Master in Informatics Engineering
Dissertation

SVM Optimization for Epileptic Seizure Prediction

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Abstract

Some of the epileptic patients cannot be treated by drugs or surgery, fact that affects the patient's daily life. The quality of life of these patients would be extremely improved by the existence of effective seizure prediction algorithms. Epileptic seizures prediction can be achieved considering it as a classification problem. In order to predict the occurrence of an epileptic episode, an approach using computational intelligence methods is currently under development, on behalf of the EPILEPSIAE project. Twenty-two univariate features were extracted from EEG (electroencephalogram). For a real-time prediction of the epileptic seizures, the number of inputs must be reduced in order to achieve a fast detection of the seizures, while maintaining the predictive power.

In this thesis, Support Vector Machines (SVM) were optimized by three evolutionary approaches: The Elitist Non-dominated Sorting Genetic Algorithm (NSGA-II), the Particle Swarm Optimization (PSO) and $\mathscr{S}$ Metric Selection - Evolutionary Multi-Objective Algorithm (SMS-EMOA). The parameters under optimization were the inputs, and *Cost* and *Gamma* of the SVM classifiers.

Several tests were made, with different formulations, in order to reduce the complexity of the problem.

The results show that using these algorithms it is possible to achieve low-complex predictors with appropriate prediction performance.

Keywords

Epilepsy, Epileptic seizure prediction, Evolutionary algorithms, Feature selection, NSGA-II, PSO, SMS-EMOA

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Chapter 1

Introduction

Epilepsy is one of the most common neurological disorders (D'Alessandro et al., 2003). Some patients suffering from this disease cannot be cured with surgery or medication. The EPILEPSIAE[1] project has two main objectives: the development of one large database on epilepsy (Ihle et al., 2011); and the development of an enhanced alarming system based on a multi-feature and multi-algorithm approaches. The alarming system aims to warn the patient, enabling him/her to take some preventive action to minimize the efects of the incoming seizure. The multi-feature space encompass descriptors extracted from the electroencephalogram (EEG). Univariate features were considered, and are the base information to perform seizure prediction by computational intelligence methods.

On the work presented here, the EEG was the only information that was used. An EEG recording is represented by an array of electrodes that receive electrical signal from the brain of the patient. This signal is then processed to obtain 22 different features for each channel. This 22 different features from each channel/electrode represent the dataset. Since the final objective of the project is to develop a small device that can predict epileptic episodes, it is interesting that not only the features are reduced but also the channels, so the patient needs only six or less electrodes on his head.

The objective of this thesis is to find patient-specific predictors, i.e., aimed to find both the appropriate input set and also the appropriate classifier parameters that result in an improved prediction at low computational cost. The work described considered Support Vector Machines based predictors, optimized by using three different Evolutionary Algorithms: the Elitist Non-dominated Sorting Genetic Algorithm (NSGA-II), the Particle Swarm Optimization (PSO) and the SMS-EMOA ($\mathscr{S}$ Metric Selection - Evolutionary

[1]EU FP7 Project EPILEPSIAE - Evolving Platform for Improving the Living Expectations of Patients Suffering from IctAl Events - http://www.epilepsiae.eu/

Multi-Objective Algorithm).

This thesis considers several optimizations procedures, starting with tests with the entire dataset, where the objective was to reduce the inputs. This tests took long time and the resulting reduced dataset also needed all the electrodes/channels almost all the times. Then, the next approach, was to reduce the number of channels, instead of focusing on the features. After this reduction, it is interesting to find out if the features inside the best channels can also be reduced. A comparison with SVMs trained with the entire dataset is made so the results can be correctly analyzed.

In Chapter 2, we present the actual State of the Art concerning feature reduction in general, and for epileptic seizure prediction. This section also shows an overview on some other important topics for this work, like Evolutionary Algorithms and Support Vector Machines.

In Chapter 3, the different methods and approaches applied in this thesis are described and explained. Several tests were made, with different configurations that are explained in diferent sub-sections.

The results obtained with the applied methodologies are presented in Chapter 4.

The main conclusions obtained from the results, as well as the indication of future actions, are described in Chapter 5.

In Appendices all the results obtained are listed, separated by sub-sections corresponding to the different tests.

Chapter 2

State of the Art

This chapter addresses the State of the Art concerning feature selection, and the relation with epileptic seizure prediction. The main type of methods are described, and the reasons that lead to the choice of the methods applied in the thesis pointed.

2.1 Feature Selection Methods

When we have a large ammount of features, some of them may be redundant or not contain useful information, so, it is necessary and desirable to reduce their number in order to achieve a faster training and testing, to avoid curse of dimensionality, and to find what are the features that give more information about the problem (Guyon and Elisseeff, 2003). In this section we describe different feature selection methods.

2.1.1 Filters

Filters are a type of feature selection method that ranks the data according to their intrinsic information, like minimum redundance maximum relevance (mRMR) (Ding and Peng, 2005).

A filter is basically a preprocessing step that ranks the features and creates an optimal subset of a certain number of features. This methods try to determine the relevance or the discriminative power of the features and then rank them accordingly.

This kind of feature selection methods does not rely on the classification results, and so, doesn't rank features accordingly to the prediction behavior but on the value of the feature itself, what can be an advantage for the generalization property of the classifier, avoiding overfitting. Usually, this kind of

algorithms are fast and can improve the accuracy of the classifier (Ding and Peng, 2005).

2.1.2 Wrappers

Another type of feature selection methods is the wrapper. In this method, the features are selected according to their classification result. Given so, the learning algorithm also has a very important role in this type of feature selection methods.

The main problem of this type of techniques is that usually the algorithm takes a long time to compute, because it perform an extensive search for the best subset of features. The wrappers can use, for example, a genetic algorithm to perform the search.

Some search algorithms have been developed to reduce the computational cost of this type of feature selection methods (Guyon and Elisseeff, 2003).

2.1.3 Embedded

In an embedded approach, similarly to wrapper methods, feature selection is is performed along with the classification. But, in embedded methods, the link between the classification and the feature selection is much stronger because the feature selection is included in the construction of the classifier.

Embedded methods tend to be faster than the wrapper methods because the feature selection is made inside the training process and building of the classifier.

An example of methods like this are Random Forests and Decision Trees, like ID3 or C4.5.

2.2 Feature Selection and Epileptic Seizure Prediction

Epileptic patients have four different brain activity states. Interictal is related with the long periods where patient is completly seizure free. Preictal is related to the time previous to a seizure and where alarms are required to be raised. The ictal time is the time where the patient is under the efect of a seizure, and finaly postictal refers to the transitory period between a seizure and the interictal state. Preictal period is the target of this classification problem, since the objective is to detect that a seizure is about to happen and warn the patient.

Studies in feature detection and prediction have been addressed by several authors (D'Alessandro et al., 2003, 2005; Firpi et al., 2006; Ozkurt et al., 2006).

D'Alessandro et al. (2003) study revealed that each pacient has a specific seizure pattern, so the algorithm should be tailored for each patient independently. In the work presented, the objective was to find if a subset of features and electrodes could be found using a genetic search. The study presents a result of 62.5% probability of prediction with a false positive rate of 0.2775% false predictions per hour. The authors defined a ten minutes preictal period.

In the work by D'Alessandro et al. (2005), the authors also used a genetic-based selection process and developed a probabilistic neural network classifier. Using a sliding window approach, tried to predict seizures ten minutes in advance. The results obtained were unsatisfying, because even if a 100% sensitivity was achieved, the rate of false positives per hour was 1.1 in testing (out-of-sample) data. The authors varied the window length, but with no better results.

Ozkurt et al. (2006) presented a study using data from a single patient. The authors used a feature selection method that changes the feature space into a reduced optimal space by a linear transformation based on a divergence measure. The study revealed that the reduced features differentiated the seizure class from the non-seizure class, and that the seizures were detected earlier with the transformed feature space.

Firpi et al. (2006) considered a prediction horizon from 1 to 5 minutes. The method used was based in genetic programming and inductive algorithms that created artificial features. The genetic programming creates features and uses them in a classifier to find the best ones. When comparing the results obtained with the ones from D'Alessandro et al. (2005), the authors concluded that the overall results were slightly better with the new approach, but the false predictions rate in this study was uncertain.

2.3 Evolutionary Algorithms

As described in Cartwright (2008), an evolutionary algorithm (EA) is a computer program that tries to recreate operations of natural selection. This kind of algorithms creates an initial random population of individuals and evolves this population using a certain fitness function trying to drive the population to an optima. This algorithms base their action on the principle of the "survival of the fittest". The EAs can end when they achieve a certain objective or when a certain limit is met.

EAs revealed to be an interesting approach to feature selection, as shown by Hamdani et al. (2007), Emmanouilidis et al. (2000), Huang and Wang (2006).

Other authors used Evolutionary Algorithms to select features in epileptic

seizure prediction, like D'Alessandro et al. (2005, 2003) that used derived features from the original ones and Firpi et al. (2006) that used an evolutionary algorithm to generate features.

2.3.1 Elitist Non-dominated Sorting Genetic Algorithm

As described in Deb et al. (2002), Elitist Non-dominated Sorting Genetic Algorithm (NSGA-II) is a multiobjective evolutionary algorithm that uses non-domination to determine the best individuals. The non-dominated solutions are the ones that cannot be said to be better or worse than each other, because even if they are behave worse in one of the objectives, it has a better result in other, so they are non-dominated by each other. If a solution is not dominated in any of the dimensions, it is said to be of rank 1. If it is dominated by one solution, rank 2, and so on.

The algorithm also uses a density estimator to provide diversity to the population, because this estimator avoids the crowding of solutions in the same space, allowing and encouraging individuals to spread in the Pareto front. The Pareto-optimal set corresponds to all the non-dominated solutions, and the solutions' image in the search space corresponds to the Pareto front.

During the algorithm loop, elitism is provided, so the best solutions are never lost. Some studies revealed that NSGA-II seems to be a good approach to feature selection (Hamdani et al., 2007).

2.3.2 Particle Swarm Optimization

Particle Swarm Optimization (PSO) is an optimization method (Blackwell et al., 2007), that is inspired by the behaviour of swarming animals, like fishes or birds.

PSO uses a population of 'particles' that are spread in the problem space. These particles change direction in the space according to the population best position and the previous particle's best position.

This algorithm also uses the definition of velocity to affect the change of direction of the particles. This velocity is a factor that influenciates the particles' positions. It works like the mutation on genetic algorithms, causing some change to happen, and influences the particle to move to the known best solution, while taking into account its own best position.

Using this algorithm, the particles tend to approach a minimum, that, hopefully, will be the best solution.

There are many variations of PSO, but the one that was used in this thesis was the one described in Kennedy and Eberhart (1997), because it is a discrete version and fits better the problem treated in this work.

Some authors used PSO for feature selection with good results, like Lai and Wu (2007) and Niiniskorpi et al. (2009).

2.3.3 SMS-EMOA: $\mathscr{S}$ Metric Selection - Evolutionary Multi-Objective Algorithm

SMS-EMOA, as described in Beume et al. (2007), is an Evolutionary Multi-Objective Algorithm that aims to iteractively maximize of the hypervolume measure (or $\mathscr{S}$ metric).

Hypervolume is the volume, in the objective space, covered by the individuals. This is a very important measure because it rewards the approximation to the Pareto front and also the spread distribution of the solutions in this front. To calculate the hypervolume, a reference point is used. This reference point is a point that should be dominated by all Pareto-optimal solutions.

To rank the individuals, this algorithm uses the non-dominated sort method used by NSGA-II. Using both definitions of Hypervolume and non-dominated sorting, the algorithm first ranks the solutions using non-dominated sorting. After this step, the individual which contributes the least to the global hypervolume, is removed.

Only one individual is created at each iteration and, given so, only one individual is removed at each iteration. This makes the algorithm faster than others, like PSO and NSGA-II that create an entire new population.

This algorithm has proven to be better than NSGA-II in some scenarios (Beume et al., 2007), so it was decided to try this algorithm in this work.

2.4 SVM (Support Vector Machine)

Support Vector Machine is a classification method proposed by Vapnik (1995). This algorithm is also considered a state-of-the art classification method (Ben-Hur and Weston, 2010), and so, it was chosen to be the classifier used in this work. Another reason that led to this choice is the fact that in previous tests made on behalf of the EPILEPSIAE project, this classifier achieved the best overall results.

SVM is a margin classifier that transforms the input space in a new higher dimensional space and then draws a hyperplane in the feature space defining a decision boundary between samples of different target classes (Figure 2.1). This classifier tries to build the separating hyperplane with the largest margin to any training examples. In this way, the SVM tries to lower the generalization error. Generalization error means that the classifier does not react well to new and out-of-sample examples.

SVMs have a cost parameter, C, that has the function of regulating the trade-off between classification errors and creating rigid margins. This way, if the C value is high, the margins are rigid and the penalty associated to misclassifications is high, forcing the SVM to be recreated and can cause the model to overfit. If the *Cost* value is low, the model tolerates some classification errors, and may generalize better.

Gamma value also has an important role, as it is the scale parameter of the RBF kernel functions, what means that this value controls the shape of the separating hyperplane. A higher value of *Gamma* usually represents an increase on the number of support vectors.

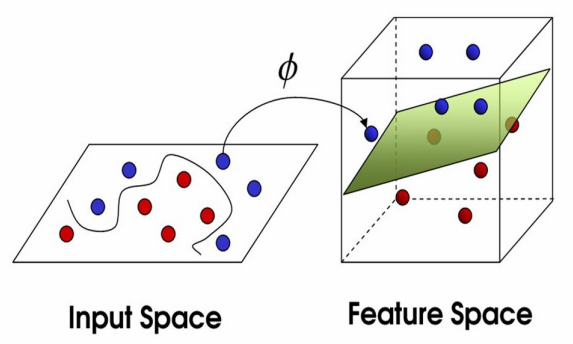

Figure 2.1: Principle of Support Vector Machines

http://www.imtech.res.in/raghava/rbpred/svm.jpg

This study used the libSVM library (Chang and Lin, 2001) interface for MATLAB.

Chapter 3

Methods

The objective of this work is to find the best subset of features available for a given patient. It is also important to find the EEG channels that provide the more relevant information for seizure prediction. So, the intention is to find the best inputs for a given classifier, where an input is based on a feature extracted from a given channel. In adition, it is intended to find also the best SVM parameters, which in this case are *Cost* and *Gamma*.

Given so, the final objective is to reduce the number of features used but also the number of channels needed to predict the seizures in a given patient. A reduced number of inputs is essential for real-time operation.

3.1 Seizure prediction formulation

Unlike D'Alessandro et al. (2005, 2003); Ozkurt et al. (2006); Firpi et al. (2006), that used only two classes, the interictal and non-interictal classes, this work considers four classes: interictal, preictal, ictal and postictal classes. There is another difference in this work, the previous authors used a smaller preictal period, less than 10 minutes, and in this work we use 30, 40 minutes of preictal period. The alarm system works based on this preictal time. If examples from the preictal class are identified in the classification, it means that within the preictal time an epileptic episode will occur, so the seizure detection device can raise alarms and warn the patient that a seizure is about to happen.

One of the issues with the seizure prediction problem is that in the most part of the time the patients are seizure free. This means that the number of interictal patterns are much more superior than the number of patterns belonging to the other classes. The training of SVM with the entire dataset would result in a specialization on the interictal class, resulting in a poor generalization capacity. To improve generalization, the number of patterns were equalized in the training dataset. Below, one can see the equation that

reflects the balancing of classes.

$$\#interictal = \#preictal + \#ictal + \#postictal \tag{3.1}$$

This means the ammount of interictal samples equal the sum of all the other three classes.

In this work, datasets from five patients are used. The data is described in Table 3.1. The Patient column is the name that the patient will have on the next chapters of this thesis. Seizures represent the number of seizures in the dataset. Epileptic focus is the part of the brain where the seizures occur. Channels is the number of channels used and Features is the total number of features. Time is the duration, in hours, that the dataset has.

