8.042405975	8.34763054	5.84646373
208	6.015626714	6.8045856	6.0217574	0.074056304	3.0755461	1.14624722	2.85974704	3.8653989	9.86598579	7.967422753	3.16519716	2.91788397
209	4.926283667	5.4289761	1.9305445	3.807390038	1.247948976	5.76098881	8.070981887	2.57164919	1.587439475	6.744682601	9.53846496	9.92291898
210	6.542563261	7.431348	5.4490495	5.328131743	9.681391071	2.60210469	4.107752018	4.66602528	5.398957576	5.963731325	3.72412218	6.57692308
211	6.404419464	3.6227938	8.1598601	0.154602902	6.149070467	4.65168075	1.600177619	9.57510208	3.16343886	8.594571271	2.70020073	3.78224862
212	5.226203523	1.8385472	7.636807	7.516853816	3.223489296	6.0070534	7.415157462	7.36130137	3.251758387	5.329923819	1.10375325	5.56010493
213	0.277101696	3.7421186	5.3215422	3.07852048	9.922356756	8.67181979	8.067337099	6.66355531	5.561459642	5.059366931	3.38176053	9.86518318
214	7.092746422	7.111449	2.7662734	9.397913364	0.509860173	1.43263308	0.43774752	0.54435355	0.378866422	1.385699798	9.38875795	8.35842674
215	6.455488534	7.173405	4.3028756	8.74228196	8.029635488	9.57362557	9.751458545	1.80851056	8.140594158	7.641412262	2.43917055	2.12504342
216	6.938267908	0.3164173	9.8519301	5.104141862	2.745337189	4.71361769	6.586617317	3.49675437	5.363650562	5.513344437	6.910668	2.69267217
217	7.07295917	1.6338825	0.9438556	9.535036838	9.441777541	4.62126554	0.011925487	9.6420624	7.374235251	0.645487537	7.81063981	4.12362327
218	3.427889076	7.3272079	3.4301096	5.2888523	6.226254986	1.60318641	6.575367203	7.6502487	9.976343251	0.786191648	4.88707419	4.13214466
219	6.157189925	5.4763487	0.5001507	1.373480293	1.617702187	9.17578944	4.191335185	8.85241749	0.656598816	6.224730919	0.29216644	3.91459603
220	3.862072505	2.7532341	1.2857577	7.415261389	4.322138715	2.681979	0.079483443	6.43612392	1.809017882	6.536310074	1.55574691	0.62852898
221	4.735765265	0.1639204	4.7138913	6.546527713	0.605076252	9.33720742	0.732979277	4.024197	8.965628227	8.286839752	6.2496297	4.85729284
222	0.715163836	9.2434875	2.6116108	5.023286237	4.98619644	2.75314029	6.553383232	0.57999203	1.332495174	3.820591954	4.19710904	7.74195576
223	5.471429721	8.7715286	8.4688364	6.509876146	0.164747521	5.66160137	5.773544143	7.27768883	4.640319814	9.596508463	0.98254153	5.02948466
224	2.216022179	1.1801589	7.8120693	7.300919081	3.961363995	5.30530636	6.809107933	5.37908569	2.044833658	7.142512247	7.21836847	4.66927348
225	3.810866082	0.0597634	2.5640239	5.128693161	7.345742187	6.68307501	9.827309743	3.43430271	3.937547417	0.924704236	9.10571336	9.32876435
226	8.703432705	5.3521228	0.4274845	1.738084478	3.013553861	2.4104786	8.246740362	7.00995636	1.323499776	3.668773547	3.78540996	7.27541229
227	1.097662795	7.2529926	2.4541957	3.066278274	9.265165793	4.84398625	9.723849486	0.45151174	4.957793169	8.025788237	3.3198115	7.40984563
228	8.936090582	2.7420197	6.4875222	2.465110793	2.135152381	2.59706252	8.597635588	7.67190787	8.208007304	9.336050694	4.26449209	6.8924013
229	8.000425086	6.3531808	6.826786	1.292734083	6.898250518	0.15864377	2.420594219	6.06010697	1.930085803	0.586101776	9.32905272	6.62488249
230	1.558855486	8.9694364	7.0510756	2.927266205	7.086316851	7.96993857	2.688962881	9.71258274	3.296917965	1.914331491	3.67641128	8.88088224
231	3.360395423	2.1421291	8.0040322	8.241825422	4.842390147	5.67364157	4.038195682	7.84599584	1.383680669	9.029774709	7.44232387	6.4580113
232	5.244438367	6.9408677	1.5067895	2.777882443	4.162446986	0.1568039	5.907559118	5.60562279	4.119550772	1.359953438	0.87930111	0.16034453
233	2.030864205	6.9867115	9.5174303	5.947015953	4.609100933	5.0754207	3.446731089	1.01236133	3.675189591	8.284867043	5.64660484	4.77882954
234	1.769607938	7.1887933	7.0508584	9.396146734	9.382788838	5.71703922	4.984644392	5.21138094	4.521776212	9.88971322	4.09704855	1.32745516
235	0.980602993	7.9518885	6.0990932	6.916074143	8.799533718	9.57196461	8.607020301	3.20651437	4.108795876	6.807477144	2.35382677	6.94374713
236	3.480638347	7.7236385	9.6918163	6.019381293	9.983191137	1.28608528	8.598743796	0.76154941	7.976308128	8.029940663	4.41917719	4.22375111
237	1.5393959	2.2967856	1.7256994	5.840880014	6.068766686	5.28644549	9.442050304	2.97613455	3.563953503	7.741358393	2.46301953	4.3666926

