first four inputs are the previous water demand figures representing four consecutive days, and the fifth input is the annual population figure. A sample of the results from the model input development procedure is reflected in table IV below. This sample shows the results obtained from MLP architecture making use of the linear scaled conjugate gradient optimization algorithm.

TABLE IV
A SAMPLE OF THE RESULTS USED TO DECIDE ON THE NUMBER OF MODEL INPUTS

Inputs	Training Error
Two	1.585493
Three	1.552321
Four	1.525390
Five	1.538540
Six	1.539795

In order to facilitate fair comparison between ANNs and SVMs, the same number of model inputs was adopted for the SVR experiment.

VI. EXPERIMENTAL RESULTS AND ANALYSIS

A) Object of the Performance Analysis

The SVR experiment is carried out in parallel with the ANN experiment, and the performance of all the models is analyzed. The object of the analysis is to determine the genius model from each experiment. The genius model from the SVR experiment is referred to as Support Vector Genius (SVG) and the genius from the ANN experiment is referred to as the Artificial Neural Genius (ANG). The SVG and the ANG are then compared in order to determine the Overall Genius (OG). These two parallel experiments are simulated on a Pentium 4 computer with a frequency of 2.40GHz.

B) Determination of the SVG

In order to fine-tune the heuristics of the SVR models different kernel functions are tried and tested. Some of these kernels have additional arguments such as the degree, scale, offset, sigma (width) and maximum order of terms. The kernels that are available for use are the Anova, BSpline, exponential radial basis function (ERBF), Linear, Polynomial (Poly), radial basis function (RBF) and Spline. To determine the SVG, the different models are trained in a supervised manner and thereafter given the validation set to estimate the target of the validation set. The SVG is that model that has the least error and the most accuracy when estimating the target value of the validation set. This therefore implies that the two key performance parameters are the validation error and the accuracy. The other performance parameter taken into deliberation is the execution time, but does not carry much weight.

The validation error is computed using the traditional method of computing the percentage error. The accuracy of model can be evaluated in many ways. In this paper the accuracy is evaluated based on the practicality of the water demand figures. This is done by introducing a tolerance figure, τ , with which the predicted value can be acceptable. This implies that the predicted value is regarded as accurate if it is equal to the actual value, plus or minus the tolerance figure. The sum of the accurate values is thereafter divided by the total number of points in the test set and multiplied by hundred to give the percentage of the accurate values in the validation set. This relationship is depicted in (6) below.

$$Acc = \frac{Cnt\ \{\forall \left|(prediction - actual)\right| \leq \tau\}}{Cnt\ \{\forall\ prediction\}} \times 100 \tag{6}$$

Where *Acc* represents the accuracy, *Cnt* denotes the count operation and τ is the acceptable tolerance.

According to the South African Department of Water Affairs and Forestry, the water services sector represents an overall demand of the order of 19% of the total water use [16]. This implies that 19% of the water used is consumed by the water supplier. This figure is therefore introduced as the tolerance value in the accuracy check. Nineteen percent of the average annual water demand (2700 Mega litres) is 500 Mega litres.

The results obtained from the SVR experiment are tabulated in table V below. The code 999 stands for 'NOT APPLICABLE'.

TABLE V
SUMMARY OF THE RESULTS OBTAINED FROM THE SVR EXPERIMENT

Kernel	Degree	Scale	Offset	Sigma	Max Order	Error (%)	Accuracy (%)	Time (s)
Anova	999	999	999	999	0	4.044	100	1294.1
Anova	999	999	999	999	1	4.044	100	1289.1
Anova	999	999	999	999	2	4.044	100	1269.3
Anova	999	999	999	999	3	4.044	100	1330.4
BSpline	0	999	999	999	999	4.95541	100	320.2
BSpline	1	999	999	999	999	11.9352	79	255.8
ERBF	999	999	999	1	999	4.28951	100	451.5
ERBF	999	999	999	2	999	4.29828	100	429.1
ERBF	999	999	999	3	999	4.29901	100	433.2
Linear	999	999	999	999	999	3.94003	100	3911.8
Poly	1	999	999	999	999	3.94016	100	2194.7
Poly	2	999	999	999	999	4.09741	100	11868.6
Poly	3	999	999	999	999	4.82196	100	18130.7
RBF	999	999	999	5	999	5.4237	98	1823.7
RBF	999	999	999	6	999	5.3654	99	507.3
RBF	999	999	999	7	999	5.22129	100	359.1
Spline	999	999	999	999	999	10.9939	83	467.7