It is also important to refer that the datasets of each patient that were used in this work are divided in 3 sections: Train, Test and Validation.

Table 3.1: Description of the datasets

Patient	**Seizures**	**Epileptic Focus**	**Channels**	**Features**	**Time**
a)	9	Frontal	27	594	252
b)	11	Frontal	24	528	137
c)	12	Fronto-Temporal	31	682	77
d)	9	Parietal	33	726	143
e)	9	Frontal	22	484	161

3.2 Evolutionary Algorithms

In this thesis, three different algorithms were studied, with different approaches. The first one was using NSGA-II, the second one using SMS-EMOA, and the other was using PSO. Different approaches are explained in different sections below.

In all methods, Support Vector Machine was the chosen classifier.

Different metrics that are used in the domain of epileptic seizure prediction, to evaluate the classifiers, were also used in this work. In this section, the metrics are explained.

In this work, positive cases are considered as being of preictal class, because it is the class to identify in order to predict the epileptic episode. Given so, the negative cases are all the other classes (interictal, ictal and postictal).

Specificity is the capacity of the classifier to correctly identify negative cases:

$$Specificity(\%) = \frac{TrueNegatives}{TrueNegatives + FalsePositives} * 100 \quad (3.2)$$

Sensitivity is the capacity of the classifier to correctly identify positive cases:

$$Sensitivity(\%) = \frac{TruePositives}{TruePositives + FalseNegatives} * 100 \quad (3.3)$$

Two other metrics are also used in the work, the number of channels, that represents the number of electrodes needed to train the classifier, and the number of features. This features represent the 22 different features used in each channel. So, if the same feature appears in a lot of individuals, it can be concluded that the feature has a positive effect on seizure detection. If there are features that never appear, it is also possible to conclude that they are not needed in order to correctely identify the preictal class.

Since the three implementations differ in some points, they are described in different sections.

3.2.1 Implementation with NSGA-II

This method, since NSGA-II is a multi-objective evolutionary algorithm, has four different fitness functions that are: sensitivity (3.3), specificity (3.2), number of inputs and number of channels.

NSGA-II uses tournament selection. Tournament selection is when different individuals are chosen randomly, and the one with the best fitness value is used for reproduction. Since NSGA-II is multi-objective, the comparison is made by looking at the non-dominance ranks, because the ones in a higher rank have better fitness values.

In Figure 3.1 one can see the fluxogram of the algorithm.

The algorithm works as following:

1. Initial population is created;
2. The initial population is evaluated by training the SVMs with the inputs, *Gamma* and *Cost* values defined in the individuals. Then, fitness values are calculated based on the results of classification on the test dataset;
3. The initial population is sorted according to their values in the different fitness functions;
4. Parents are chosen randomly using tournament selection;

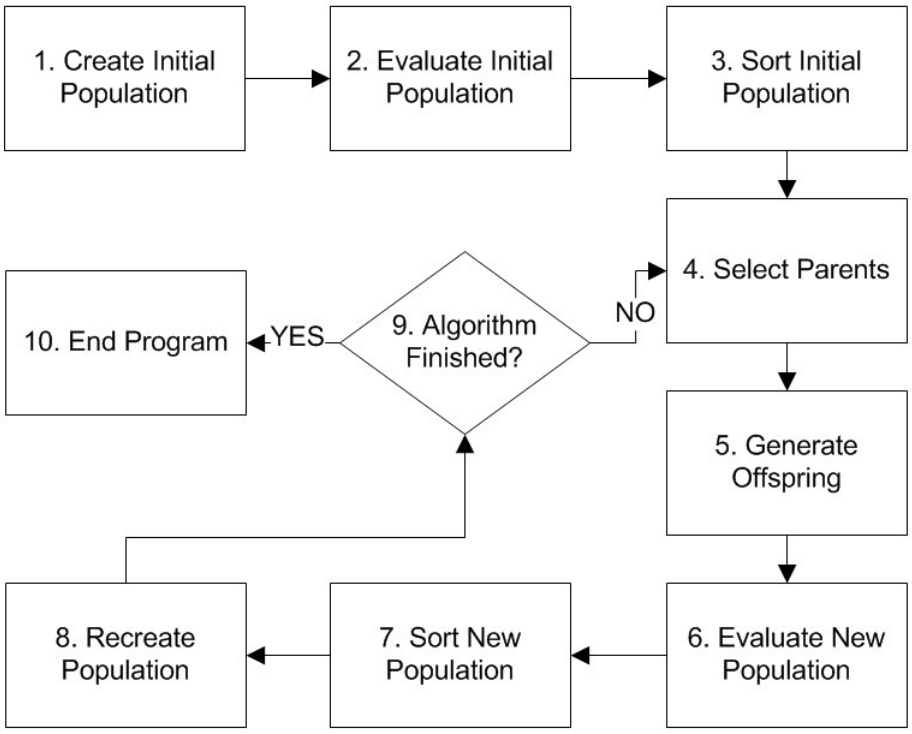

Figure 3.1: NSGA-II implementation

5. Offspring is generated using mutation and crossover on the parents;

6. New population (old population + offspring) is evaluated;

7. New population is sorted;

8. Population is recreated, by truncating the population to the original size, keeping the best individuals (elitism);

9. If the iterations of the algorithm have reached the limit, or the algorithm converges, the program goes to step 10. If not, it goes to the step 4;

10. End of program. Population is saved.

The algorithm tries to minimize all the fitness functions. Best individuals are used for reproduction so, the population tends to converge to the best solutions found.

It is important to notice that there is not just one best solution, but a front of best solutions, because there are 4 fitness functions that are being minimized at the same time.

3.2.2 Implementation with PSO

PSO originally is single-objective, and so, it had to be adapted in a way that it worked with the different fitness functions that were used for the other algorithms. Given so, a fitness function that is a combination of the others was implemented. In Equation (3.4) one can see the operator used to transform the 4 functions in just 1. This way, we are trying to minimize the value of Fitness.

$$Fitness = (1 - Sensitivity) + (1 - Specificity) + \#Inputs/132 + \#Channels/6 \tag{3.4}$$

Since the objective is minimization, the inverse of Sensitivity and Specificity is used. Inputs are divided by 132 and channels by 6 to force the final dataset to use less than 132 features and less than 6 channels, and to ensure that the values are normalized.

In Figure 3.2 one can see the fluxogram of the algorithm.

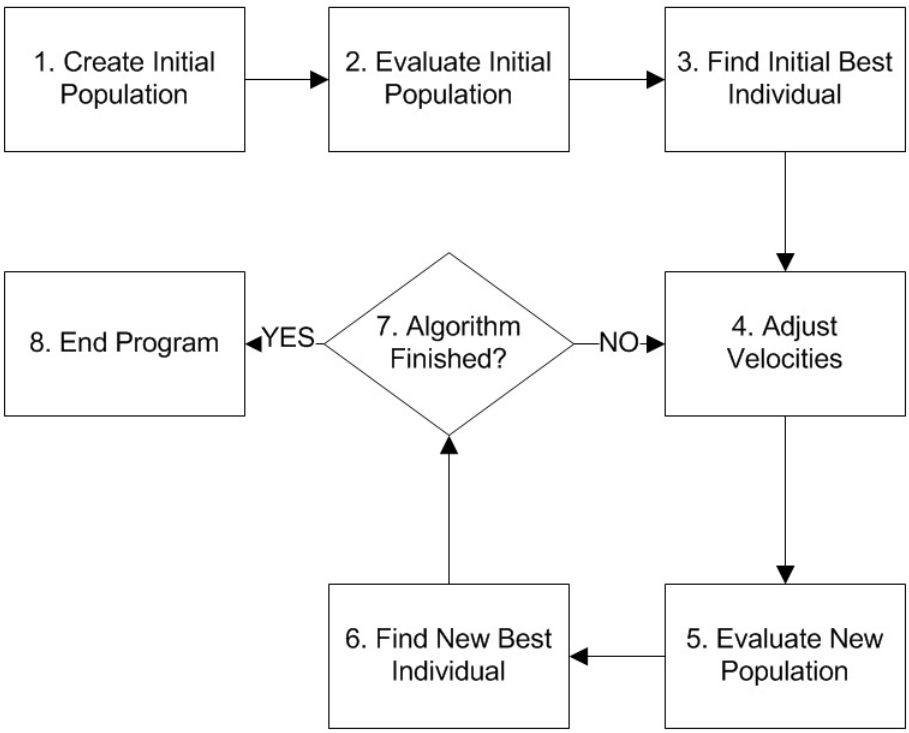

Figure 3.2: PSO implementation

The algorithm is explained below:

1. The population is initalized, what can be done randomly or some other way;

2. The initial population is evaluated by training the SVMs with the inputs, *Gamma* and *Cost* values defined in the individuals. Then, fitness value is calculated, based on the results of classification on the test dataset, using Equation (3.4);

3. The best individual is found and saved, because it will be used to adjust the velocities;

4. Velocities are adjusted;

5. The new population is evaluated;

6. The new best individual is found;

7. If the iterations of the algorithm have reached the limit, or the algorithm converges, the program goes to step 8. If not, it goes to the step 4;

8. End of program. Population is saved.

During the execution, the program saves each particle/individual best position p, the new position of each one x, the velocities v and the best individual g. Using this information, velocities are updated and individuals try to converge to their best and global best position combined.

3.2.3 Implementation with SMS-EMOA

SMS-EMOA, like NSGA-II, uses four different fitness functions that are: sensitivity (3.3), specificity (3.2), number of inputs and number of channels. The main difference between the two algorithms is that SMS-EMOA only creates one new individual each iteration and that it uses the hypervolume contribution to rank the individuals.

In Figure 3.3 one can see the fluxogram of the algorithm.

The algorithm works as following:

1. Initial population is created;

2. The initial population is evaluated by training the SVMs with the inputs, *Gamma* and *Cost* values defined in the individuals. Then, fitness values are calculated based on the results of classification on the test dataset;

3. The initial population is sorted according to their values of hypervolume contribution;

4. Parents are chosen randomly using tournament selection;

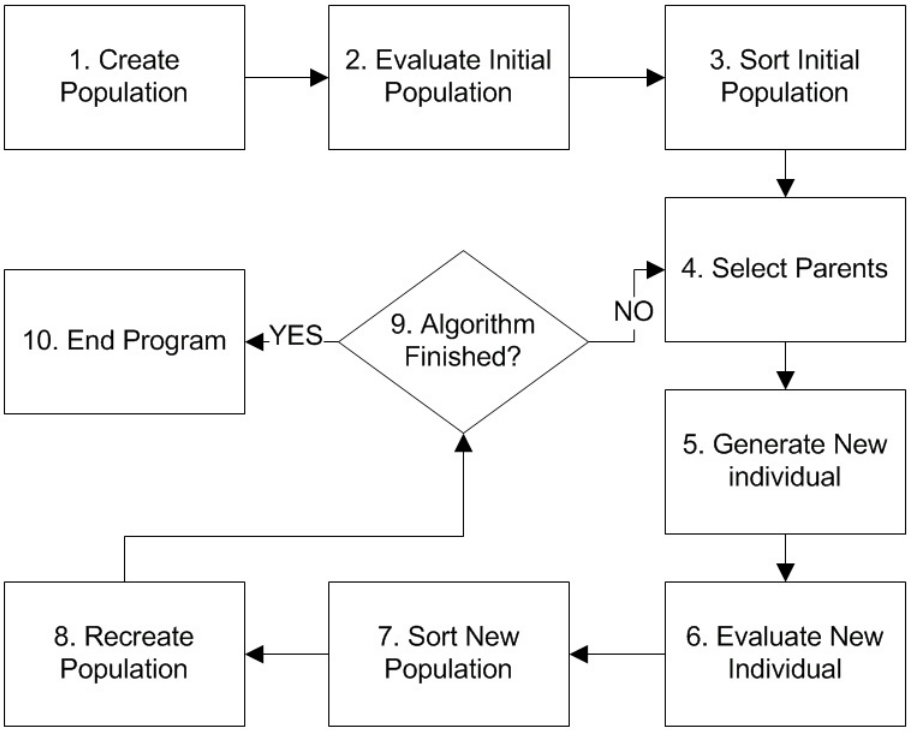

Figure 3.3: SMS-EMOA implementation

5. One individual is created by mutation and crossover on the parents;

6. New individual is evaluated;

7. Individual joins the population and population is sorted based on their hypervolume contribution;

8. Population is recreated, truncating the population to the original size, keeping the best individuals (elitism);

9. If the iterations of the algorithm have reached the limit, or the algorithm converges, the program goes to step 10. If not, it goes to the step 4;

10. End of program. Population is saved.

To calculate the hypervolume and the hypervolume contributions, this thesis used the work developed by Fonseca et al. (2006).

3.3 Approaches

3.3.1 SVMs with no input reduction

In order to find out if dataset reduction has a positive effect on the classification, it was needed to have a baseline comparison result. So, this first test had the objective of building a set of results that could be used for comparison.

The objective of the next tests is to improve the results obtained in this test.

3.3.2 Selecting Genetic Operator Probabilites

In the default NSGA-II settings, the algorithm uses 0.9 probability of crossover (Deb et al., 2002), but it was decided in this work to test with another value, 0.5, in both multi-objective genetic algorithms. Given so, NSGA-II and SMS-EMOA were tested with these two different crossover probabilities in order to see if there is a significant difference and so, choose the best value for each algorithm.

This way, since the probability of the chromosome to suffer mutation is 1-crossover probability, this change affects both probabilities. Given so, when crossover probability is mentioned, one must understand that mutation rate is also changed.

Inside the algorithm, if mutation is performed, the probability of one bit to be mutated is equal to 1/size of chromosome.

In this test, all the features were used and the chromosome was represented like the one in 3.4.

Figure 3.4: Representation of the Individuals

The algorithms have the same objectives, to reduce the number of inputs and number of channels, and keep sensitivity (3.3) and specificity (3.2) high. Said so, it means that the algorithms have four fitness functions.

This test also allowed to try to find in the three tested patients what was the best pre-ictal for each of them, if possible. This way, it is possible to narrow the number of tests for the next phase, on this three patients, for the best pre-ictal time.

3.3.3 Input reduction

After selecting best value for crossover and mutation, new tests were made with all patients.

Since it is really hard to define a goal for the algorithm, because as much as it lowers the fitness values, the better, and it is hard do predict if it won't evolve more. Until now, only the definition of maximum iterations was used. To change this paradigm, a stagnation measure that tries to find if the algorithm has stopped evolving was implemented. This convergence test is made during the execution of the algorithm, in order to make it faster and to stop unnecessary computational effort. It isn't possible to guarantee that the algorithm wouldn't perform better if not stopped, but since time is an issue, making the tests faster is very important. The test compares the chromosomes after a certain interval. This work used 100 iterations interval. This way, if none of the fitness functions evolved at least 2% (comparing mean values) during 100 iterations, it means the algorithm has stagnated, and so, it can be stopped.

This test uses all the patients, but it was tried to remove one of the algorithms, because the tests take too long, and if one of the algorithms is consistently worse than any of the others, it won't be used on the next tests.

With this test it is intended to find if the algorithms are able to converge to a low number of features and electrodes while keeping sensitivity and specificity high. It is also important to understand what is the best pre-ictal time for each patient in order to reduce the tests that need to be made.

3.3.4 Channel reduction

Since using all features provided a large chromosome and it was time consuming, it was decided to use the channel selection instead of feature selection. This way, if a channel is selected, all the features from that channel are used. So, it is possible to find what are the most important electrodes.

The chromosome then is represented like the one in Figure 3.5;

Figure 3.5: Representation of the Individuals

It is also interesting to understand if there is a relation between the chosen channels and the focal region of the patient.

Feature count is not used in the fitness functions, and only specificity, sensitivity and channel count are used.

In this phase, the maximum number of iterations allowed is 500, since the chromosome is a lot smaller and the algorithms are expected to converge faster to a solution.

3.3.5 Channel and Input reduction

The best electrodes have been chosen in the last phase, and so, in this test, it was intended to find the best subset of features corresponding to that channels.