238	5.693483486	2.1161984	4.1262374	3.04739628	9.167505784	7.93107692	5.666694363	7.73489617	5.386667818	8.490023027	1.14188274	6.41778546
239	5.505553902	9.8381242	1.3469343	0.174544918	0.074201536	7.09808705	9.738326324	0.41502524	6.365904052	1.870315427	8.36471882	7.83531761
240	4.905770431	8.2731061	0.261596	1.208338349	6.435242802	1.60486674	0.532468622	0.65788904	7.402427892	9.783595399	9.33194377	7.97204512
241	5.044345647	7.2365639	4.1788309	1.742624206	0.577399259	0.53322873	8.55246238	8.06765299	2.614376125	4.761009015	0.60825309	4.83596049
242	4.72574012	7.7210465	6.4797668	6.756744901	6.944474225	9.63003905	0.43079125	4.54415289	8.604644305	7.801229883	9.5561849	3.16177361
243	9.916913432	5.8585515	1.9332285	8.344294048	6.084197643	6.4901534	0.534246987	5.01714078	1.465223744	4.65501048	2.2413439	9.12084077
244	1.346621773	4.6561718	0.6386411	6.998724551	6.684043515	3.41300765	3.517831461	0.2842164	0.080606391	7.81319792	8.32840763	6.86259879
245	4.971668411	6.1953943	6.9510447	0.439562441	9.847846906	6.17268544	1.738019471	8.00491842	5.457925638	6.166708692	6.66886623	8.9277874
246	2.900346258	6.0550316	4.9473191	1.184782126	9.06526319	7.91343542	2.585753531	6.9073843	8.84476862	6.525485763	3.23296021	9.61220029
247	3.253646014	4.3770676	1.7346956	2.48499186	1.937542667	9.40921829	7.068173058	3.19781567	9.505394955	5.632058022	4.00760755	9.29649602
248	9.270092429	5.2244475	8.2503285	7.493193272	6.581420495	9.99489084	0.77624066	2.23540135	6.57155086	0.238372955	7.69826048	8.72767561
249	9.52042692	8.9006656	9.8421789	5.79019256	4.238538575	8.10329401	7.902244333	7.51826518	1.060267671	9.523707543	6.81720153	8.09731745
250	4.050406986	1.3354212	1.3557973	6.048756841	1.240710916	3.46009797	1.38337672	3.97920539	4.107974018	6.60918729	3.01539697	8.49838261
251	7.235681849	2.8638156	3.4654766	5.334274276	5.264960755	8.20591914	9.565498517	6.47760874	5.151090465	0.0152317	8.0045012	5.14372643
252	8.061062339	5.0049423	3.5513223	8.307061458	5.567529555	8.12584609	1.298956243	6.41169781	9.150857565	2.725580465	9.29611555	9.6212814
253	9.894338971	7.1573625	2.1466417	0.694847571	4.598381636	8.04811143	8.011923263	2.42130971	1.838133262	1.027093465	6.42227195	4.60466512
254	5.460001673	5.133503	7.7609252	4.615070528	0.688135331	1.31184162	4.79539921	1.30880813	1.11854162	6.267888487	9.40091796	4.48248582
255	6.466382939	1.9956714	0.9388178	4.909611876	2.359353865	5.79361045	6.513359593	8.61999614	2.496809182	7.039119144	9.20089922	7.67277412
256	7.506680493	3.7396311	4.9510788	5.238277035	5.000026445	2.42932584	3.076991978	6.0233705	2.151685199	5.356157621	9.51606708	7.16242368
257	2.269919497	4.6321493	6.859791	5.128297413	9.662512308	8.17098834	1.637550405	5.39515019	3.119721216	8.726867814	9.4516961	7.25854637
258	3.499048923	3.2300979	1.7896772	0.169267447	2.49594662	6.18091697	3.735125595	2.91821147	2.601417756	6.874368103	9.0587972	7.11788884
259	8.196274757	7.4319295	7.6342971	4.580952291	1.81353348	1.44372217	8.075894445	3.61731404	5.061205359	0.042032494	6.99913542	8.13103119
260	5.980540211	2.929891	2.7717897	7.598780748	8.818709957	9.2617964	9.537280602	0.78640829	9.514975706	7.779556812	0.32224335	0.48378708
261	3.974977636	9.4206952	4.4738901	9.236100659	9.705167257	5.3875632	7.336025483	3.35047903	5.051634479	1.38862963	4.0788637	6.57103931
262	6.942841374	4.0528087	8.7864172	7.352649751	8.578645431	4.90479924	0.94506573	8.73611173	5.370296636	9.576332201	1.47869434	1.18432611
263	0.055215249	2.9221555	7.2016915	9.754246354	7.992910784	1.13331201	4.115105399	6.18770014	2.009615845	7.36821677	8.11688965	6.80734328
264	7.547218306	1.3110524	5.8018561	5.097103563	2.546016345	2.02421316	0.628066989	6.12908699	7.159446483	7.113419434	9.8205286	7.0082826
265	9.069702512	4.5168106	5.1019769	0.319859779	4.118153676	3.52843919	0.828337978	6.63498957	2.211782512	3.751095757	5.84933078	4.74080572
266	7.619357726	5.6361906	7.5424607	3.317743087	3.86590673	6.49E-04	0.511300811	2.25692514	8.550028517	9.890313242	4.98795169	0.04311503
267	2.020071474	1.0376841	2.8757722	8.675963266	6.943457422	0.24023113	6.805261673	3.61454975	2.181581849	7.631758418	7.12224558	6.60267468
268	4.763884917	3.0162831	4.9217058	2.517262976	9.419268402	9.88672388	9.61307567	6.6436551	8.593966964	6.807060985	0.32162979	0.88864937