Given so, the best individual obtained in the last test is used to create a new dataset, with the chosen channels. The algorithms make a test similar with the one described on Section 3.3.3, that uses all the features, but using only the features corresponding to the channels that were chosen on the last phase. Channel count is not used in the fitness functions, since it was used in the last test, and the best channels were already chosen.

For this last test, the population size was reduced to 25 individuals.

Chapter 4

Results

This chapter will present all the results obtained. The results are shown by the values of specificity (SP), sensitivity (SS), number of channels and number of inputs.

All the results are obtained based on the the validation dataset, i.e., this test is to see how the SVM's perform on new, out-of-sample, data. This is important because it gives information about the generalization capacity of the classifiers.

4.1 SVMs with no input reduction

In this section, the Best results found obtained by several tests of SVMs for all the patients are shown. Using this results, one is able to compare if feature reduction has a positive effect in the classification. All the results obtained on this test can be seen on Appendix A.

As one can see in Table 4.1, when using the entire dataset, no satisfatory solution is found for Patient a) on both preictal times. Analysing the results, it means that it would say every example is from class 2, what means the SVMs are useless. The same results are obtained for Patient c).

For Patient b), the values on preictal 30, Sensitivity is low but Specificity is somewhat high, what means that it would probably raise false alarms. Talking about preictal 40, the results improve drastically, but are still low values.

Patient d) shows better results with preictal 40, what suggests this could be the correct preictal time to use with this patient. With preictal 30, no useable results are obtained.

The results obtained for patient e) suggest that something must be tuned in the features, because it achieves no satifatory results.

Looking at the overall results, there are no good results, so, something must be made in order to be able to correctly identify incoming seizures. Further

Table 4.1: Best results found with SVMs with no input reduction

Patient	Preictal	SS	SP
a)	30	1	0
	40	1	0
b)	30	0.75	0.29
	40	0.57	0.42
c)	30	1	0
	40	1	0
d)	30	0.11	0.9
	40	0.41	0.7
e)	30	0.82	0.18
	40	1	0

tests were made in order to achieve this.

4.2 Selecting Genetic Operator Probabilities

In this section, the results concerning the finding of the best genetic operator probability, are shown.

In Table 4.2 and 4.3 one can see the average values of Specificity (SP), Sensitivity (SS), number of features and number of channels.

Using this information, the algorithm can be fine-tuned in order to provide better results.

By looking at the Table 4.2 it is noticeable that both methods have similar sensitivity and specificity values overall, but SMS-EMOA needs more inputs to achieve this values. This tends to happen also in Table 4.3 results.

If one looks at Table 4.2 patient by patient, it can be seen that the Best results found for Patient a) are obtained in the 30 pre-ictal time. This fact is also seen in 4.3 what suggests that the 40 pre-ictal time for this patient can be discarded.

Unfortunately, for the other patients it isn't possible to take such a conclusion, so the further tests must be made with both pre-ictal times until no pattern is found.

Looking at both tables it is not possible to find what crossover value is the best, so it was decided to keep 0.9 crossover value for both methods since they don't consistently perform better with 0.5 and doing both tests would be a high time consuming.

Table 4.2: Overall results with 0.9 crossover probability

Crossover probability = 0.9						
Patient	**Preictal Time**	**Method**	**SS**	**SP**	**Channels**	**Inputs**
a)	30	NSGA-II	0.44	0.91	27	218.38
		SMS-EMOA	0.66	0.88	27	252.66
	40	NSGA-II	0.33	0.91	27	217.80
		SMS-EMOA	0.35	0.90	27	263.68
b)	30	NSGA-II	0.08	0.81	24	174.76
		SMS-EMOA	0.13	0.79	24	226.18
	40	NSGA-II	0.19	0.72	24	187.16
		SMS-EMOA	0.16	0.81	24	228.80
c)	30	NSGA-II	0.37	0.88	31	283.04
		SMS-EMOA	0.34	0.84	31	303.62
	40	NSGA-II	0.38	0.87	31	250.94
		SMS-EMOA	0.42	0.86	31	300.68

Table 4.3: Overall results with 0.5 crossover probability

Crossover probability = 0.5						
Patient	**Preictal Time**	**Method**	**SS**	**SP**	**Channels**	**Inputs**
a)	30	NSGA-II	0.43	0.92	27	200.86
		SMS-EMOA	0.65	0.86	27	263.86
	40	NSGA-II	0.37	0.89	27	229.90
		SMS-EMOA	0.36	0.89	27	265.94
b)	30	NSGA-II	0.05	0.81	24	189.08
		SMS-EMOA	0.09	0.79	24	234.06
	40	NSGA-II	0.20	0.77	24	183.18
		SMS-EMOA	0.16	0.78	24	232.74
c)	30	NSGA-II	0.38	0.81	31	269.40
		SMS-EMOA	0.28	0.86	31	306.30
	40	NSGA-II	0.32	0.91	31	246.94
		SMS-EMOA	0.41	0.85	31	314.26

4.3 Input reduction

In this section, the tests using all the inputs are shown. The objective is to reduce the number of inputs and channels while keeping the values of sensitivity and specificity high. If one wants to see all the results regarding this test, they are shown in Appendix B.

4.3.1 Patient a)

On the last test it was found that Patient a) performed consistently better using 30 minutes preictal time, so the other test was discarded.

On this section the Best results found for Patient a) using the three diferent algorithms are shown.

Table 4.4: Best results found for Patient a)

Method	SS	SP	Channels	Inputs
NSGA-II	0.55	0.89	27	229
SMS-EMOA	0.79	0.87	27	255
PSO	0.84	0.86	27	202

By looking at table 4.4 one can see that the Best results found are obtained by PSO because it had the lowest features with the best sensitivity. The specificity is not as high as the one obtained by the other two methods but the sensitivity and specificity are much more balanced then any of the others.

NSGA-II had the worst sensitivity. SMS-EMOA had a good result, but the number of inputs is higher than in any of the other algorithms.

PSO was the only algorithm able to reduce the number of channels to 26 on some of the individuals (Appendix B).

It is also important to understand that the comparison with the result obtained using all the inputs shows that the results were much better, what means that feature reduction has a positive impact in this patient.

4.3.2 Patient b)

By looking at Table 4.5 one can see that none of the results is good. Anyway, the best result was achieved by SMS-EMOA. It is also interesting to notice that, once again, PSO was the algorithm that was able to achieve the lowest number of inputs.

Comparing with the test with all inputs, the reduction has not bring better results, but further tests were made in order to find out if there is a way to reduce the inputs and electrodes and gain performance.

Table 4.5: Best results found for Patient b) using 30 minutes preictal time

Method	SS	SP	Channels	Inputs
NSGA-II	0.12	0.77	24	192
SMS-EMOA	0.28	0.74	24	222
PSO	0.19	0.79	24	165

Below, one can see the results obtained using 40 minutes preictal time, on Table 4.6.

Table 4.6: Best results found for Patient b) using 40 minutes preictal time

Method	SS	SP	Channels	Inputs
NSGA-II	0.28	0.67	24	191
SMS-EMOA	0.30	0.75	24	220
PSO	0.31	0.77	24	165

Once again, the best results found are obtained by SMS-EMOA and PSO, but PSO uses a lot less inputs that SMS-EMOA. NSGA-II was the worst algorithm again, despite being able to reduce inputs more than SMS-EMOA, specificity and sensitivity have lower values.

Both times used had unpromising results and so, both times must be used on the next tests. But if one looks closely, it seems that preictal 40 tends to provide better results.

The results obtained on the first test, with all inputs, for preictal time 40, are more balanced, and so, tend to be better, what means that feature reduction has not worked so good for this patient. Further tests must be made in order to find out better results.

4.3.3 Patient c)

Table 4.7: Best results found for Patient c) using 30 minutes preictal time

Method	SS	SP	Channels	Inputs
NSGA-II	0.41	0.85	31	305
SMS-EMOA	0.46	0.85	31	329
PSO	0.46	0.86	31	250

Table 4.7 shows that the results of the three algorithms are quite similar, except on the input count, where PSO is clearly better. The results are not

very good, because sensitivity should be higher. If sensitivity is too low, the algorithm tends to fail detecting incoming seizures.

Like for the patients analyzed before, all the channels tend to be used.

Table 4.8: Best results found for Patient c) using 40 minutes preictal time

Method	**SS**	**SP**	**Channels**	**Inputs**
NSGA-II	0.40	0.86	31	255
SMS-EMOA	0.59	0.77	31	327
PSO	0.54	0.82	31	267

If one looks at Table 4.8 one can see that the results are somewhat similar for the three algorithms. SMS-EMOA has a lower specificity and an higher number of inputs, but has a better sensitivity, near 60%. NSGA-II was able to reduce the inputs more than any of the other algorithms. Using 40 minutes preictal revealed slightly better results, but no conclusion can be taken on the best time to use so, both times will be used in the next test.

4.3.4 Patient d)

If one looks at Table 4.9, it can be noticed that all the algorithms have similar behaviors, and that the values are not satisfying. PSO seems to have the best overall results, but the sensitivity is too low.

Table 4.9: Best results found for Patient d) using 30 minutes preictal time

Method	**SS**	**SP**	**Channels**	**Inputs**
NSGA-II	0.27	0.89	33	272
SMS-EMOA	0.26	0.88	33	318
PSO	0.31	0.88	33	282

Talking about 40 minutes preictal, on Table 4.10, one can see that the results, like the ones obtained using 30 minutes preictal time, are low.

Table 4.10: Best results found for Patient d) using 40 minutes preictal time

Method	**SS**	**SP**	**Channels**	**Inputs**
NSGA-II	0.24	0.89	32	241
SMS-EMOA	0.29	0.86	33	343
PSO	0.28	0.83	33	297

4.3.5 Patient e)

This patient had bad results overall, as can be seen in Tables 4.11 and 4.12. The number of inputs is slightly lower when using 30 minutes preictal, but no conclusion on the best time to use can be taken.

Table 4.11: Best results found for Patient e) using 30 minutes preictal time

Method	SS	SP	Channels	Inputs
NSGA-II	0.18	0.86	22	186
SMS-EMOA	0.15	0.86	22	222
PSO	0.23	0.83	22	177

Table 4.12: Best results found for Patient e) using 40 minutes preictal time

Method	SS	SP	Channels	Inputs
NSGA-II	0.20	0.77	22	168
SMS-EMOA	0.23	0.86	22	206
PSO	0.26	0.82	22	168

4.4 Channel reduction

Since the number of inputs obtained by the last test are still high, a new test was performed in order to find the best subset of channels for each patient.

In this section, tables with the Best results found and figures representing the chosen channels will be shown. When looking at the figures, one must see that when the value is 1, it means the channel is chosen by the method, if it is 0, it is not chosen.

The overall results regarding this test are located on Appendix C.

4.4.1 Patient a)

As one can see in Table 4.13, the channel reduction was successful, since all methods have found a good solution with 6 or less channels. PSO found a solution with 2 channels, and it was the best solution found.

Figure 4.1 shows the channels chosen by the different methods. It is interesting to notice that channel F4 is chosen by the three methods, what suggests that this channel has important information regarding classification.

Table 4.13: Best results found for Patient a) using 30 minutes preictal time

Method	SS	SP	Channels
NSGA-II	0.90	0.85	6
SMS-EMOA	0.92	0.83	6
PSO	0.95	0.82	2

This patient has an epileptic focus that is Frontal, but, besides F4 and FP2, no other channels are regarding frontal area of the brain, so, no conclusion can be taken regarding the relation between epileptic focus and channel selection.

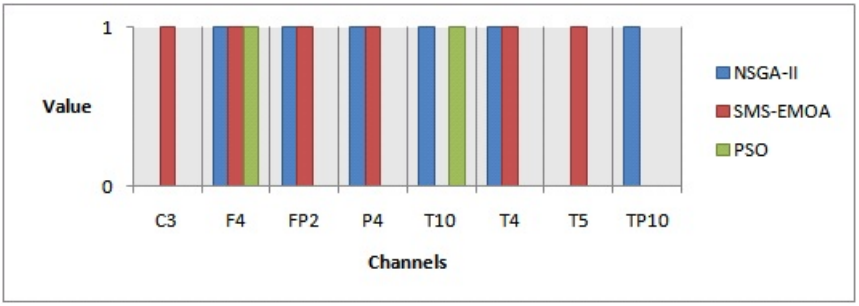

Figure 4.1: Channels chosen by the three methods on Patient a) using 30 minutes preictal time

The results also suggest that channel selection has a positive effect on classification results, because the results obtained with this test are better than when using just input selection.

4.4.2 Patient b)

The best result found for Patient b) using 30 minutes preictal time was discovered by SMS-EMOA, using 3 channels (Table 4.14). All the three methods have found results with a low number of channels.

Table 4.14: Best results found for Patient b) using 30 minutes preictal time

Method	SS	SP	Channels
NSGA-II	0.48	0.58	2
SMS-EMOA	0.58	0.58	3
PSO	0.47	0.65	1

Unlike Patient a), no channel was chosen by the three methods, as one can see in Figure 4.2, but P3 was chosen by SMS-EMOA and NSGA-II, what can

mean this channel is important. Mainly Frontal and Parietal channels were chosen, but one can not conclude that it has a relation with the fact that patient has a Frontal epileptic focus, since Parietal channels are also chosen along with the Frontal ones.

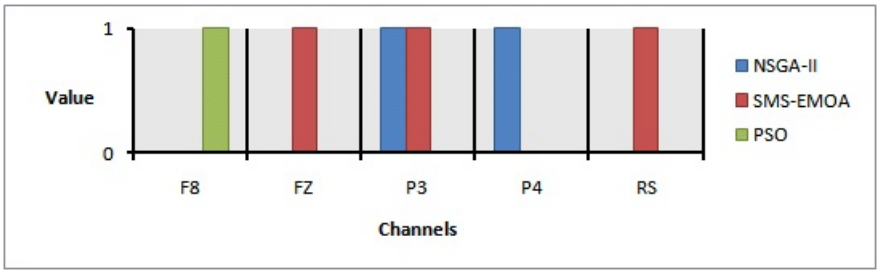

Figure 4.2: Channels chosen by the three methods on Patient b) using 30 minutes preictal time

Analysing the same patient using 40 minutes preictal time (Table 4.15 and Figure 4.3, one can conclude that even if the results are close to the 30 minutes case, they are slighly worse, and the best was found by PSO with only one channel. The chosen channels, however, had no pattern. This suggests that the best time for this patient is 30 minutes, and so, on the next test, only that case will be shown.

Table 4.15: Best results found for Patient b) using 40 minutes preictal time

Method	**SS**	**SP**	**Channels**
NSGA-II	0.52	0.57	2
SMS-EMOA	0.27	0.75	3
PSO	0.54	0.59	1

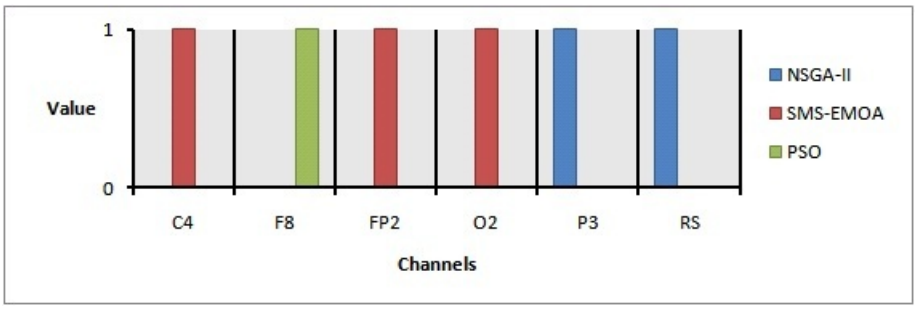

Figure 4.3: Channels chosen by the three methods on Patient b) using 40 minutes preictal time

4.4.3 Patient c)

Table 4.16 shows that the best result obtained for 30 minutes preictal for Patient c) was obtained by NSGA-II. SMS-EMOA had the highest number of channels. The result obtained by PSO is worse than the others, but uses the lowest number of channels. Looking at Figure 4.4 one can see that there are no common channels to the three approaches, but CZ and F7 are both chosen by two algorithms.

Table 4.16: Best results found for Patient c) using 30 minutes preictal time

Method	SS	SP	Channels
NSGA-II	0.60	0.81	4
SMS-EMOA	0.53	0.84	8
PSO	0.44	0.81	2

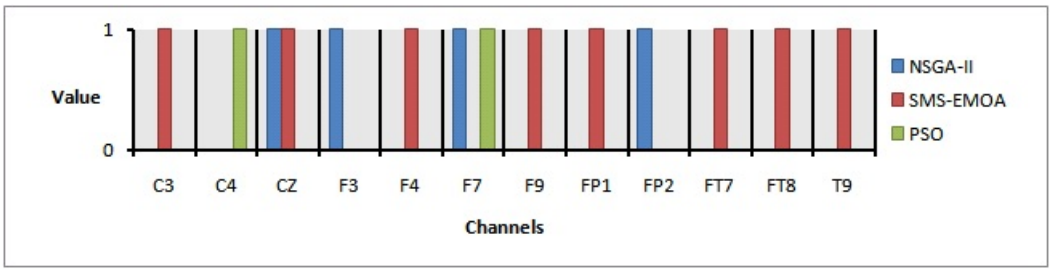

Figure 4.4: Channels chosen by the three methods on Patient c) using 30 minutes preictal time

Table 4.17: Best results found for Patient c) using 40 minutes preictal time

Method	SS	SP	Channels
NSGA-II	0.62	0.78	5
SMS-EMOA	0.53	0.78	11
PSO	0.64	0.71	2

Analysing the 40 minutes preictal case, Table 4.17 shows that the results are very similar to the 30 minutes preictal case. Since the best overall result was obtained by NSGA-II on 30 minutes preictal, the next test will use this information to build the dataset. Looking at Figure 4.5, one can see that there are a few channels that are shared by two algorithms, but never by the three. Overall, this solution also uses more channels, so one can conclude that 30 minutes preictal suits this patient better.

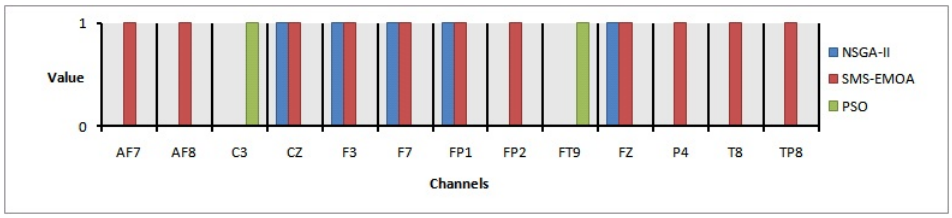

Figure 4.5: Channels chosen by the three methods on Patient c) using 40 minutes preictal time

4.4.4 Patient d)

Patient d) results are not very good, but there is an improvement comparing to the last tests done for this patient. Comparing Table 4.18 with Table 4.19 one can see that the results are very similar, but PSO on the 40 minute preictal test uses less channels and the results are almost the same, so, for the next test, it was considered only the 40 minutes preictal example.

Table 4.18: Best results found for Patient d) using 30 minutes preictal time

Method	**SS**	**SP**	**Channels**
NSGA-II	0.20	0.89	5
SMS-EMOA	0.37	0.84	10
PSO	0.51	0.74	3

Figure 4.6 shows almost no patterns on the channels, while Figure 4.7 reveals the importance of CP6, that is chosen by the three algorithms and was the only channel chosen by NSGA-II. This pattern was another reason that led to the choice of the 40 minutes preictal for the next test.

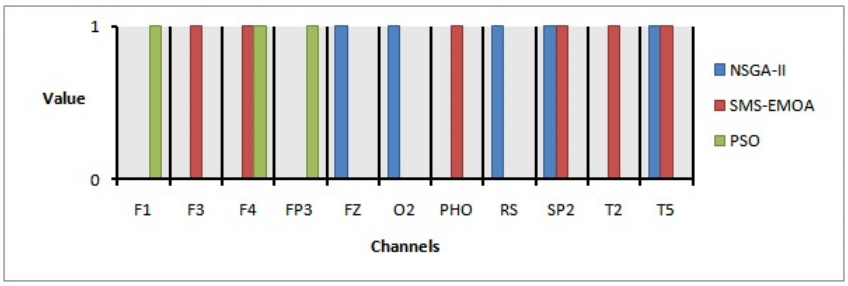

Figure 4.6: Channels chosen by the three methods on Patient d) using 30 minutes preictal time

Table 4.19: Best results found for Patient d) using 40 minutes preictal time

Method	SS	SP	Channels
NSGA-II	0.33	0.85	1
SMS-EMOA	0.32	0.85	14
PSO	0.49	0.77	2

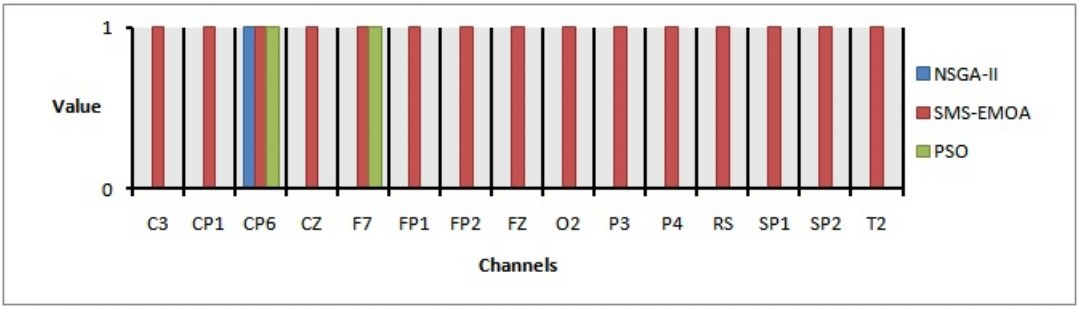

Figure 4.7: Channels chosen by the three methods on Patient d) using 40 minutes preictal time

4.4.5 Patient e)

If one looks at Table 4.20, it is easy to understand that no results are satisfatory. Anyway, it is interesting to notice that channel F3 is chosen by all three algorithms, as shown in Figure 4.8. The best result is obtained by PSO using only one channel, on 30 minutes preictal.

Table 4.20: Best results found for Patient e) using 30 minutes preictal time

Method	SS	SP	Channels
NSGA-II	0.24	0.83	14
SMS-EMOA	0.24	0.79	7
PSO	0.23	0.85	1

In the case using 40 minutes preictal time, the results on sensitivity and specificity are similar to the 30 minutes case, but since the test using 30 minutes preictal time has a solution with only one channel, that is one of the best solutions, that was the preictal time chosen for the next test.

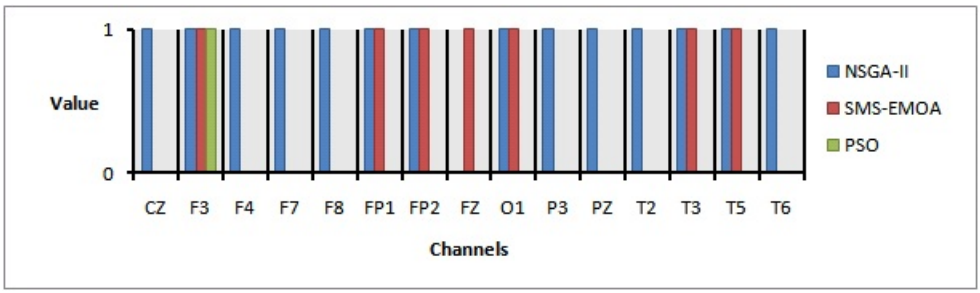

Figure 4.8: Channels chosen by the three methods on Patient d) using 30 minutes preictal time

Table 4.21: Best results found for Patient e) using 40 minutes preictal time

Method	SS	SP	Channels
NSGA-II	0.28	0.74	3
SMS-EMOA	0.21	0.87	4
PSO	0.18	0.80	2

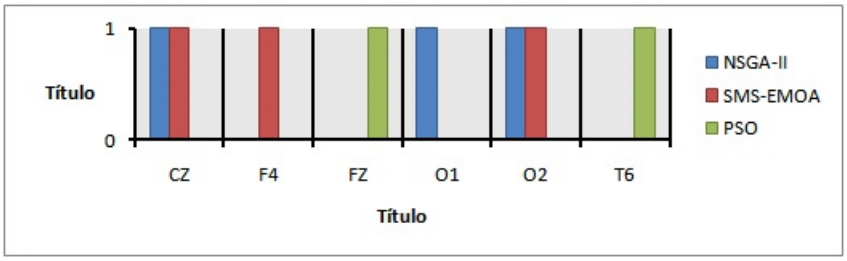

Figure 4.9: Channels chosen by the three methods on Patient a) using 40 minutes preictal time

4.5 Channel and Input reduction

This section presents the last test, that uses the best individual found on the previous test, builds a dataset using the channels chosen by that individual and then tries to reduce the inputs.

All the results regarding this test are shown on Appendix D.

4.5.1 Patient a)

Table 4.22 presents the best results obtained after channel and input reduction. SMS-EMOA obtained the best result, but at the cost of more inputs than any of the other methods. PSO found a good result using only three inputs.

No conclusion can be taken on Gamma value, since there are values over

3000 and values smaller than 20. Cost values are usually large, and that means that the penalty associated to misclassifications is very high.

Table 4.22: Best results found for Patient a)

Method	SS	SP	Inputs	Cost	Gamma
NSGA-II	0.78	0.83	5	76880	3202
SMS-EMOA	0.91	0.84	18	44972	14
PSO	0.85	0.76	3	182012	3578

If one looks at Figure 4.10, one can see that ARCoeff and DecorrTime are chosen by NSGA-II and SMS-EMOA, what indicates that this features have relevance for the correct classification of instances. Different types of RelPow and Wavelets are chosen by SMS-EMOA, what suggests that this type of features are important.

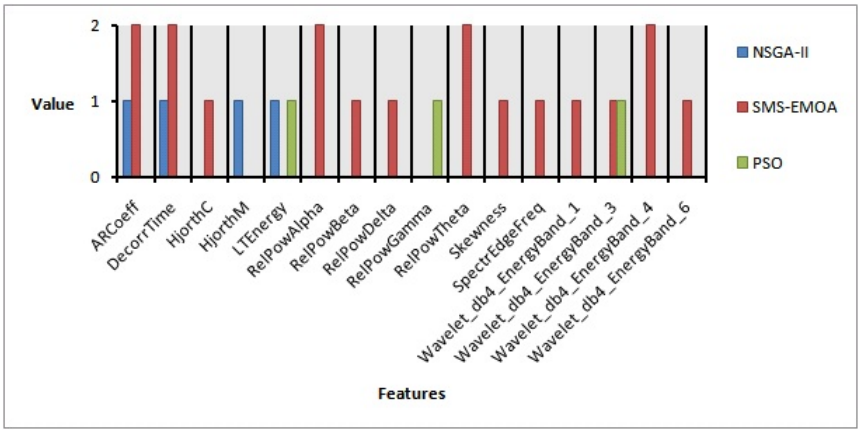

Figure 4.10: Features chosen for Patient a)

4.5.2 Patient b)

NSGA-II on this patient was not able to find a satisfatory solution (Table 4.23), so the features chosen by this method will not be presented. The best result was found by PSO, and only needed 8 inputs. Cost values tend to be high, and Gamma values tend to be low.

Figure 4.11 shows that, once again, different types of Wavelets were chosen and some of this features appear several times. Both methods tend to find Mean, RelPow and SpectrEdge important.

Table 4.23: Best results found for Patient b)

Method	SS	SP	Inputs	Cost	Gamma
NSGA-II	0.02	0.99	30	232830	0.00014
SMS-EMOA	0.55	0.56	24	199484	0.004386
PSO	0.59	0.55	8	244876	0.005319

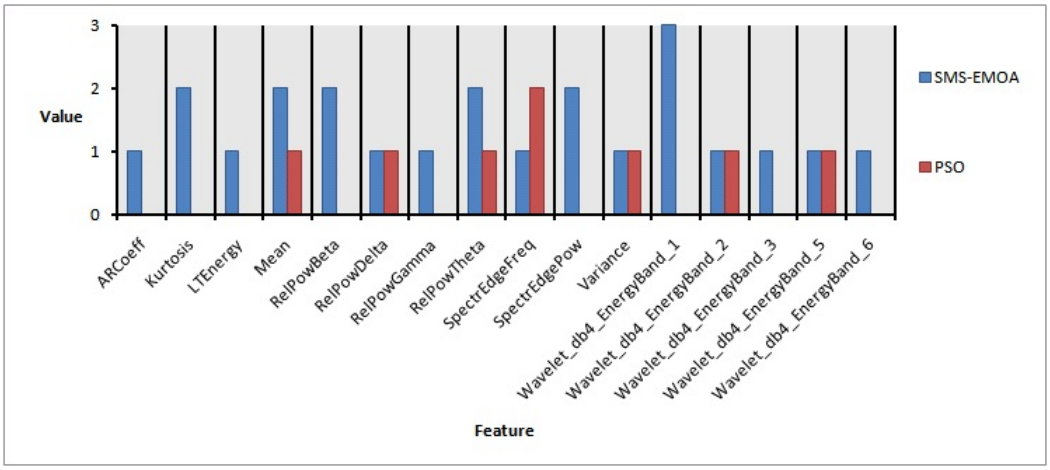

Figure 4.11: Features chosen for Patient b)

4.5.3 Patient c)

No satisfatory solutions were found for this patient on this test. The algorithms probably need more iterations to find good solutions.

4.5.4 Patient d)

Table 4.24: Best results found for Patient d)

Method	SS	SP	Inputs	Cost	Gamma
NSGA-II	0.02	0.99	1	31096	0.000223
SMS-EMOA	0.50	0.69	11	217682	4222
PSO	0.48	0.82	11	129696	0.001247

Table 4.24 reveals that NSGA-II was not able to find a good solution. PSO, once again, had the best result, using 11 inputs. Gamma values oscilate between very small values and big values. Cost tends to be high.

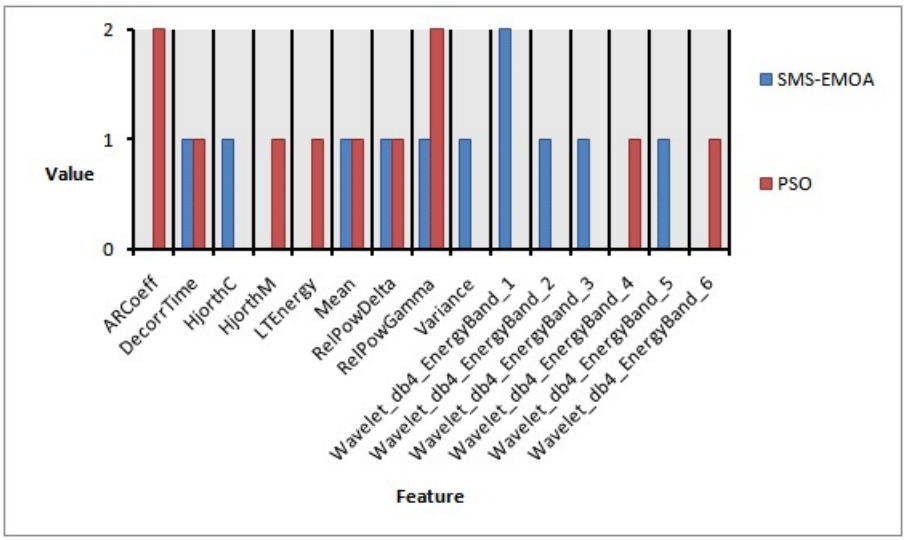

Figure 4.12: Features chosen for Patient d)

DecorrTime and RelPowGamma seem to have important information regarding seizure detection, since the two analysed methods chose this type of feature. Wavelet kind of features, once again, are selected (Figure 4.12).