269	7.969316247	9.0572354	7.7141297	4.36353792	0.92303881	0.42498005	7.660425983	8.29194672	9.576012405	4.477152426	9.10434264	0.42645601
270	0.974987267	5.1529998	7.9467639	8.693150167	4.513654547	8.92912895	2.802242661	4.21145	2.790592836	4.813088205	2.35701673	5.6589012
271	4.742230435	2.8625137	5.4874886	5.613293664	3.509662662	0.58766559	6.623495774	9.65877455	2.134608298	3.123717903	6.49791682	7.10923302
272	6.825283902	5.8226887	5.8359508	2.794847346	5.029420471	6.68093122	5.990474627	9.47679942	7.388354215	3.182540017	7.16432439	2.1422701
273	3.921098551	6.4678739	1.7256964	5.536205295	3.461501981	6.32784858	3.337364527	7.95274749	8.06631859	9.003327714	0.70471433	7.57488671
274	7.088757502	3.707533	6.1661549	2.772161922	2.426981281	7.16357286	0.693910682	4.8032277	6.925576167	9.540765749	6.19787995	7.51087068
275	7.189350056	0.1375576	8.5683309	8.854196236	3.32977999	7.19337672	7.028723581	6.55735199	4.151730837	6.939837997	0.22422257	2.41398791
276	4.544085818	5.6713401	1.8228371	6.171257541	0.249343876	1.35078693	8.723109613	0.27639059	2.120561923	1.572561336	3.1022901	5.65041711
277	5.134916512	9.2017193	5.4446239	5.202276921	4.557123908	4.73411955	8.029860169	1.6357483	0.301047371	0.713289325	9.2741202	0.14998559
278	0.917110197	0.5349138	2.3467175	9.575820646	0.199223128	4.45936264	4.320798398	6.64451009	9.436300413	1.24701729	7.23586746	6.96799212
279	0.198338736	0.8229122	7.9084875	0.47338899	1.080739767	4.53780687	9.923415081	1.71735512	7.709290584	6.430795761	8.86447011	5.52883629
280	0.816826625	0.2646869	6.6013833	2.99965184	5.95373765	4.51246888	9.849753196	9.04832239	1.732703224	1.992041541	9.92041928	0.30319611
281	5.165222688	3.6356712	7.9651106	5.378516418	1.303216387	6.66350682	4.877103452	5.72559084	7.372601926	0.394164337	8.16718068	2.24871206
282	9.115719183	5.0255919	3.3234656	1.489960104	0.698451169	2.8295697	3.280860058	2.91881559	8.303451454	5.545758381	4.41108284	3.34923254
283	8.991622428	1.8620043	6.445745	9.624848169	6.862681939	1.75337828	7.304300883	1.62286209	3.262641309	7.998289168	6.45097424	6.24850699
284	7.696336529	8.8295278	6.9185729	0.481223114	2.079042569	7.83945988	2.542814409	5.82609987	1.85528886	5.110244658	0.95810667	4.97669448
285	5.753807329	2.8828994	5.9873767	0.297775232	4.305121531	4.71043944	0.6460093	0.72170996	0.495722484	5.78018749	1.16655123	0.17284238
286	9.66180268	2.0587332	2.4350877	5.037074176	5.9720967	1.65749258	7.225095975	0.50151499	4.361255831	7.249914139	3.68224301	2.87517126
287	6.976342622	1.739186	6.3309028	6.248326544	5.943140463	8.312763	6.91594127	6.69283899	0.381348956	4.271270069	1.33053462	1.34861401
288	8.974777264	8.4679007	4.273401	9.128009683	7.871628969	3.88367321	1.286151486	6.41714922	5.598524351	2.932971706	6.20493603	5.05586704
289	5.766426066	9.7793542	4.7484286	3.772647036	3.691737176	3.7935729	5.055740949	7.97166021	7.19950157	0.146383906	6.52456034	6.29128421
290	9.689831647	6.0403381	8.2562062	9.017693989	0.892375531	0.11052176	8.076671667	5.78796184	0.114964063	0.836729485	2.5426102	1.98881584
291	5.226203523	1.8385472	7.636807	7.516853816	3.223489296	6.0070534	7.415157462	7.36130137	3.251758387	5.329923819	1.10375325	5.56010493
292	0.277101696	3.7421186	5.3215422	3.07852048	9.922356756	6.67181979	8.067337099	6.66365531	5.561459642	5.059367631	3.38176053	9.86518318
293	7.092746422	7.11749	2.7662734	9.397913364	0.509860173	1.43263308	0.43774752	0.54435355	0.378866422	1.385699798	9.8875795	8.35842674
294	6.455488534	1.7313405	4.3028756	8.74228196	8.029635488	9.57362557	9.751458545	1.80851056	8.140594158	7.641412262	2.43917055	2.12504342
295	6.938267908	0.3164173	9.8519301	5.104141862	2.745337189	4.71361769	6.586617317	3.49675437	5.363650562	5.513344437	6.910668	2.69267217
296	7.07295917	1.6338825	0.9438556	9.535036838	9.441777541	4.62126554	0.011925487	9.6420624	7.374235251	0.645487537	7.81063981	4.12362327
297	3.427889076	7.3272079	3.4301096	5.28886523	6.226254986	1.60318641	6.575367203	7.6502487	9.976343251	0.786191648	4.88070419	4.13214466
298	6.457100235	5.4763403	6.6041507	4.378009883	1.617303107	4.37678044	4.101331405	0.85444740	5.66609816	6.394700916	6.20356644	3.05456603
288	8.974777264	8.4679007	4.273401	9.128009683	7.871628969	3.88367321	1.286151486	6.41714922	5.598524351	2.932971706	6.20493603	5.05586704
289	5.766426066	9.7793542	4.7484286	3.772647036	3.691737176	3.7935729	5.055740949	7.97166021	7.19950157	0.146383906		