4.5.5 Patient e)

Like for Patient c), no satisfatory solutions were found for this patient on this test. The reason is probably the same, not enough iterations to allow the algorithms to converge.

Chapter 5

Conclusions and Future Work

Feature reduction had a positive effect in the overall results of the algorithms. When comparing input reduction with the use of all dataset, one easily understands that using all the inputs is computational heavy and, most of the times, the algorithms were not able to find satisfatory solutions, what leads to the conclusion that some of the features are useless and confusing for the algorithms, because the algorithms are not able to achieve good classification results.

Patient a) was the patient with the best results, but b) and c) also had good results. Patients d) and e) did not present satisfatory solutions, what can be an indication that the preictal times chosen are not the best for this two patients. The patients usually evolved positively when reducing features, but in the last test, for patients c) and e) no viable solutions were found, what means that the final test, the channel and feature reduction, must be tuned. Maybe by running the algorithms longer, allowing it to converge to better solutions.

It is not possible to define what is the best algorithm, since all of them had tests in which they had the best results. Anyway, SMS-EMOA seems to find solutions with more inputs than any of the others, what can be explained by the fact that it only generates one new individual every iteration, while the two others build an entire new population, allowing the algorithms to test more solutions. PSO revealed to be a good implementation, despite of being single-objective.

There are patterns in the channels chosen by the algorithms, what is important to conclude what are the best electrodes to use with each patient. Using this information, when building the device to detect seizures, the most important electrodes can be placed in the head of the patient in order to more efficiently detect the incoming seizures. There was no evidence of a relation between the focal region of the patients and the electrodes chosen.

The features chosen by the algorithms on the last test revealed important

information, because the algorithms tend to choose Wavelets and RelPow, what shows that this kind of features have important information regarding seizure detection.

Cost values seem to converge to big values, while, most of the times, the Gamma value seems to converge to very small values. This reveals that the misclassifications have a high penalty associated and that the width of the radial basis functions associated with the SVM's kernels is very small.

The results obtained are promising, pointing that this kind of methodologies can be applied for the tailoring of patient specific predictors, with potential for clinical application.

The next step on this work would be testing the classifiers on seizure detection. Instead of finding only the values of specificity and sensitivity, one should test if the classifiers, inside the seizure detection algorithm, are able to raise alarms before the seizures happen.

Future work can include the ability of the genetic algorithms to generate the preictal times, so, the algorithm tries to find the best preictal time for each patient. This way, it is possible to find what are the suitable preictal times for each patient, tailoring the algorithms accordingly. Testing with different classifiers, like Multi-Layer-Perceptrons (MLPs), can also be an interesting approach. Chromosomes with real values can also be tested, in order to find if the algorithms converge faster and better.

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Appendices

Appendix A

SVMs with no input reduction

Table A.1: Results of SVMs with no input reduction on Patient a) using 30 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000976563
0.00	1.00	32	0.03125
0.00	1.00	32	8
1.00	0.00	32	32
0.00	1.00	32	256
0.00	1.00	256	0.000976563
0.00	1.00	256	0.03125
1.00	0.00	256	8
1.00	0.00	256	32
0.00	1.00	256	256
0.00	1.00	1024	0.000976563
0.00	1.00	1024	0.03125
1.00	0.00	1024	8
1.00	0.00	1024	32
0.00	1.00	1024	256
1.00	0.00	8192	0.000976563
0.00	1.00	8192	0.03125
0.00	1.00	8192	8
0.00	1.00	8192	32
0.00	1.00	8192	256
1.00	0.00	16384	0.000976563
0.00	1.00	16384	0.03125
1.00	0.00	16384	8
0.00	1.00	16384	32
0.00	1.00	16384	256

Table A.2: Results of SVMs with no input reduction on Patient a) using 40 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
0.00	1.00	32	32
0.00	1.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
0.00	1.00	256	8
1.00	0.00	256	32
0.00	1.00	256	256
0.00	1.00	1024	0.000977
0.00	1.00	1024	0.03125
1.00	0.00	1024	8
1.00	0.00	1024	32
0.00	1.00	1024	256
0.00	1.00	8192	0.000977
0.00	1.00	8192	0.03125
0.00	1.00	8192	8
0.00	1.00	8192	32
0.00	1.00	8192	256
0.00	1.00	16384	0.000977
0.00	1.00	16384	0.03125
0.00	1.00	16384	8
0.00	1.00	16384	32
0.00	1.00	16384	256

Table A.3: Results of SVMs with no input reduction on Patient b) using 30 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
0.00	1.00	32	32
0.00	1.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
0.00	1.00	256	8
0.00	1.00	256	32
0.00	1.00	256	256
0.00	1.00	1024	0.000977
0.00	1.00	1024	0.03125
0.00	1.00	1024	8
0.00	1.00	1024	32
0.00	1.00	1024	256
0.75	0.29	8192	0.000977
0.00	1.00	8192	0.03125
0.00	1.00	8192	8
0.00	1.00	8192	32
0.00	1.00	8192	256
0.82	0.21	16384	0.000977
0.00	1.00	16384	0.03125
0.00	1.00	16384	8
0.00	1.00	16384	32
0.00	1.00	16384	256

Table A.4: Results of SVMs with no input reduction on Patient b) using 40 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
0.00	1.00	32	32
0.00	1.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
0.00	1.00	256	8
0.00	1.00	256	32
0.00	1.00	256	256
0.57	0.42	1024	0.000977
0.00	1.00	1024	0.03125
0.00	1.00	1024	8
0.00	1.00	1024	32
0.00	1.00	1024	256
0.95	0.04	8192	0.000977
0.00	1.00	8192	0.03125
0.00	1.00	8192	8
0.00	1.00	8192	32
0.00	1.00	8192	256
1.00	0.00	16384	0.000977
0.00	1.00	16384	0.03125
0.00	1.00	16384	8
0.00	1.00	16384	32
0.00	1.00	16384	256

Table A.5: Results of SVMs with no input reduction on Patient c) using 30 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
0.00	1.00	32	32
1.00	0.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
1.00	0.00	256	8
1.00	0.00	256	32
0.00	1.00	256	256
0.00	1.00	1024	0.000977
0.00	1.00	1024	0.03125
1.00	0.00	1024	8
0.00	1.00	1024	32
1.00	0.00	1024	256
0.00	1.00	8192	0.000977
0.00	1.00	8192	0.03125
0.00	1.00	8192	8
0.00	1.00	8192	32
1.00	0.00	8192	256
0.00	1.00	16384	0.000977
0.00	1.00	16384	0.03125
0.00	1.00	16384	8
0.00	1.00	16384	32
1.00	0.00	16384	256

Table A.6: Results of SVMs with no input reduction on Patient c) using 40 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
0.00	1.00	32	32
1.00	0.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
0.00	1.00	256	8
1.00	0.00	256	32
1.00	0.00	256	256
0.00	1.00	1024	0.000977
0.00	1.00	1024	0.03125
1.00	0.00	1024	8
0.00	1.00	1024	32
1.00	0.00	1024	256
0.00	1.00	8192	0.000977
0.00	1.00	8192	0.03125
1.00	0.00	8192	8
1.00	0.00	8192	32
1.00	0.00	8192	256
0.00	1.00	16384	0.000977
0.00	1.00	16384	0.03125
1.00	0.00	16384	8
1.00	0.00	16384	32
1.00	0.00	16384	256

Table A.7: Results of SVMs with no input reduction on Patient d) using 30 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
0.00	1.00	32	32
0.00	1.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
0.00	1.00	256	8
0.00	1.00	256	32
0.00	1.00	256	256
0.00	1.00	1024	0.000977
0.00	1.00	1024	0.03125
0.00	1.00	1024	8
0.00	1.00	1024	32
0.00	1.00	1024	256
0.00	1.00	8192	0.000977
0.00	1.00	8192	0.03125
0.00	1.00	8192	8
0.00	1.00	8192	32
0.00	1.00	8192	256
0.11	0.90	16384	0.000977
0.00	1.00	16384	0.03125
0.00	1.00	16384	8
0.00	1.00	16384	32
0.00	1.00	16384	256

Table A.8: Results of SVMs with no input reduction on Patient d) using 40 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
0.00	1.00	32	32
0.00	1.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
0.00	1.00	256	8
0.00	1.00	256	32
0.00	1.00	256	256
0.00	1.00	1024	0.000977
0.00	1.00	1024	0.03125
0.00	1.00	1024	8
0.00	1.00	1024	32
0.00	1.00	1024	256
0.41	0.70	8192	0.000977
0.00	1.00	8192	0.03125
0.00	1.00	8192	8
0.00	1.00	8192	32
0.00	1.00	8192	256
1.00	0.00	16384	0.000977
0.00	1.00	16384	0.03125
0.00	1.00	16384	8
0.00	1.00	16384	32
0.00	1.00	16384	256

Table A.9: Results of SVMs with no input reduction on Patient e) using 30 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
1.00	0.00	32	32
0.00	1.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
1.00	0.00	256	8
1.00	0.00	256	32
0.00	1.00	256	256
0.00	1.00	1024	0.000977
0.00	1.00	1024	0.03125
1.00	0.00	1024	8
1.00	0.00	1024	32
0.00	1.00	1024	256
1.00	0.00	8192	0.000977
0.00	1.00	8192	0.03125
0.00	1.00	8192	8
0.00	1.00	8192	32
0.00	1.00	8192	256
1.00	0.00	16384	0.000977
0.00	1.00	16384	0.03125
1.00	0.00	16384	8
0.00	1.00	16384	32
0.00	1.00	16384	256

Table A.10: Results of SVMs with no input reduction on Patient e) using 40 minutes preictal time

SS	SP	Cost	Gamma
0.00	1.00	32	0.000977
0.00	1.00	32	0.03125
0.00	1.00	32	8
1.00	0.00	32	32
1.00	0.00	32	256
0.00	1.00	256	0.000977
0.00	1.00	256	0.03125
1.00	0.00	256	8
1.00	0.00	256	32
0.00	1.00	256	256
0.00	1.00	1024	0.000977
0.00	1.00	1024	0.03125
1.00	0.00	1024	8
1.00	0.00	1024	32
0.00	1.00	1024	256
0.82	0.18	8192	0.000977
0.00	1.00	8192	0.03125
1.00	0.00	8192	8
1.00	0.00	8192	32
0.00	1.00	8192	256
0.98	0.02	16384	0.000977
0.00	1.00	16384	0.03125
1.00	0.00	16384	8
1.00	0.00	16384	32
0.00	1.00	16384	256

Appendix B

Input reduction results

Table B.1: Input reduction on Patient a) using 30 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.44	0.91	27	237
0.44	0.91	27	237
0.42	0.92	27	231
0.45	0.92	27	237
0.33	0.94	27	246
0.48	0.90	27	237
0.43	0.93	27	238
0.42	0.92	27	237
0.33	0.94	27	250
0.55	0.89	27	229
0.44	0.91	27	237
0.44	0.91	27	237
0.42	0.92	27	237
0.46	0.91	27	228
0.44	0.91	27	235
0.44	0.91	27	235
0.44	0.91	27	235
0.47	0.90	27	233
0.45	0.92	27	228
0.41	0.93	27	231
0.34	0.93	27	239
0.44	0.91	27	237
0.34	0.92	27	223
0.50	0.90	27	236
0.32	0.94	27	245
0.34	0.93	27	239
0.39	0.91	27	241
0.44	0.91	27	235
0.42	0.92	27	230
0.55	0.89	27	230
0.44	0.91	27	237
0.34	0.94	27	247
0.33	0.94	27	250
0.44	0.91	27	237
0.44	0.91	27	237
0.45	0.91	27	228
0.31	0.92	27	222
0.33	0.94	27	251
0.41	0.91	27	228
0.35	0.91	27	223
0.43	0.91	27	235
0.44	0.91	27	234
0.34	0.94	27	250
0.44	0.91	27	226
0.42	0.91	27	230
0.35	0.91	27	223
0.44	0.91	27	235
0.34	0.93	27	240
0.41	0.91	27	228
0.34	0.92	27	225

Table B.2: Input reduction on Patient a) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.43	0.90	27	281
0.35	0.92	27	254
0.81	0.82	27	263
0.77	0.78	27	248
0.00	1.00	27	266
0.64	0.90	27	244
0.30	0.93	27	254
0.52	0.90	27	251
0.37	0.92	27	266
0.38	0.91	27	239
0.52	0.90	27	250
0.33	0.93	27	255
0.43	0.90	27	262
0.47	0.91	27	256
0.54	0.92	27	246
0.52	0.92	27	239
0.52	0.90	27	242
0.31	0.93	27	248
0.37	0.92	27	241
0.81	0.81	27	261
0.48	0.91	27	253
0.44	0.92	27	263
0.53	0.90	27	251
0.52	0.90	27	262
0.51	0.91	27	244
0.79	0.87	27	255
0.76	0.88	27	254
0.50	0.91	27	242
0.37	0.92	27	268
0.55	0.89	27	267
0.76	0.87	27	245
0.37	0.92	27	254
0.76	0.88	27	251
0.74	0.86	27	262
0.78	0.87	27	253
0.37	0.92	27	247
0.79	0.80	27	241
0.78	0.85	27	240
0.76	0.88	27	248
0.39	0.91	27	250
0.43	0.85	27	252
0.33	0.93	27	251
0.76	0.87	27	257
0.53	0.90	27	241
0.47	0.91	27	261
0.36	0.92	27	251
0.80	0.82	27	254
0.53	0.92	27	248
0.44	0.90	27	245
0.00	1.00	27	257

Table B.3: Input reduction on Patient a) using 30 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.90	0.72	27	203
0.75	0.83	26	219
0.42	0.90	27	196
0.89	0.78	27	208
0.47	0.90	27	206
0.86	0.82	27	206
0.40	0.91	27	204
0.53	0.89	26	222
0.45	0.90	26	204
0.45	0.90	27	204
0.41	0.91	26	203
0.74	0.82	27	207
0.45	0.90	27	202
0.39	0.92	26	207
0.87	0.78	27	204
0.51	0.89	27	201
0.39	0.91	27	206
0.50	0.89	26	211
0.53	0.89	27	204
0.39	0.90	27	201
0.43	0.91	27	198
0.39	0.90	27	202
0.77	0.82	27	212
0.74	0.81	27	205
0.58	0.88	26	212
0.76	0.83	27	195
0.45	0.83	27	203
0.44	0.90	26	216
0.85	0.84	27	212
0.68	0.87	27	211
0.55	0.87	27	202
0.56	0.87	27	207
0.42	0.90	27	206
0.49	0.88	26	227
0.68	0.87	27	207
0.33	0.92	27	199
0.81	0.81	27	204
0.77	0.85	27	212
0.44	0.89	27	201
0.41	0.91	27	206
0.40	0.92	26	218
0.91	0.79	27	200
0.84	0.86	27	202
0.75	0.81	26	211
0.43	0.90	27	210
0.84	0.83	26	205
0.49	0.89	27	201
0.44	0.91	26	223
0.40	0.92	27	206
0.55	0.89	27	202

Table B.4: Input reduction on Patient b) using 30 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.12	0.79	24	197
0.12	0.79	24	197
0.12	0.79	24	197
0.08	0.80	24	190
0.12	0.77	24	192
0.06	0.82	24	192
0.12	0.79	24	197
0.12	0.77	24	192
0.08	0.80	24	192
0.10	0.79	24	189
0.06	0.82	24	192
0.06	0.84	24	201
0.12	0.77	24	192
0.12	0.79	24	197
0.05	0.81	24	194
0.08	0.80	24	190
0.12	0.79	24	197
0.12	0.77	24	192
0.08	0.79	24	194
0.08	0.80	24	190
0.12	0.79	24	197
0.08	0.79	24	194
0.10	0.77	24	197
0.12	0.78	24	196
0.12	0.77	24	192
0.06	0.82	24	192
0.05	0.81	24	193
0.05	0.81	24	192
0.10	0.79	24	196
0.12	0.77	24	192
0.12	0.77	24	192
0.12	0.79	24	197
0.12	0.78	24	196
0.12	0.79	24	197
0.12	0.79	24	197
0.10	0.79	24	191
0.11	0.78	24	193
0.06	0.81	24	190
0.12	0.77	24	192
0.12	0.79	24	197
0.10	0.79	24	196
0.07	0.81	24	191
0.12	0.79	24	197
0.06	0.82	24	194
0.10	0.79	24	190
0.06	0.82	24	193
0.10	0.77	24	197
0.12	0.78	24	197
0.10	0.78	24	195
0.12	0.79	24	196

Table B.5: Input reduction on Patient b) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.16	0.79	24	238
0.00	1.00	24	236
0.16	0.79	24	230
0.12	0.76	24	237
0.13	0.78	24	227
0.28	0.74	24	229
0.08	0.84	24	243
0.28	0.74	24	226
0.10	0.82	24	228
0.10	0.82	24	245
0.20	0.78	24	227
0.10	0.82	24	226
0.20	0.79	24	224
0.09	0.83	24	228
0.12	0.79	24	234
0.12	0.79	24	231
0.10	0.80	24	225
0.18	0.76	24	223
0.10	0.80	24	228
0.27	0.76	24	229
0.11	0.79	24	222
0.08	0.82	24	227
0.09	0.83	24	227
0.13	0.81	24	219
0.10	0.80	24	243
0.13	0.78	24	217
0.17	0.78	24	223
0.09	0.83	24	220
0.11	0.84	24	217
0.09	0.79	24	221
0.11	0.78	24	238
0.06	0.83	24	227
0.10	0.80	24	215
0.13	0.81	24	224
0.10	0.82	24	225
0.09	0.81	24	217
0.09	0.83	24	223
0.13	0.76	24	219
0.14	0.78	24	225
0.16	0.81	24	222
0.14	0.79	24	222
0.28	0.74	24	222
0.09	0.83	24	223
0.05	0.83	24	222
0.08	0.81	24	226
0.11	0.78	24	214
0.07	0.82	24	223
0.07	0.80	24	229
0.07	0.81	24	228
0.08	0.81	24	215

Table B.6: Input reduction on Patient b) using 30 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.00	1.00	24	170
0.00	1.00	23	200
0.00	1.00	24	177
0.00	1.00	23	192
0.00	1.00	24	171
0.00	1.00	24	176
0.00	1.00	24	177
0.00	1.00	24	177
0.19	0.79	24	165
0.00	1.00	23	192
0.00	1.00	24	184
0.00	1.00	24	184
0.00	1.00	24	180
0.00	1.00	24	175
0.00	1.00	23	191
0.00	1.00	23	182
0.00	1.00	24	179
0.00	1.00	24	178
0.00	1.00	24	180
0.17	0.81	23	189
0.00	1.00	24	183
0.00	1.00	24	186
0.00	1.00	24	184
0.00	1.00	23	194
0.00	1.00	24	179
0.00	1.00	23	193
0.17	0.78	23	176
0.00	1.00	23	200
0.00	1.00	23	190
0.00	1.00	24	179
0.00	1.00	24	178
0.00	1.00	24	175
0.00	1.00	23	203
0.00	1.00	24	185
0.00	1.00	24	183
0.00	1.00	24	183
0.00	1.00	24	184
0.00	1.00	23	184
0.00	1.00	24	180
0.00	1.00	23	199
0.00	1.00	24	180
0.00	1.00	24	182
0.00	1.00	23	186
0.00	1.00	24	170
0.00	1.00	24	182
0.00	1.00	24	179
0.00	1.00	24	173
0.00	1.00	24	177
0.00	1.00	24	179
0.00	1.00	24	179

Table B.7: Input reduction on Patient b) using 40 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.18	0.72	24	221
0.15	0.74	24	209
0.16	0.80	24	198
0.19	0.76	24	192
0.15	0.74	24	217
0.15	0.74	24	208
0.19	0.71	24	215
0.20	0.74	24	194
0.20	0.71	24	212
0.19	0.70	24	208
0.16	0.72	24	210
0.15	0.74	24	196
0.25	0.70	24	189
0.18	0.72	24	221
0.19	0.71	24	215
0.29	0.68	24	193
0.24	0.69	24	191
0.13	0.75	24	195
0.15	0.74	24	213
0.19	0.76	24	192
0.19	0.76	24	192
0.19	0.76	24	192
0.19	0.71	24	208
0.19	0.71	24	215
0.17	0.79	24	191
0.24	0.68	24	205
0.16	0.80	24	196
0.19	0.76	24	192
0.19	0.71	24	205
0.15	0.74	24	195
0.15	0.74	24	209
0.13	0.75	24	195
0.17	0.72	24	208
0.21	0.71	24	186
0.19	0.71	24	215
0.15	0.74	24	204
0.19	0.78	24	190
0.15	0.74	24	195
0.28	0.67	24	191
0.21	0.71	24	185
0.15	0.74	24	195
0.17	0.76	24	195
0.19	0.71	24	215
0.17	0.73	24	190
0.13	0.75	24	196
0.16	0.72	24	206
0.15	0.74	24	195
0.25	0.74	24	189
0.19	0.71	24	215
0.16	0.80	24	193

Table B.8: Input reduction on Patient b) using 40 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.14	0.78	24	221
0.23	0.77	24	240
0.14	0.78	24	235
0.14	0.78	24	222
0.22	0.77	24	226
0.16	0.75	24	227
0.14	0.79	24	224
0.15	0.79	24	238
0.18	0.80	24	242
0.14	0.78	24	223
0.24	0.77	24	237
0.14	0.79	24	221
0.15	0.75	24	223
0.19	0.81	24	223
0.15	0.76	24	223
0.25	0.76	24	238
0.16	0.75	24	219
0.23	0.77	24	221
0.14	0.78	24	223
0.29	0.75	24	228
0.00	1.00	24	224
0.00	1.00	24	239
0.23	0.77	24	235
0.24	0.78	24	222
0.16	0.75	24	242
0.15	0.79	24	220
0.02	0.98	24	221
0.14	0.79	24	228
0.30	0.75	24	220
0.23	0.77	24	242
0.15	0.75	24	229
0.23	0.81	24	223
0.00	1.00	24	239
0.23	0.77	24	239
0.15	0.75	24	234
0.15	0.75	24	219
0.15	0.75	24	225
0.14	0.79	24	222
0.14	0.78	24	223
0.15	0.75	24	228
0.00	1.00	24	236
0.15	0.75	24	222
0.23	0.77	24	233
0.15	0.76	24	223
0.15	0.75	24	220
0.15	0.75	24	241
0.15	0.75	24	238
0.14	0.78	24	239
0.15	0.79	24	229
0.16	0.81	24	231

Table B.9: Input reduction on Patient b) using 40 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.00	1.00	24	173
0.00	1.00	24	178
0.00	1.00	24	173
0.00	1.00	24	173
0.00	1.00	24	172
0.00	1.00	24	177
0.00	1.00	24	167
0.00	1.00	24	175
0.00	1.00	24	172
0.00	1.00	24	176
0.00	1.00	24	181
0.00	1.00	24	167
0.00	1.00	24	172
0.00	1.00	24	174
0.00	1.00	24	170
0.00	1.00	24	173
0.00	1.00	24	166
0.00	1.00	24	176
0.00	1.00	24	166
0.00	1.00	24	176
0.00	1.00	24	174
0.00	1.00	24	174
0.00	1.00	24	175
0.00	1.00	24	173
0.00	1.00	24	167
0.25	0.75	24	176
0.00	1.00	24	182
0.00	1.00	24	174
0.00	1.00	24	179
0.00	1.00	24	172
0.00	1.00	24	171
0.00	1.00	24	173
0.00	1.00	24	175
0.00	1.00	24	168
0.00	1.00	24	176
0.00	1.00	24	174
0.00	1.00	24	168
0.00	1.00	24	175
0.00	1.00	24	169
0.00	1.00	24	175
0.00	1.00	24	169
0.00	1.00	24	176
0.00	1.00	23	184
0.00	1.00	24	176
0.00	1.00	24	174
0.00	1.00	24	165
0.00	1.00	24	177
0.00	1.00	24	166
0.00	1.00	24	172
0.31	0.77	24	165

Table B.10: Input reduction on Patient c) using 30 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.41	0.86	31	323
0.41	0.85	31	307
0.41	0.85	31	302
0.41	0.85	31	302
0.37	0.90	31	299
0.39	0.86	31	299
0.41	0.85	31	302
0.37	0.90	31	299
0.41	0.85	31	301
0.37	0.90	31	303
0.36	0.89	31	297
0.41	0.85	31	305
0.39	0.86	31	300
0.41	0.86	31	312
0.37	0.88	31	311
0.41	0.86	31	307
0.34	0.88	31	311
0.39	0.86	31	297
0.35	0.91	31	301
0.37	0.87	31	305
0.39	0.86	31	301
0.35	0.91	31	305
0.37	0.87	31	299
0.39	0.86	31	301
0.41	0.86	31	306
0.37	0.88	31	305
0.41	0.86	31	305
0.41	0.85	31	301
0.37	0.87	31	308
0.39	0.86	31	300
0.41	0.86	31	312
0.37	0.87	31	299
0.36	0.89	31	299
0.34	0.88	31	307
0.41	0.85	31	306
0.34	0.91	31	293
0.35	0.91	31	293
0.37	0.90	31	295
0.39	0.86	31	299
0.41	0.85	31	305
0.41	0.85	31	301
0.36	0.88	31	302
0.37	0.88	31	308
0.37	0.87	31	304
0.41	0.85	31	298
0.40	0.85	31	305
0.39	0.86	31	298
0.40	0.86	31	295
0.38	0.87	31	294
0.37	0.87	31	308

Table B.11: Input reduction on Patient c) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.00	1.00	31	316
0.46	0.85	31	329
0.42	0.88	31	306
0.42	0.88	31	312
0.29	0.79	31	316
0.38	0.88	31	303
0.29	0.82	31	317
0.37	0.87	31	303
0.38	0.80	31	325
0.41	0.87	31	302
0.38	0.87	31	307
0.44	0.84	31	343
0.43	0.77	31	320
0.45	0.85	31	298
0.38	0.88	31	292
0.42	0.86	31	299
0.04	0.99	31	293
0.32	0.80	31	327
0.38	0.87	31	289
0.38	0.88	31	317
0.44	0.83	31	292
0.44	0.84	31	303
0.38	0.89	31	318
0.46	0.86	31	291
0.40	0.88	31	292
0.32	0.80	31	304
0.39	0.87	31	293
0.41	0.87	31	284
0.42	0.86	31	313
0.42	0.88	31	294
0.30	0.81	31	290
0.31	0.79	31	282
0.45	0.84	31	283
0.42	0.88	31	309
0.43	0.82	31	281
0.39	0.87	31	287
0.33	0.82	31	300
0.42	0.86	31	322
0.42	0.86	31	316
0.45	0.85	31	311
0.37	0.89	31	316
0.37	0.87	31	309
0.41	0.87	31	305
0.42	0.84	31	293
0.43	0.84	31	308
0.43	0.78	31	289
0.29	0.82	31	307
0.44	0.77	31	285
0.42	0.87	31	296
0.15	0.97	31	294

Table B.12: Input reduction on Patient c) using 30 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.35	0.86	31	256
0.31	0.87	31	249
0.38	0.85	31	256
0.37	0.87	31	262
0.41	0.88	31	264
0.37	0.87	31	260
0.34	0.88	31	263
0.46	0.87	31	257
0.41	0.86	31	263
0.38	0.87	31	260
0.41	0.85	31	253
0.34	0.87	31	250
0.29	0.90	31	265
0.41	0.84	31	254
0.46	0.82	31	262
0.44	0.86	31	254
0.39	0.88	31	248
0.40	0.87	31	249
0.46	0.86	31	250
0.39	0.86	31	263
0.38	0.86	31	256
0.38	0.87	31	272
0.40	0.81	31	253
0.43	0.86	31	265
0.37	0.82	31	258
0.36	0.88	31	258
0.30	0.89	31	253
0.34	0.88	31	242
0.31	0.85	31	248
0.39	0.87	31	252
0.37	0.88	31	255
0.35	0.88	31	265
0.43	0.87	31	251
0.34	0.87	31	256
0.42	0.86	31	262
0.44	0.85	31	253
0.32	0.88	31	245
0.40	0.85	31	247
0.34	0.89	31	247
0.37	0.89	31	267
0.35	0.87	31	261
0.37	0.86	31	255
0.41	0.85	31	264
0.37	0.87	31	244
0.38	0.87	31	251
0.46	0.88	31	246
0.37	0.86	31	266
0.38	0.87	31	241
0.32	0.88	31	255
0.37	0.90	31	262

Table B.13: Input reduction on Patient c) using 40 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.38	0.87	31	258
0.37	0.89	31	260
0.39	0.87	31	268
0.38	0.87	31	258
0.35	0.89	31	261
0.38	0.87	31	258
0.38	0.87	31	258
0.34	0.90	31	265
0.39	0.87	31	268
0.41	0.86	31	259
0.40	0.87	31	255
0.34	0.90	31	265
0.38	0.87	31	258
0.38	0.87	31	257
0.34	0.90	31	265
0.41	0.86	31	259
0.37	0.89	31	260
0.39	0.87	31	269
0.39	0.86	31	267
0.39	0.87	31	255
0.37	0.89	31	260
0.38	0.87	31	257
0.38	0.87	31	258
0.38	0.87	31	258
0.38	0.87	31	258
0.37	0.89	31	260
0.37	0.89	31	260
0.39	0.87	31	268
0.35	0.90	31	264
0.37	0.89	31	262
0.37	0.89	31	260
0.38	0.87	31	257
0.38	0.87	31	258
0.37	0.89	31	260
0.37	0.89	31	260
0.37	0.89	31	260
0.40	0.86	31	255
0.38	0.87	31	257
0.37	0.89	31	259
0.37	0.89	31	260
0.34	0.90	31	265
0.39	0.87	31	268
0.38	0.87	31	258
0.38	0.87	31	257
0.39	0.88	31	255
0.41	0.86	31	258
0.38	0.87	31	257
0.37	0.89	31	262
0.34	0.90	31	265
0.38	0.87	31	258

Table B.14: Input reduction on Patient c) using 40 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.00	1.00	31	295
0.47	0.84	31	304
0.43	0.81	31	306
0.47	0.85	31	284
0.52	0.82	31	288
0.59	0.77	31	309
0.48	0.85	31	285
0.48	0.79	31	298
0.37	0.86	31	300
0.38	0.87	31	323
0.52	0.83	31	325
0.59	0.77	31	327
0.45	0.85	31	299
0.38	0.87	31	328
0.44	0.87	31	303
0.44	0.85	31	311
0.52	0.82	31	305
0.50	0.82	31	328
0.46	0.84	31	285
0.43	0.84	31	294
0.45	0.83	31	291
0.39	0.87	31	289
0.48	0.85	31	291
0.51	0.83	31	305
0.51	0.84	31	281
0.48	0.84	31	310
0.38	0.88	31	290
0.45	0.83	31	310
0.47	0.83	31	290
0.51	0.82	31	292
0.46	0.85	31	309
0.45	0.85	31	300
0.45	0.84	31	315
0.44	0.83	31	297
0.43	0.81	31	304
0.54	0.80	31	308
0.51	0.84	31	289
0.38	0.87	31	299
0.43	0.86	31	288
0.43	0.85	31	304
0.42	0.87	31	296
0.51	0.84	31	302
0.37	0.88	31	291
0.44	0.83	31	296
0.45	0.85	31	294
0.46	0.85	31	287
0.46	0.86	31	298
0.49	0.85	31	305
0.48	0.83	31	301
0.37	0.86	31	305