Source: [https://storage.googleapis.com/kagglestdataset/einsteindata4u/covid19/%2F558703/datasets\\_5740763456\\_104031167855\\_dataset.xlsx](https://storage.googleapis.com/kagglestdataset/einsteindata4u/covid19/%2F558703/datasets_5740763456_104031167855_dataset.xlsx)

### 3.2 Adaptive Neuro Fuzzy Inference System (ANFIS)

ANFIS is a Fuzzy Inference System (FIS) implemented in the framework of adaptive networks. It integrates both Neural Networks (NN) And Fuzzy Logic (FL) principles into a single framework with learning capability to approximate non-linear functions and works as a universal estimator. It is based on the Takagi–Sugeno FIS [15]. The ANFIS architecture is made up of six layers, the layers are described below:

Input Layer: the symptoms for diagnosing COVID-19 are the inputs used in this layer. These symptoms include: fever, dry cough, tiredness, aches and pains, sore throat, diarrhoea, conjunctivitis, headache, loss of taste or smell, a rash on skin or discolouration of fingers or toes, difficulty breathing or shortness of breath and chest pain or pressure. The input layer is represented mathematically as shown in equation 1:

$$O_i^1 = x_i \quad (1)$$

Where;

$O_i^1$  is the  $i^{\text{th}}$  neuron output from the input layer

$x$  is value for each parameters

Membership function Layer: it connects the symptoms from the input layer to a fuzzy set. In this layer each symptom is mapped using the Gaussian membership function to a membership set.

The Gaussian membership function is shown in equation 2:

$$\mu(x) = \exp\left(-\frac{(c_i - x)^2}{2a_i^2}\right) \quad (2)$$

Where;

$c_i$  is the centre of the  $i^{\text{th}}$  fuzzy set

$a_i$  is the width of the  $i^{\text{th}}$  fuzzy set

$x$  is the value for each node input

$\mu(x)$  is the membership function of  $x$ .

Rule Layer: in this layer the fuzzified symptom values are combined using Takagi-Sugeno inference rule to generate an outcome for each case. Takagi-Sugeno is a fuzzy inference technique that develops a systematic approach to generate fuzzy rules from a given input – output data set. Takagi-Sugeno has fuzzy inputs and a crisp output. Takagi-Sugeno uses weighted average to compute the crisp output. It is computationally efficient and suitable to work with optimization and adaptive techniques, so it is very adequate for control problems, mainly for dynamic nonlinear systems [17]. It can be represented mathematically as shown in equation 3:

$$O_i^3 = \mu(x) * \mu(y) \quad (3)$$

Where;

$O_i^3$  is the  $i^{\text{th}}$  neuron output from the rule layer

$x$  and  $y$  are the inputs to node  $i$

$\mu(x)$  and  $\mu(y)$  is the membership function of  $x$  and  $y$  respectively.

Normalization Layer: each neuron in this layer links to exactly one neuron in the rule layer and it computes the firing strength of each rule. It can be denoted mathematically as shown in equation 4:

$$O_i^4 = \frac{O_i^3}{O_1^3 + O_2^3 + \dots + O_n^3} \quad (4)$$

Where;

$O_i^4$  is the  $i^{\text{th}}$  neuron output for normalization layer

$O_i^3$  is the  $i^{\text{th}}$  neuron output from the rule layer

$n$  is the total number of neurons in normalization layer.

Defuzzification Layer: consists of a single neuron to which all the neurons from the normalization layer are linked. The defuzzification layer output is determined by multiplying the firing strength of a rule by its subsequent parameters. The defuzzification method used in this layer is wtaver. It can be represented mathematically as shown in equation 5:

$$O_i^5 = O_i^4(p_i x + q_i y + r) \quad (5)$$

Where;

$O_i^5$  is the  $i^{\text{th}}$  neuron output for defuzzification layer

$O_i^4$  is the  $i^{\text{th}}$  neuron output for normalization layer

$x$  and  $y$  are the inputs to node  $i$

$p_i$  and  $q_i$  are the consequent parameters

$r$  is the bias

Output Layer: the neurons in this layer determined the total output of the ANFIS. The input into this layer is received from the defuzzification layer and it creates its output by adding the inputs from the defuzzification layer. It can be represented mathematically as shown in equation 6:

$$O_i^6 = \sum_i^n O_i^5 \quad (6)$$

Where;

$O_i^6$  is the total output of the ANFIS

$O_i^5$  is the  $i^{\text{th}}$  neuron output from defuzzification layer.