Table B.15: Input reduction on Patient c) using 40 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.46	0.78	31	278
0.48	0.79	31	272
0.44	0.79	31	263
0.54	0.79	31	279
0.43	0.80	31	279
0.43	0.85	31	252
0.46	0.80	30	285
0.45	0.82	31	260
0.52	0.78	31	269
0.49	0.82	30	278
0.55	0.74	31	274
0.43	0.83	31	276
0.44	0.80	30	292
0.58	0.74	31	264
0.44	0.78	31	280
0.55	0.78	31	274
0.42	0.80	30	280
0.46	0.82	31	272
0.48	0.73	31	272
0.45	0.82	30	295
0.37	0.84	31	276
0.43	0.81	31	269
0.40	0.84	31	270
0.46	0.79	31	283
0.53	0.80	31	270
0.46	0.77	31	274
0.41	0.83	31	264
0.49	0.80	31	262
0.49	0.74	31	268
0.42	0.81	30	279
0.54	0.76	31	271
0.51	0.79	31	263
0.43	0.83	31	271
0.39	0.84	30	275
0.45	0.81	31	280
0.45	0.81	31	272
0.43	0.81	31	279
0.46	0.77	31	278
0.54	0.82	31	267
0.41	0.87	31	281
0.46	0.84	31	273
0.50	0.79	31	274
0.45	0.84	31	263
0.40	0.87	31	283
0.54	0.75	31	279
0.53	0.77	31	288
0.51	0.77	31	271
0.56	0.77	31	272
0.47	0.79	31	267
0.52	0.81	31	281

Table B.16: Input reduction on Patient d) using 30 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.27	0.89	33	272
0.27	0.89	33	272
0.21	0.91	33	266
0.27	0.89	33	272
0.27	0.89	33	272
0.21	0.91	33	266
0.27	0.89	33	272
0.27	0.89	33	272
0.27	0.89	33	272
0.27	0.89	33	272
0.22	0.90	33	266
0.21	0.91	33	276
0.27	0.89	33	272
0.27	0.89	33	272
0.27	0.89	33	272
0.27	0.89	33	272
0.21	0.91	33	263
0.21	0.91	33	266
0.27	0.89	33	272
0.27	0.89	33	272
0.27	0.90	33	266
0.22	0.90	33	272
0.27	0.89	33	272
0.27	0.89	33	272
0.27	0.90	33	266
0.27	0.89	33	266
0.22	0.90	33	266
0.22	0.90	33	272
0.27	0.89	33	272
0.27	0.89	33	272
0.22	0.90	33	266
0.27	0.89	33	272
0.27	0.89	33	272
0.22	0.90	33	266
0.27	0.89	33	272
0.22	0.90	33	264
0.23	0.89	33	268
0.27	0.89	33	272
0.27	0.90	33	266
0.27	0.89	33	272
0.21	0.91	33	266
0.22	0.90	33	266
0.27	0.89	33	272
0.27	0.89	33	272
0.21	0.91	33	266
0.27	0.90	33	266
0.27	0.90	33	266
0.27	0.89	33	272
0.22	0.90	33	266
0.27	0.89	33	272

Table B.17: Input reduction on Patient d) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.18	0.89	33	351
0.16	0.88	33	357
0.19	0.89	33	352
0.18	0.89	33	351
0.19	0.89	33	352
0.15	0.87	33	368
0.18	0.85	33	370
0.13	0.87	33	345
0.13	0.88	33	354
0.17	0.87	33	341
0.19	0.89	33	340
0.18	0.91	33	326
0.00	1.00	33	321
0.16	0.90	33	344
0.18	0.89	33	332
0.16	0.90	33	349
0.11	0.88	33	324
0.19	0.89	33	336
0.16	0.90	33	349
0.18	0.86	33	352
0.12	0.87	33	328
0.24	0.86	33	313
0.17	0.89	33	339
0.16	0.89	33	355
0.18	0.90	33	336
0.13	0.88	33	346
0.12	0.87	33	333
0.17	0.90	33	318
0.19	0.87	33	354
0.17	0.89	33	345
0.12	0.88	33	333
0.15	0.90	33	335
0.21	0.84	33	367
0.18	0.89	33	328
0.14	0.91	33	333
0.12	0.88	33	346
0.16	0.89	33	337
0.24	0.86	33	311
0.22	0.86	33	314
0.19	0.89	33	340
0.11	0.87	33	336
0.16	0.90	33	349
0.12	0.88	33	336
0.00	1.00	33	335
0.20	0.88	33	336
0.17	0.89	33	323
0.18	0.89	33	341
0.18	0.90	33	336
0.12	0.88	33	356
0.26	0.88	33	318

Table B.18: Input reduction on Patient d) using 30 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.20	0.91	33	280
0.18	0.91	33	289
0.17	0.88	33	275
0.18	0.89	33	290
0.20	0.87	33	278
0.19	0.90	33	296
0.20	0.88	33	281
0.23	0.87	33	287
0.19	0.89	33	269
0.23	0.88	33	281
0.15	0.88	33	286
0.20	0.90	33	299
0.15	0.93	33	276
0.19	0.88	33	285
0.16	0.90	33	279
0.15	0.89	33	270
0.18	0.88	33	285
0.27	0.87	33	285
0.21	0.88	33	273
0.28	0.86	33	280
0.24	0.85	33	283
0.20	0.89	33	276
0.19	0.89	33	275
0.13	0.92	33	269
0.13	0.87	33	282
0.24	0.87	33	268
0.18	0.88	33	295
0.21	0.87	33	275
0.26	0.88	33	290
0.21	0.85	33	268
0.17	0.91	33	281
0.16	0.90	33	277
0.20	0.89	33	298
0.19	0.91	33	274
0.14	0.92	33	288
0.19	0.87	33	281
0.25	0.89	33	280
0.31	0.86	33	284
0.20	0.86	33	284
0.16	0.90	33	292
0.17	0.88	33	282
0.20	0.87	33	291
0.21	0.90	33	280
0.19	0.90	33	293
0.14	0.90	33	273
0.17	0.89	33	283
0.22	0.89	33	283
0.25	0.86	33	285
0.16	0.92	33	276
0.31	0.88	33	282

Table B.19: Input reduction on Patient d) using 40 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.09	0.90	33	278
0.27	0.82	33	299
0.12	0.85	33	294
0.20	0.85	33	289
0.21	0.85	33	296
0.22	0.88	33	300
0.11	0.84	33	294
0.08	0.89	33	273
0.25	0.81	32	302
0.19	0.89	33	286
0.17	0.85	33	286
0.15	0.85	33	281
0.21	0.85	33	282
0.20	0.82	33	274
0.16	0.87	33	296
0.23	0.86	33	287
0.16	0.85	33	276
0.17	0.89	33	297
0.23	0.86	33	288
0.11	0.87	33	282
0.17	0.88	33	283
0.12	0.91	33	293
0.19	0.85	33	295
0.16	0.87	33	287
0.20	0.88	33	285
0.17	0.85	33	275
0.19	0.86	33	303
0.27	0.82	33	277
0.16	0.85	33	297
0.12	0.87	33	300
0.19	0.84	33	274
0.27	0.90	33	300
0.13	0.87	33	291
0.16	0.89	33	295
0.21	0.78	33	287
0.15	0.87	33	293
0.11	0.89	33	307
0.18	0.86	33	302
0.15	0.86	33	295
0.29	0.81	33	286
0.18	0.84	33	299
0.09	0.86	33	286
0.12	0.91	33	292
0.20	0.87	33	307
0.24	0.83	33	283
0.09	0.91	33	296
0.13	0.89	33	288
0.28	0.83	33	297
0.20	0.89	33	305
0.23	0.86	33	297

Table B.20: Input reduction on Patient d) using 40 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.15	0.87	33	327
0.00	1.00	33	326
0.28	0.87	33	340
0.16	0.90	33	350
0.14	0.84	33	345
0.21	0.90	33	321
0.00	1.00	33	348
0.14	0.90	33	350
0.16	0.86	33	338
0.20	0.91	33	353
0.14	0.88	33	351
0.19	0.93	33	342
0.17	0.89	33	350
0.16	0.85	33	335
0.16	0.85	33	335
0.12	0.91	33	338
0.29	0.86	33	343
0.13	0.84	33	341
0.21	0.89	33	335
0.16	0.87	33	333
0.14	0.82	33	342
0.00	1.00	33	341
0.18	0.86	33	347
0.18	0.89	33	353
0.16	0.89	33	342
0.25	0.90	33	342
0.16	0.86	33	336
0.13	0.86	33	339
0.16	0.85	33	328
0.18	0.89	33	353
0.17	0.83	33	326
0.20	0.89	33	340
0.18	0.87	33	331
0.17	0.90	33	343
0.13	0.85	33	347
0.15	0.86	33	340
0.14	0.87	33	328
0.17	0.90	33	342
0.15	0.87	33	329
0.14	0.84	33	334
0.23	0.92	33	340
0.15	0.90	33	333
0.13	0.90	33	334
0.20	0.89	33	336
0.15	0.90	33	332
0.26	0.91	33	341
0.16	0.90	33	350
0.26	0.91	33	337
0.21	0.89	33	340
0.00	1.00	33	345

Table B.21: Input reduction on Patient d) using 40 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.09	0.90	33	278
0.27	0.82	33	299
0.12	0.85	33	294
0.20	0.85	33	289
0.21	0.85	33	296
0.22	0.88	33	300
0.11	0.84	33	294
0.08	0.89	33	273
0.25	0.81	32	302
0.19	0.89	33	286
0.17	0.85	33	286
0.15	0.85	33	281
0.21	0.85	33	282
0.20	0.82	33	274
0.16	0.87	33	296
0.23	0.86	33	287
0.16	0.85	33	276
0.17	0.89	33	297
0.23	0.86	33	288
0.11	0.87	33	282
0.17	0.88	33	283
0.12	0.91	33	293
0.19	0.85	33	295
0.16	0.87	33	287
0.20	0.88	33	285
0.17	0.85	33	275
0.19	0.86	33	303
0.27	0.82	33	277
0.16	0.85	33	297
0.12	0.87	33	300
0.19	0.84	33	274
0.27	0.90	33	300
0.13	0.87	33	291
0.16	0.89	33	295
0.21	0.78	33	287
0.15	0.87	33	293
0.11	0.89	33	307
0.18	0.86	33	302
0.15	0.86	33	295
0.29	0.81	33	286
0.18	0.84	33	299
0.09	0.86	33	286
0.12	0.91	33	292
0.20	0.87	33	307
0.24	0.83	33	283
0.09	0.91	33	296
0.13	0.89	33	288
0.28	0.83	33	297
0.20	0.89	33	305
0.23	0.86	33	297

Table B.22: Input reduction on Patient e) using 30 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.11	0.89	22	177
0.11	0.90	22	184
0.12	0.89	22	179
0.11	0.90	22	184
0.17	0.87	22	188
0.17	0.87	22	188
0.11	0.90	22	184
0.10	0.89	22	182
0.11	0.90	22	183
0.18	0.86	22	186
0.10	0.89	22	182
0.17	0.87	22	188
0.17	0.87	22	188
0.17	0.87	22	188
0.11	0.89	22	180
0.12	0.89	22	179
0.10	0.91	22	188
0.14	0.88	22	188
0.18	0.86	22	186
0.11	0.90	22	184
0.18	0.86	22	186
0.12	0.89	22	179
0.11	0.89	22	177
0.17	0.87	22	188
0.11	0.90	22	184
0.11	0.90	22	183
0.10	0.91	22	189
0.11	0.89	22	176
0.18	0.86	22	186
0.11	0.90	22	185
0.17	0.87	22	188
0.17	0.87	22	188
0.15	0.87	22	183
0.11	0.89	22	179
0.11	0.90	22	184
0.11	0.90	22	184
0.10	0.91	22	185
0.12	0.89	22	179
0.11	0.90	22	185
0.12	0.89	22	178
0.16	0.87	22	185
0.10	0.89	22	181
0.13	0.88	22	180
0.09	0.91	22	182
0.11	0.89	22	177
0.11	0.89	22	176
0.11	0.90	22	184
0.18	0.86	22	186
0.17	0.87	22	186
0.09	0.91	22	181

Table B.23: Input reduction on Patient e) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.07	0.87	22	224
0.11	0.90	22	253
0.11	0.86	22	226
0.08	0.86	22	224
0.10	0.88	22	232
0.11	0.90	22	229
0.07	0.87	22	225
0.00	1.00	22	227
0.13	0.86	22	227
0.11	0.85	22	229
0.14	0.86	22	248
0.10	0.87	22	227
0.11	0.90	22	242
0.15	0.86	22	222
0.00	1.00	22	227
0.10	0.87	22	218
0.07	0.86	22	220
0.11	0.86	22	237
0.11	0.86	22	236
0.10	0.86	22	235
0.11	0.90	22	228
0.11	0.87	22	221
0.11	0.90	22	253
0.12	0.85	22	227
0.12	0.89	22	247
0.13	0.85	22	227
0.11	0.90	22	234
0.16	0.85	22	224
0.15	0.86	22	223
0.09	0.87	22	225
0.11	0.88	22	231
0.07	0.87	22	225
0.10	0.87	22	228
0.08	0.89	22	217
0.14	0.85	22	223
0.10	0.87	22	226
0.13	0.86	22	227
0.08	0.87	22	240
0.11	0.85	22	226
0.10	0.87	22	226
0.00	1.00	22	218
0.15	0.86	22	229
0.09	0.87	22	236
0.11	0.90	22	231
0.11	0.90	22	245
0.15	0.86	22	222
0.11	0.90	22	231
0.06	0.87	22	215
0.14	0.86	22	218
0.10	0.87	22	227

Table B.24: Input reduction on Patient e) using 30 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.12	0.86	21	172
0.16	0.85	21	186
0.08	0.89	21	180
0.16	0.85	21	184
0.12	0.85	21	178
0.10	0.85	21	179
0.19	0.82	21	184
0.13	0.85	22	164
0.14	0.83	22	176
0.11	0.86	21	188
0.20	0.81	22	173
0.11	0.83	22	172
0.19	0.81	21	192
0.14	0.84	21	193
0.20	0.82	22	173
0.17	0.81	21	184
0.15	0.84	22	170
0.11	0.87	21	186
0.14	0.87	22	184
0.10	0.86	21	191
0.13	0.82	22	178
0.17	0.82	22	163
0.12	0.88	22	177
0.11	0.85	21	189
0.15	0.83	21	184
0.09	0.87	21	183
0.13	0.84	21	178
0.17	0.83	22	176
0.23	0.82	21	184
0.20	0.80	21	181
0.15	0.84	21	189
0.17	0.82	22	168
0.13	0.85	21	185
0.11	0.85	21	180
0.23	0.83	22	177
0.16	0.85	21	186
0.11	0.85	21	184
0.09	0.84	21	174
0.19	0.81	22	173
0.15	0.85	21	178
0.13	0.86	21	183
0.13	0.81	21	191
0.13	0.85	21	184
0.10	0.86	21	186
0.12	0.82	22	165
0.11	0.89	22	161
0.12	0.83	21	175
0.12	0.85	22	182
0.08	0.90	22	176
0.16	0.85	21	189

Table B.25: Input reduction on Patient e) using 40 minutes preictal time - NSGA-II

SS	SP	Channels	Inputs
0.10	0.90	21	205
0.16	0.78	22	179
0.16	0.78	22	169
0.07	0.93	22	223
0.17	0.82	22	159
0.00	1.00	22	159
0.05	0.95	22	198
0.08	0.93	21	202
0.08	0.92	22	223
0.10	0.83	22	190
0.00	1.00	22	217
0.08	0.91	22	170
0.10	0.86	21	197
0.13	0.89	22	169
0.14	0.82	22	174
0.09	0.91	21	204
0.13	0.83	22	181
0.01	0.98	22	216
0.17	0.87	22	166
0.00	0.99	22	185
0.12	0.89	22	177
0.17	0.81	22	162
0.12	0.90	22	199
0.11	0.83	22	192
0.11	0.81	21	188
0.01	0.98	22	214
0.08	0.91	22	183
0.03	0.95	21	200
0.06	0.94	22	168
0.03	0.97	22	203
0.18	0.80	22	162
0.14	0.80	22	187
0.09	0.90	22	193
0.13	0.86	22	168
0.15	0.79	22	183
0.03	0.96	22	210
0.05	0.95	22	209
0.14	0.80	22	171
0.12	0.81	21	201
0.13	0.78	21	208
0.04	0.95	22	212
0.14	0.80	21	194
0.00	0.99	22	206
0.01	0.98	22	179
0.01	0.98	22	207
0.10	0.90	22	172
0.20	0.77	22	168
0.02	0.97	21	204
0.07	0.93	22	170
0.16	0.79	22	180