Matrix Laboratory (MATLAB) version 7.5.0.342 (R2007b) was used to implement the ANFIS model on Windows 10 Operating System (OS), running on Intel Celeron.

#### 4.0 Experiment, Result and Discussion

The dataset used for the experiment was divided into two independent datasets with 67% (400) of the dataset was used for training of the ANFIS model and 33% (200) of dataset for testing of the model. The 400 dataset used for training of the ANFIS model consists of 200 dataset from the negative cases and another 200 dataset from the positive cases, the 200 dataset used for testing of the ANFIS model consists of 100 dataset from the negative cases and another 100 dataset from the positive cases. The structure of the loaded dataset for training and testing is shown in Figure 4 and Figure 5 respectively:

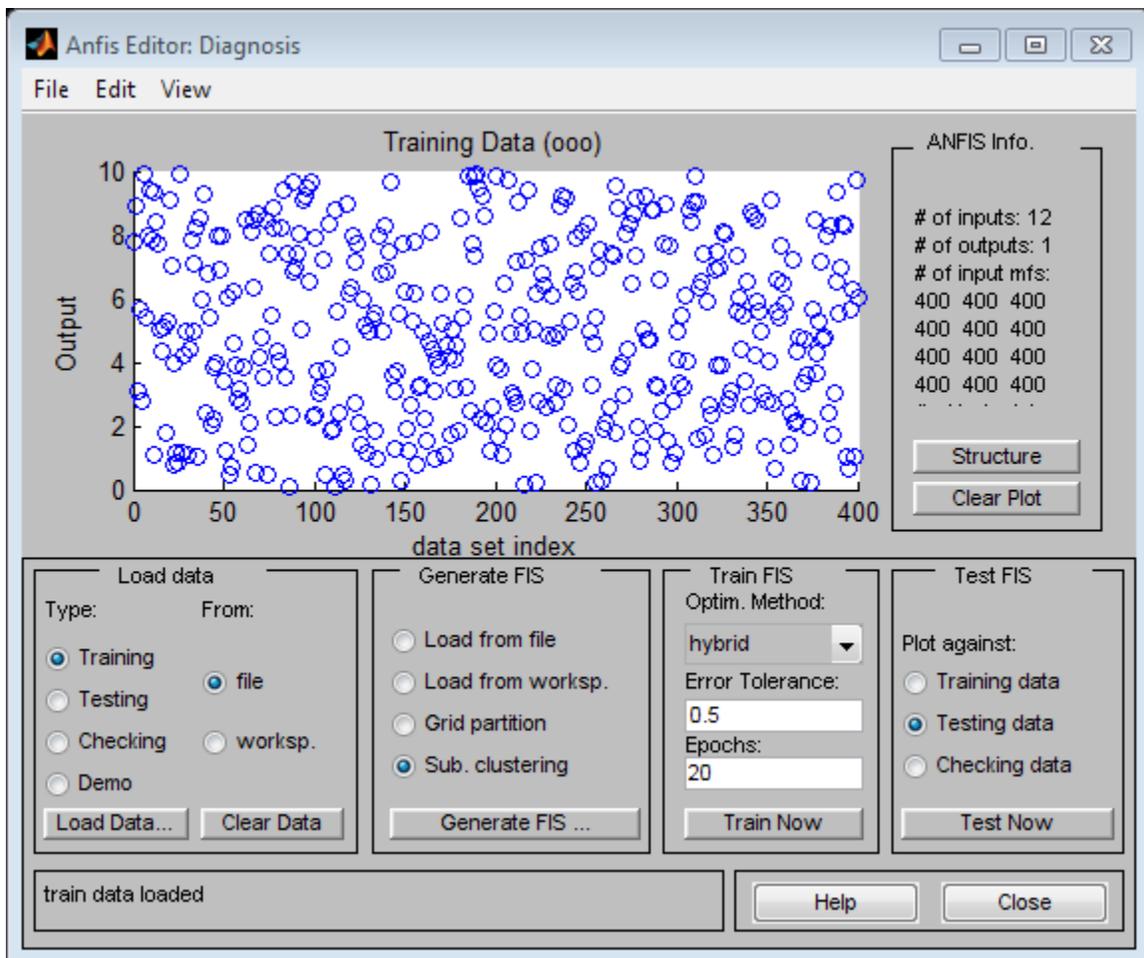


Figure 4: Training Data Structure

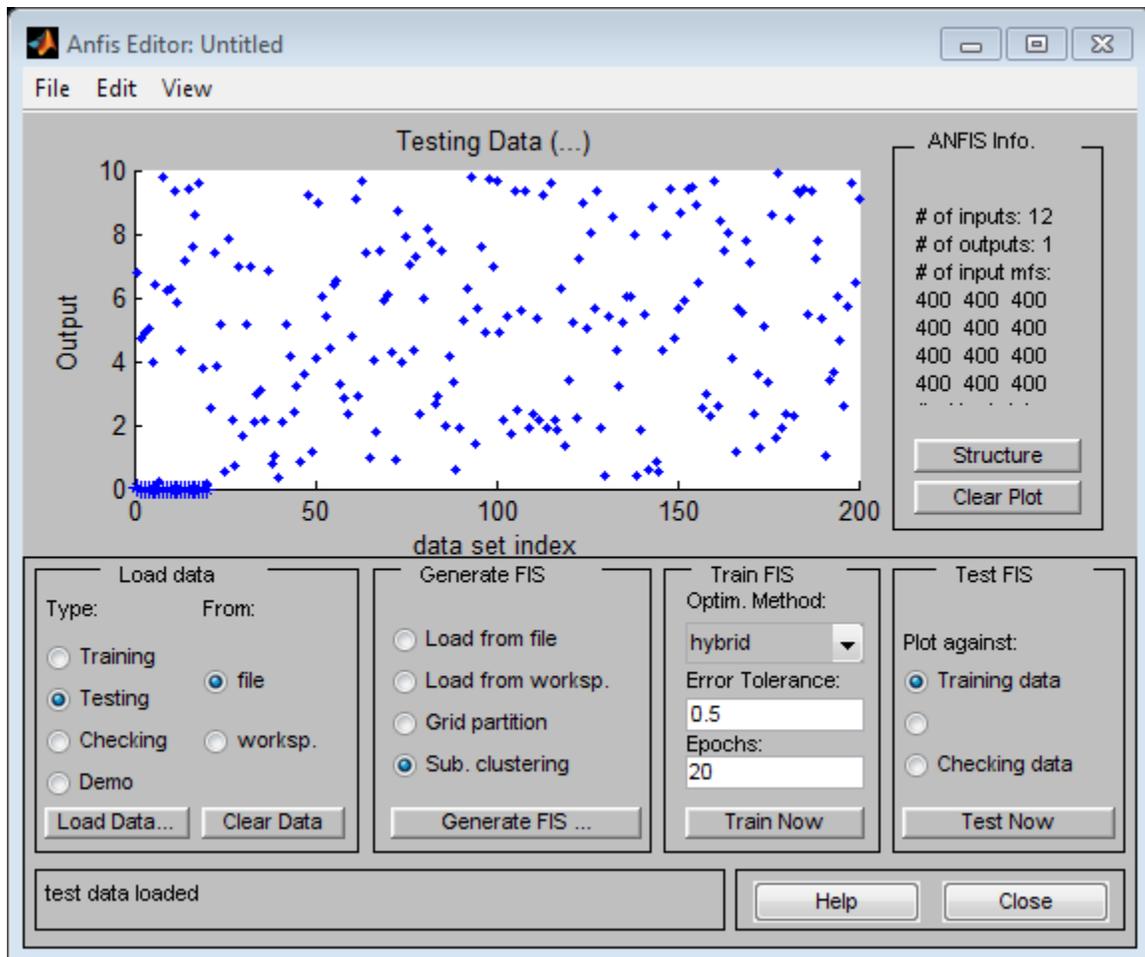
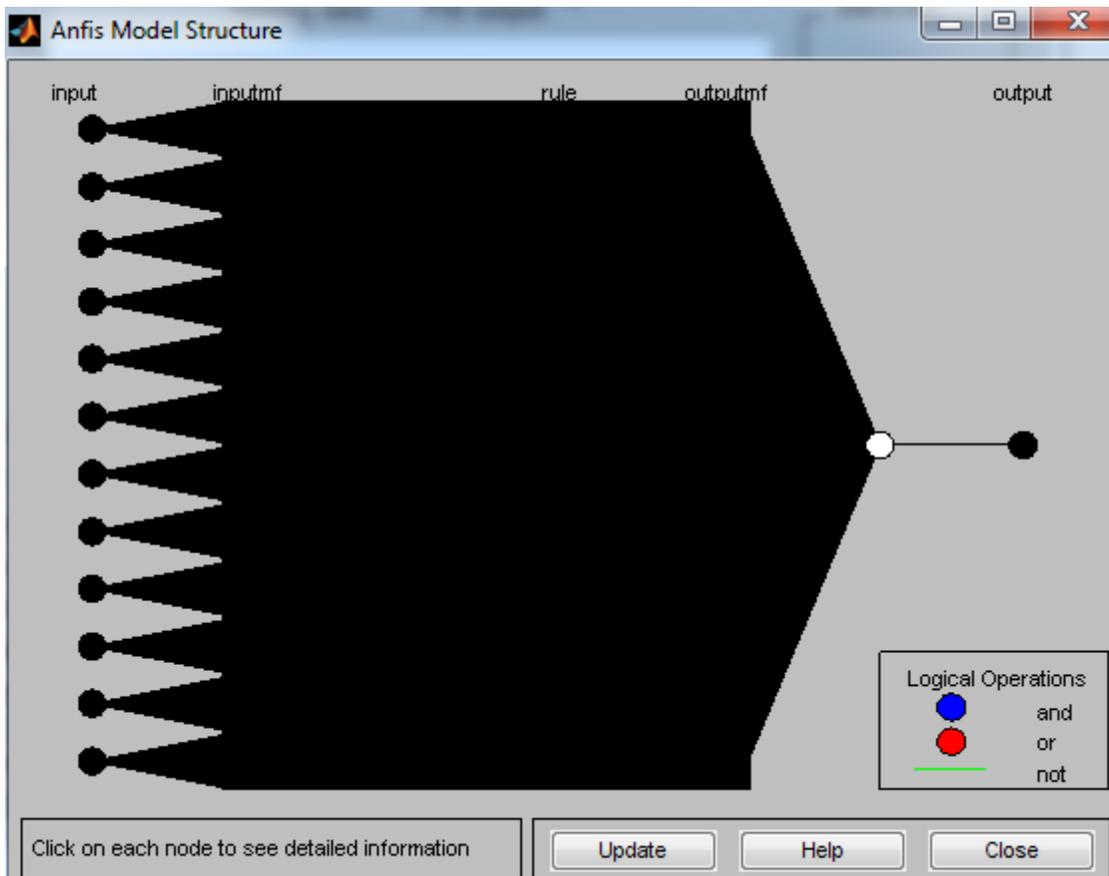


Figure 5: Testing Data Structure

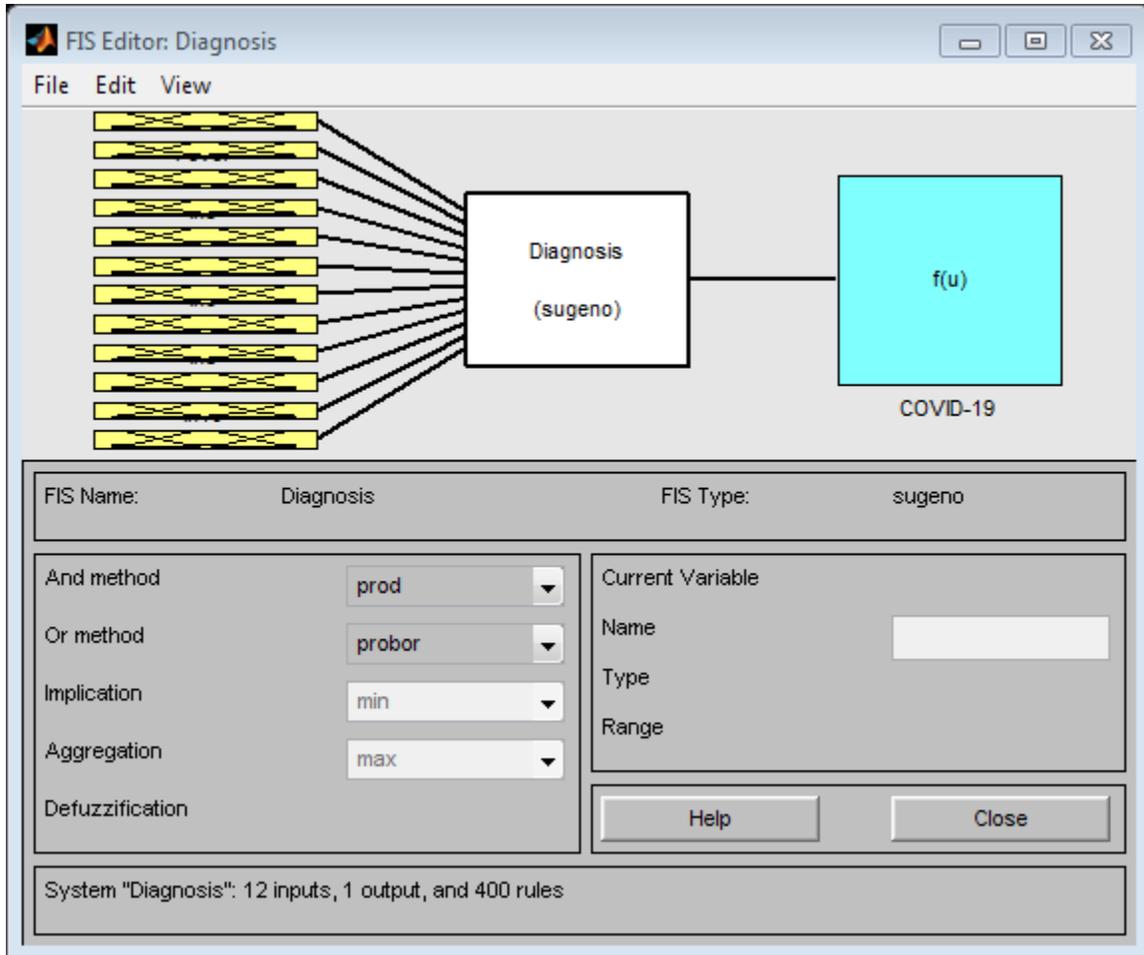
The ANFIS model was trained for 20 epochs utilizing a hybrid optimization method with an error tolerance of 0.5. Subtractive clustering (Sub-clustering) was used to produce the FIS of the ANFIS model. The idea behind the Sub-clustering method is to divide the data space into fuzzy clusters, each representing a particular part of the system behaviour. Subtractive clustering is one-pass algorithm for estimating the number of clusters. The model parameters are updated in the training process utilizing hybrid optimization learning algorithm, the hybrid optimization learning algorithm is a combination of two optimization methods which are; gradient descent (backward pass) and least squares methods (forward pass). The least squares method (forward

pass) is used to optimize the consequent parameters and the gradient descent method (backward pass) is used to optimize the premise parameters.

The structure of the ANFIS model and the FIS is shown in Figure 6 and Figure 7 respectively:

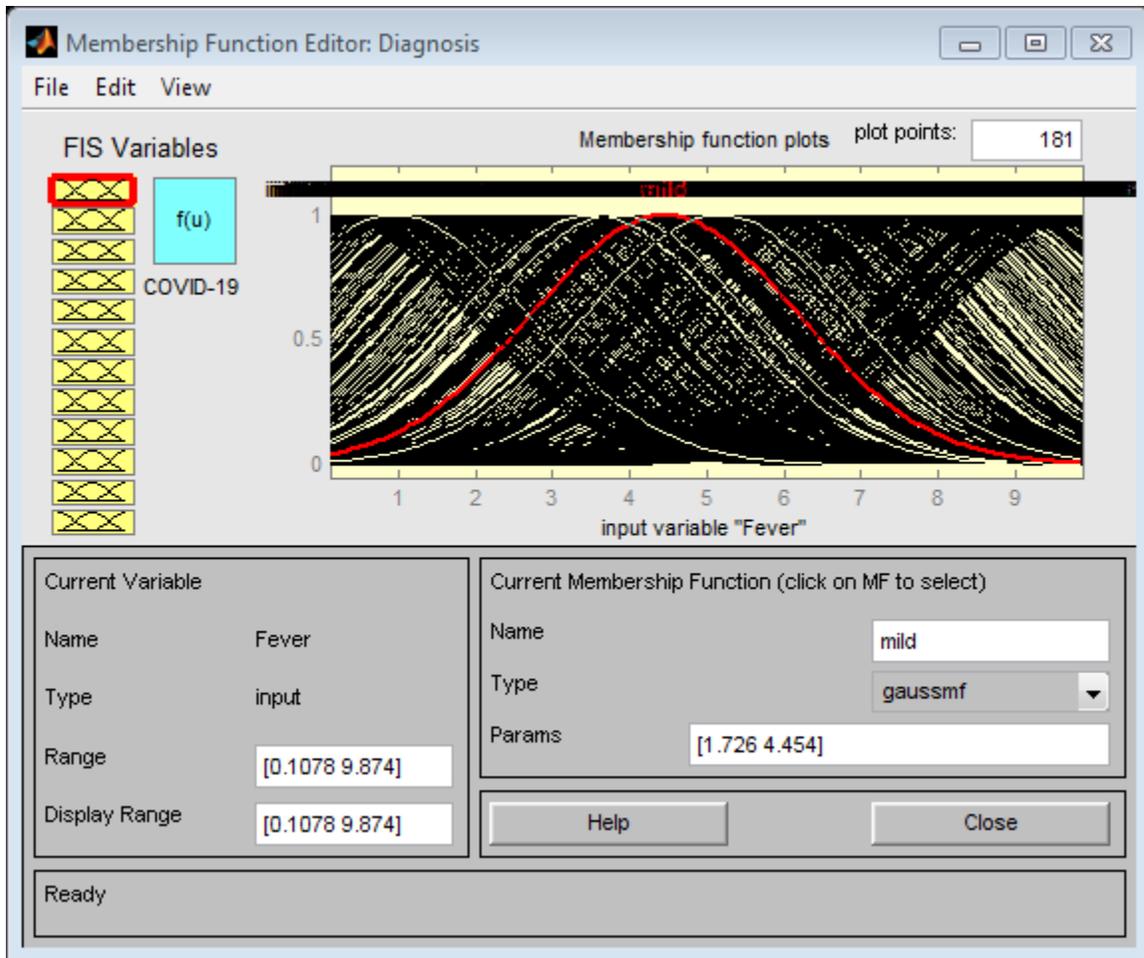


**Figure 6: ANFIS Model Structure**



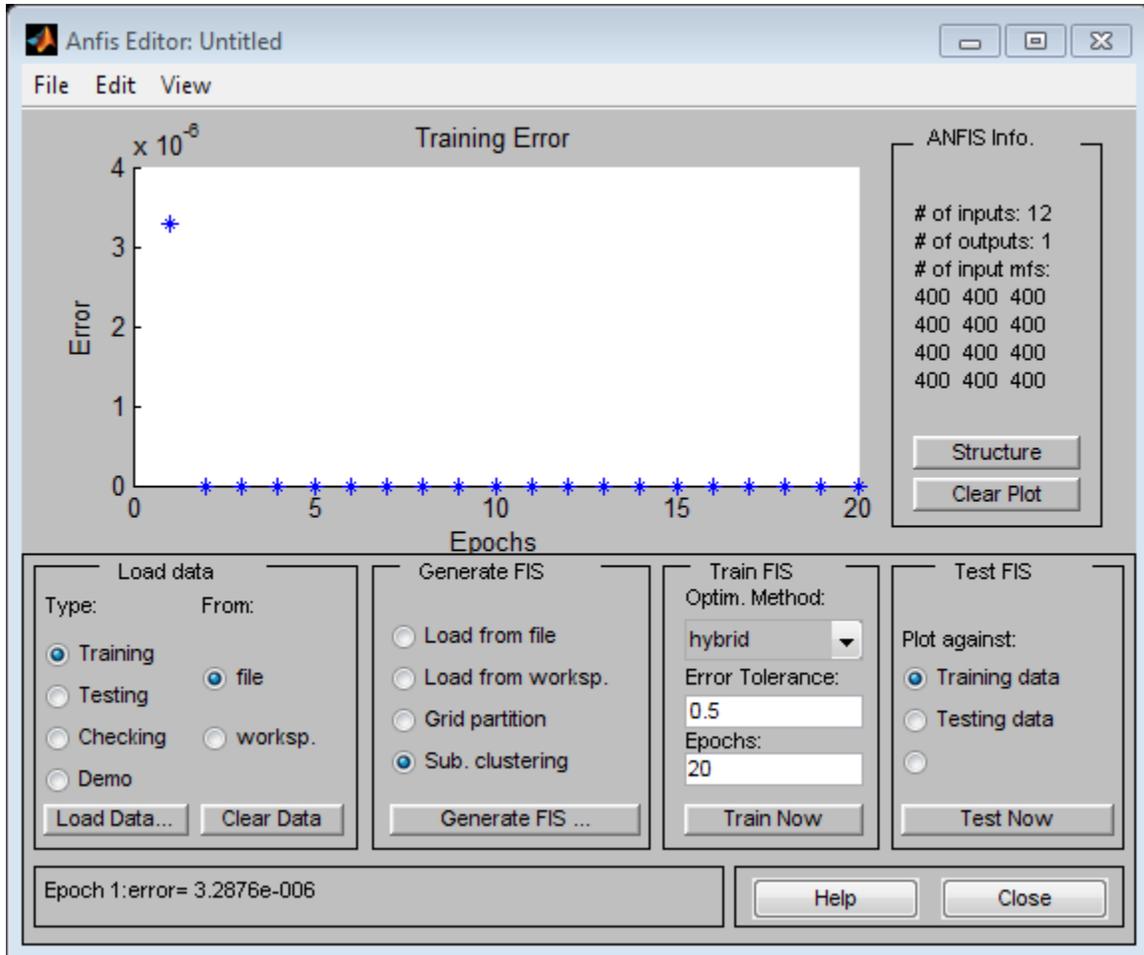
**Figure 7: FIS**

The ANFIS model was designed using Gaussian membership function. The membership function for each symptoms has three (3) linguistic labels which are; mild, moderate and severe. The membership function for one of the symptom “fever” is shown in Figure 8:



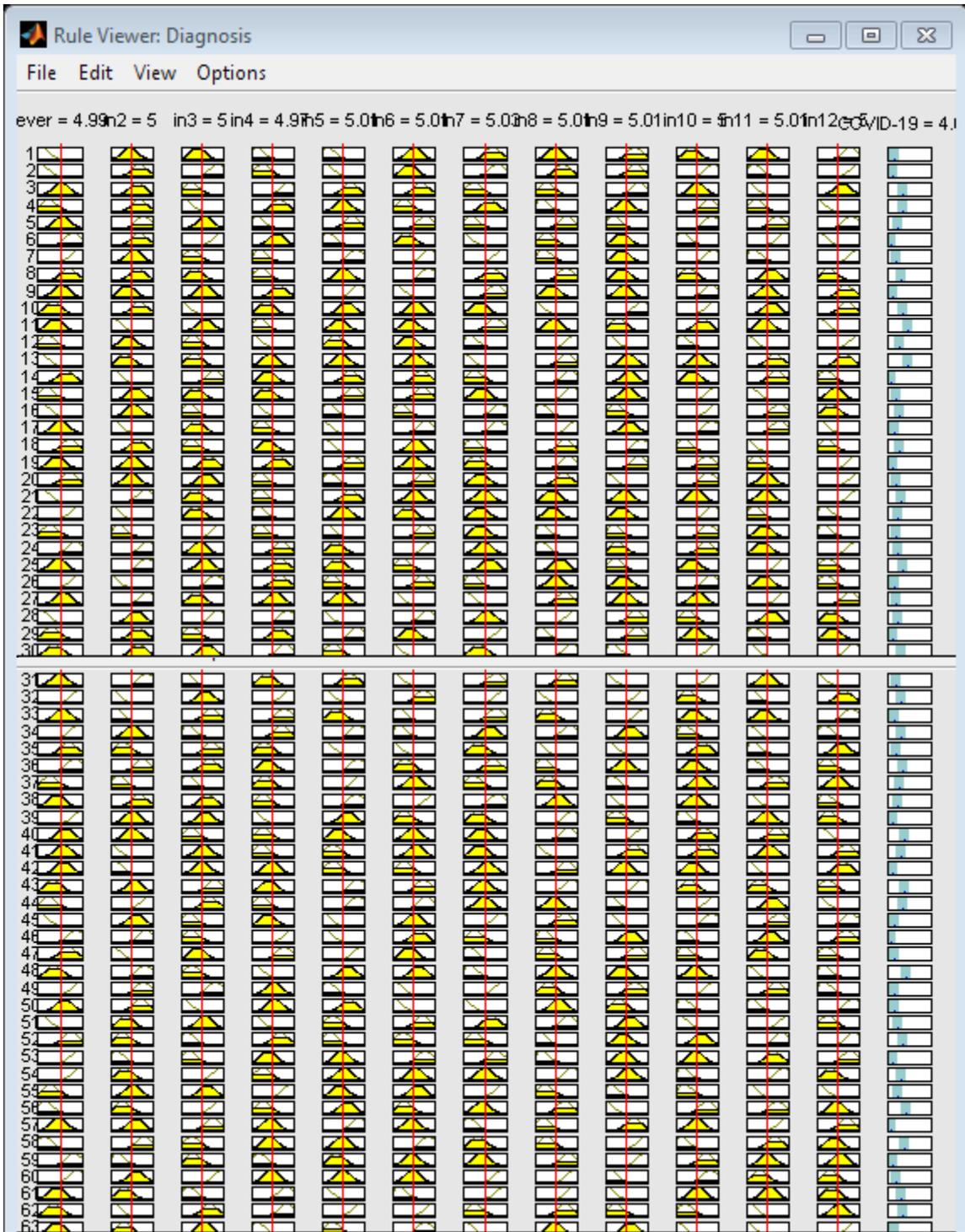
**Figure 8: Membership Function for Fever**

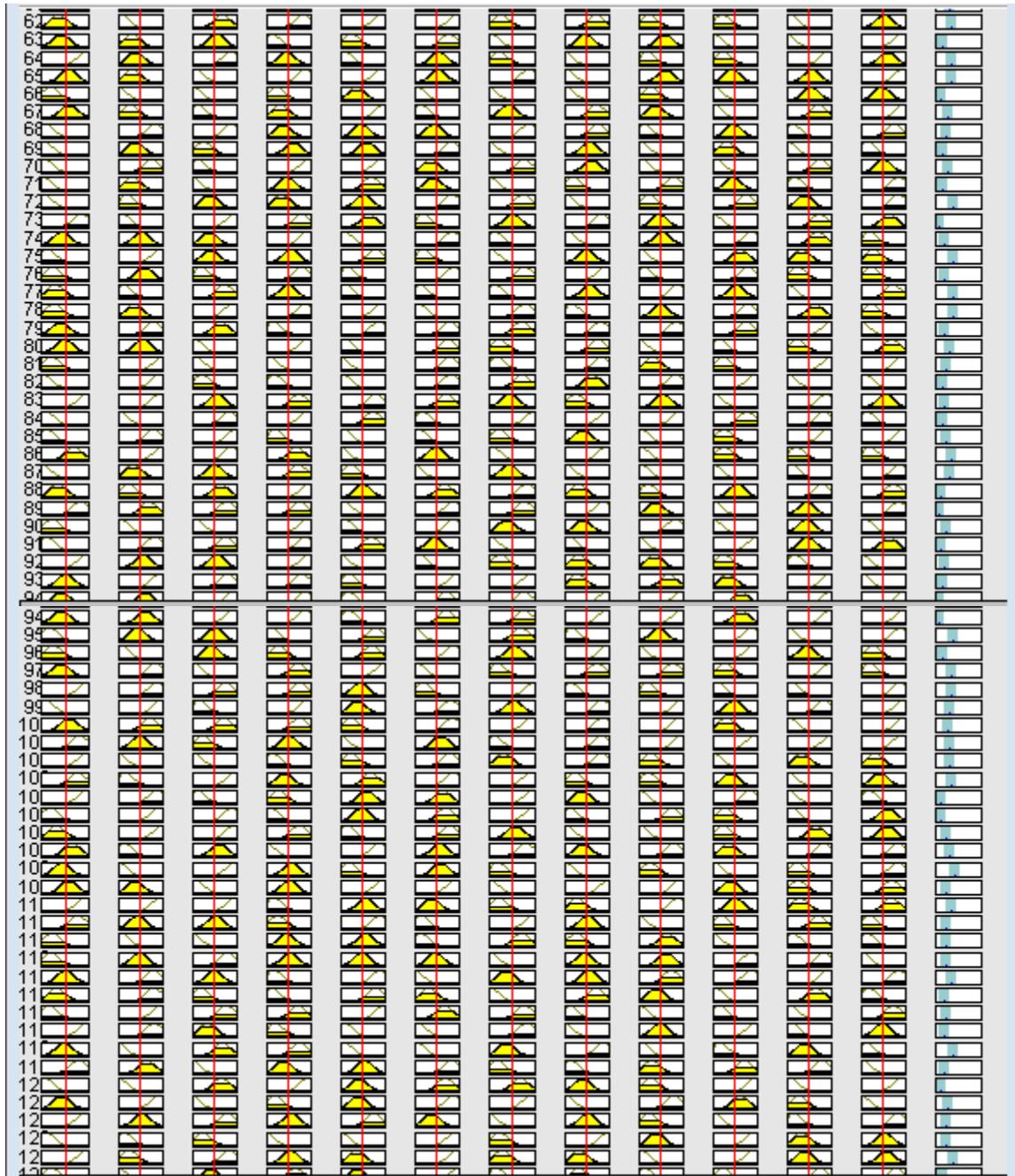
The ANFIS model was trained using the training dataset, the result achieved from training of the model showed that the system had a training error of  $3.2876e-006$  at epoch 1. The structure of the training model is shown in Figure 9:



**Figure 9: Training Model**

The system had 400 fuzzy rules in the rule layer, the structure of the rule is shown in Figure 10:





**Figure 10: Rule Structure**

After training of the ANFIS model, the model was tested using the test dataset. The result achieved from testing of the model showed that the system had an average testing error of 3.4254 on the test dataset. The result generated from the ANFIS model indicated that the model was able to accurately classify approximately 96.6% of the test dataset. The structure of the testing model is shown in Figure 11:

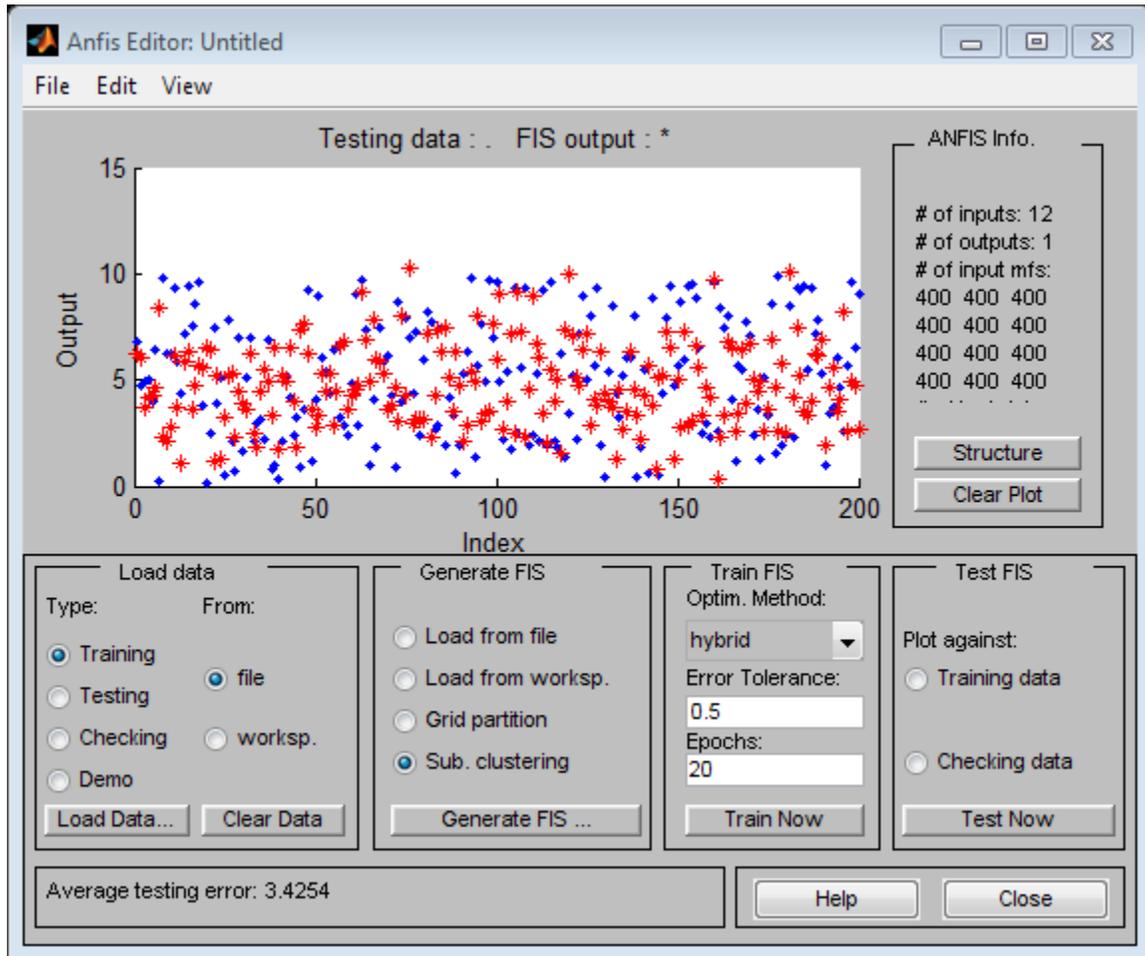


Figure 11: Testing Model

In this study, symptoms were used for diagnosing COVID-19 patients. The ANFIS model was trained and tested on the symptoms dataset collected. The ANFIS model had a prediction accuracy of 96.6%. The higher prediction accuracy achieved by the model can be traced to the learning capability of ANFIS to easily approximate non-linear functions and works as a universal estimator, the Takagi–Sugeno FIS of ANFIS and also the range of dataset used for the training and testing of the model [15]. The ANFIS model does not have any feature extraction or selection.

## 5.0 Conclusion

Detecting people infected with COVID-19 early and timely from the large number of population is imperative to prevent the spread of the disease to the masses. ANFIS model was proposed in this study for diagnosing COVID-19, the model reported high accuracy of 96.6%. This ANFIS model is cost effective, reduces uncertainties, processing time and will be beneficial in improving healthcare systems. With this model, timely and differential diagnosis of COVID-19 can be achieved and which in return helps doctors make clinical decisions easily and also reduce diagnostic errors. In subsequent studies, the ANFIS model can be implemented and also the model can be trained and tested by increasing the number of data instances of the dataset.

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