Table B.26: Input reduction on Patient e) using 40 minutes preictal time - SMS-EMOA

SS	SP	Channels	Inputs
0.18	0.83	22	234
0.13	0.87	22	213
0.19	0.89	22	226
0.20	0.84	22	201
0.13	0.89	22	245
0.22	0.87	22	219
0.18	0.84	22	229
0.18	0.83	22	216
0.20	0.82	22	216
0.00	1.00	22	215
0.14	0.84	22	218
0.18	0.83	22	218
0.02	0.97	22	219
0.00	1.00	22	216
0.19	0.88	22	226
0.00	1.00	22	210
0.23	0.86	22	206
0.16	0.86	22	211
0.10	0.91	22	217
0.00	1.00	22	235
0.09	0.92	22	215
0.02	0.97	22	219
0.19	0.86	22	223
0.15	0.84	22	217
0.16	0.83	22	226
0.18	0.85	22	208
0.13	0.89	22	216
0.15	0.83	22	224
0.19	0.86	22	225
0.16	0.85	22	237
0.00	1.00	22	210
0.22	0.87	22	227
0.00	0.99	22	212
0.00	1.00	22	208
0.17	0.84	22	228
0.14	0.84	22	224
0.13	0.87	22	210
0.20	0.86	22	230
0.17	0.91	22	210
0.00	1.00	22	214
0.15	0.87	22	209
0.00	0.99	22	236
0.08	0.92	22	240
0.00	0.99	22	215
0.16	0.84	22	214
0.16	0.84	22	231
0.00	1.00	22	226
0.08	0.92	22	216
0.12	0.84	22	216
0.07	0.93	22	218

Table B.27: Input reduction on Patient e) using 40 minutes preictal time - PSO

SS	SP	Channels	Inputs
0.15	0.83	21	186
0.12	0.82	21	184
0.21	0.83	21	181
0.26	0.80	21	190
0.19	0.78	21	182
0.13	0.84	22	162
0.26	0.81	22	177
0.15	0.82	21	177
0.18	0.79	22	173
0.16	0.81	21	175
0.20	0.81	22	173
0.17	0.81	22	181
0.26	0.82	22	168
0.15	0.82	21	174
0.19	0.80	21	186
0.21	0.80	22	176
0.13	0.82	21	185
0.21	0.81	22	166
0.15	0.82	22	168
0.22	0.77	21	185
0.16	0.83	22	168
0.16	0.81	21	182
0.17	0.79	21	187
0.13	0.81	21	185
0.22	0.83	21	175
0.21	0.80	21	186
0.13	0.81	21	184
0.18	0.82	22	171
0.20	0.79	22	165
0.10	0.82	22	170
0.13	0.82	22	178
0.16	0.81	21	176
0.21	0.77	21	186
0.11	0.83	21	178
0.18	0.80	22	173
0.13	0.81	22	182
0.14	0.82	22	184
0.12	0.82	21	186
0.16	0.80	21	189
0.14	0.80	21	180
0.15	0.82	21	184
0.15	0.82	21	182
0.13	0.83	21	167
0.23	0.82	21	189
0.20	0.80	21	191
0.20	0.82	21	185
0.17	0.75	21	193
0.19	0.81	21	175
0.25	0.82	22	172
0.17	0.83	22	170

Appendix C

Channel reduction results

Table C.1: Channel reduction on Patient a) using 30 minutes preictal time - NSGA-II

SS	SP	Channels
0.87	0.82	1
0.92	0.83	6
0.77	0.81	1
0.87	0.82	1
0.44	0.92	14
0.17	0.99	6
0.35	0.98	7
0.45	0.91	12
0.01	1.00	10
0.18	0.99	9
0.05	1.00	8
0.48	0.97	9
0.48	0.97	6
0.46	0.95	13
0.29	0.99	7
0.46	0.91	11
0.26	0.98	5
0.22	0.99	6
0.68	0.92	9
0.11	0.99	7
0.58	0.96	11
0.46	0.95	13
0.91	0.84	8
0.56	0.93	4
0.67	0.91	8
0.01	1.00	12
0.87	0.83	2
0.88	0.85	8
0.49	0.90	10
0.88	0.85	11
0.09	1.00	8
0.53	0.94	5
0.55	0.96	7
0.62	0.95	9
0.44	0.92	14
0.34	0.97	5
0.54	0.96	3
0.09	1.00	8
0.39	0.96	5
0.05	1.00	8
0.03	1.00	10
0.38	0.98	9
0.64	0.94	8
0.65	0.88	1
0.63	0.95	8
0.48	0.97	5
0.87	0.81	2
0.73	0.86	3
0.66	0.94	9
0.17	0.99	6

Table C.2: Channel reduction on Patient a) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.42	0.93	11
0.34	0.91	7
0.36	0.91	15
0.41	0.92	7
0.55	0.90	8
0.30	0.87	7
0.38	0.92	7
0.36	0.92	15
0.34	0.93	10
0.31	0.92	14
0.41	0.92	10
0.42	0.91	11
0.83	0.84	10
0.38	0.92	11
0.00	1.00	4
0.42	0.90	14
0.32	0.91	5
0.38	0.90	6
0.42	0.91	11
0.34	0.92	11
0.41	0.91	11
0.82	0.86	10
0.47	0.90	8
0.79	0.88	9
0.36	0.91	8
0.41	0.90	9
0.34	0.92	13
0.33	0.93	6
0.40	0.92	13
0.36	0.92	7
0.77	0.84	6
0.38	0.92	12
0.39	0.91	11
0.44	0.91	9
0.39	0.92	7
0.34	0.92	12
0.88	0.86	8
0.43	0.92	7
0.37	0.92	10
0.32	0.93	6
0.78	0.85	7
0.34	0.93	12
0.34	0.92	13
0.45	0.91	9
0.38	0.91	12
0.80	0.85	9
0.90	0.85	6
0.33	0.92	10
0.79	0.85	6
0.33	0.92	8

Table C.3: Channel reduction on Patient a) using 30 minutes preictal time - PSO

SS	SP	Channels
0.95	0.78	1
0.93	0.80	2
0.94	0.82	2
0.95	0.79	1
0.88	0.81	1
0.94	0.79	1
0.95	0.79	1
0.95	0.79	1
0.95	0.79	1
0.95	0.82	2
0.95	0.79	1
0.94	0.80	2
0.94	0.79	1
0.95	0.79	1
0.95	0.79	1
0.95	0.79	1
0.95	0.79	1
0.82	0.88	1
0.94	0.79	1
0.92	0.79	1
0.95	0.79	1
0.95	0.79	1
0.95	0.79	1
0.93	0.79	1
0.95	0.79	1
0.87	0.78	1
0.95	0.79	1
0.94	0.80	1
0.94	0.79	1
0.92	0.79	1
0.95	0.79	1
0.86	0.77	1
0.87	0.80	1
0.96	0.81	2
0.96	0.77	1
0.88	0.80	1
0.95	0.79	1
0.92	0.77	1
0.91	0.80	1
0.94	0.79	1
0.95	0.79	1
0.95	0.79	1
0.97	0.75	1
0.92	0.81	2
0.92	0.76	1
0.95	0.79	1
0.93	0.75	1
0.95	0.78	1
0.96	0.78	1
0.96	0.78	1

Table C.4: Channel reduction on Patient b) using 30 minutes preictal time - NSGA-II

SS	SP	Channels
0.00	1.00	2
0.16	0.88	1
0.48	0.58	2
0.48	0.54	1
0.19	0.74	7
0.00	1.00	2
0.07	0.78	7
0.11	0.77	6
0.16	0.88	1
0.11	0.77	6
0.45	0.67	4
0.42	0.62	2
0.46	0.67	4
0.42	0.64	3
0.07	0.95	1
0.11	0.92	1
0.16	0.70	4
0.05	0.96	1
0.09	0.75	6
0.19	0.73	5
0.04	0.98	1
0.01	1.00	2
0.43	0.61	2
0.45	0.62	2
0.13	0.90	1
0.19	0.70	6
0.41	0.65	2
0.37	0.72	4
0.41	0.62	1
0.44	0.70	5
0.20	0.75	4
0.07	0.95	1
0.38	0.67	3
0.41	0.65	3
0.07	0.79	7
0.43	0.60	1
0.47	0.65	3
0.12	0.92	1
0.09	0.94	1
0.16	0.89	1
0.47	0.55	1
0.09	0.94	1
0.13	0.91	1
0.07	0.95	1
0.42	0.65	2
0.16	0.89	1
0.46	0.60	2
0.20	0.74	7
0.18	0.73	4
0.19	0.73	5

Table C.5: Channel reduction on Patient b) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.07	0.79	7
0.21	0.79	4
0.10	0.75	5
0.08	0.80	6
0.17	0.72	8
0.17	0.72	7
0.17	0.71	6
0.38	0.71	5
0.47	0.66	3
0.09	0.79	6
0.08	0.80	8
0.15	0.81	6
0.06	0.83	8
0.00	0.99	2
0.09	0.83	7
0.19	0.71	6
0.17	0.71	8
0.59	0.57	3
0.07	0.82	6
0.17	0.81	3
0.50	0.59	3
0.09	0.75	5
0.08	0.76	5
0.52	0.59	3
0.58	0.58	3
0.00	1.00	3
0.43	0.66	4
0.08	0.80	8
0.08	0.81	6
0.21	0.75	3
0.17	0.82	3
0.18	0.70	5
0.09	0.84	9
0.18	0.71	7
0.09	0.85	8
0.00	1.00	3
0.09	0.80	4
0.06	0.81	5
0.09	0.85	7
0.08	0.79	6
0.08	0.78	5
0.43	0.65	4
0.26	0.75	3
0.17	0.72	8
0.00	1.00	4
0.16	0.77	4
0.20	0.70	5
0.19	0.71	7
0.45	0.67	4
0.17	0.77	4

Table C.6: Channel reduction on Patient b) using 30 minutes preictal time - PSO

SS	SP	Channels
0.48	0.55	1
0.09	0.96	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.47	0.65	1
0.49	0.59	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.47	0.56	1
0.48	0.54	1
0.48	0.55	1
0.49	0.54	1
0.49	0.54	1
0.48	0.55	1
0.48	0.55	1
0.47	0.56	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.49	0.54	1
0.48	0.54	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.44	0.58	1
0.48	0.55	1
0.48	0.55	1
0.48	0.61	1
0.48	0.55	1
0.48	0.55	1
0.48	0.55	1
0.49	0.54	1
0.48	0.55	1
0.48	0.55	1

Table C.7: Channel reduction on Patient b) using 40 minutes preictal time - NSGA-II

SS	SP	Channels
0.41	0.58	1
0.68	0.34	1
0.68	0.34	1
0.23	0.71	10
0.40	0.58	1
0.43	0.69	6
0.33	0.69	7
0.33	0.69	7
0.27	0.70	8
0.30	0.77	1
0.50	0.51	1
0.25	0.71	9
0.23	0.71	10
0.05	0.96	2
0.26	0.71	9
0.19	0.82	1
0.26	0.73	8
0.22	0.82	3
0.15	0.90	1
0.51	0.50	1
0.49	0.53	1
0.50	0.58	1
0.49	0.56	1
0.08	0.94	1
0.08	0.92	3
0.25	0.82	1
0.12	0.89	4
0.02	0.99	2
0.50	0.54	1
0.15	0.87	2
0.50	0.58	1
0.66	0.36	1
0.56	0.44	1
0.35	0.71	1
0.54	0.45	1
0.17	0.88	2
0.35	0.73	5
0.52	0.47	1
0.41	0.68	2
0.58	0.42	1
0.09	0.93	1
0.63	0.38	1
0.02	0.99	2
0.38	0.71	4
0.46	0.62	1
0.52	0.57	2
0.65	0.36	1
0.52	0.48	1
0.60	0.40	1
0.17	0.88	2

Table C.8: Channel reduction on Patient b) using 40 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.24	0.75	12
0.21	0.76	6
0.25	0.74	7
0.24	0.73	12
0.25	0.71	11
0.23	0.76	7
0.20	0.75	7
0.19	0.75	9
0.26	0.77	5
0.25	0.71	13
0.23	0.76	6
0.25	0.73	11
0.24	0.72	7
0.21	0.76	7
0.21	0.73	14
0.28	0.77	6
0.24	0.75	12
0.21	0.75	9
0.29	0.76	8
0.27	0.75	3
0.27	0.70	7
0.28	0.75	3
0.19	0.76	10
0.25	0.73	5
0.17	0.77	13
0.23	0.74	5
0.22	0.73	10
0.24	0.76	4
0.25	0.73	5
0.24	0.71	12
0.21	0.75	7
0.23	0.76	6
0.26	0.64	7
0.28	0.74	10
0.22	0.76	4
0.26	0.70	5
0.22	0.77	6
0.20	0.77	6
0.29	0.72	3
0.19	0.78	7
0.29	0.75	6
0.21	0.74	5
0.16	0.77	13
0.00	1.00	3
0.30	0.63	5
0.23	0.76	5
0.26	0.73	4
0.28	0.74	10
0.27	0.73	3
0.25	0.76	13

Table C.9: Channel reduction on Patient b) using 40 minutes preictal time - PSO

SS	SP	Channels
0.60	0.41	1
0.55	0.45	1
0.52	0.48	1
0.10	0.94	1
0.53	0.46	1
0.55	0.45	1
0.53	0.46	1
0.53	0.47	1
0.52	0.48	1
0.53	0.46	1
0.53	0.47	1
0.53	0.46	1
0.52	0.47	1
0.51	0.50	1
0.52	0.48	1
0.57	0.43	1
0.54	0.45	1
0.53	0.47	1
0.53	0.46	1
0.53	0.46	1
0.53	0.46	1
0.54	0.45	1
0.54	0.59	1
0.56	0.44	1
0.52	0.47	1
0.52	0.47	1
0.53	0.47	1
0.56	0.44	1
0.56	0.44	1
0.57	0.44	1
0.53	0.47	1
0.52	0.46	1
0.52	0.47	1
0.56	0.43	1
0.54	0.45	1
0.53	0.46	1
0.56	0.44	1
0.54	0.44	1
0.56	0.56	1
0.55	0.44	1
0.53	0.46	1
0.53	0.47	1
0.53	0.46	1
0.54	0.45	1
0.53	0.50	2
0.52	0.47	1
0.52	0.47	1
0.52	0.47	1
0.53	0.46	1
0.56	0.44	1

Table C.10: Channel reduction on Patient c) using 30 minutes preictal time - NSGA-II

SS	SP	Channels
0.00	1.00	1
0.00	1.00	1
0.84	0.35	1
0.00	1.00	1
0.84	0.35	1
0.41	0.87	10
0.36	0.86	7
0.36	0.86	6
0.82	0.37	1
0.60	0.81	4
0.40	0.87	10
0.42	0.86	8
0.43	0.86	8
0.39	0.86	7
0.54	0.83	4
0.00	1.00	1
0.00	1.00	1
0.00	1.00	1
0.83	0.36	1
0.00	1.00	1
0.00	1.00	1
0.20	0.92	3
0.38	0.86	7
0.00	1.00	1
0.00	1.00	1
0.35	0.85	6
0.39	0.86	7
0.00	1.00	2
0.00	1.00	2
0.00	1.00	1
0.37	0.86	6
0.11	0.95	3
0.01	0.99	2
0.59	0.81	4
0.00	1.00	1
0.00	1.00	1
0.36	0.86	6
0.44	0.80	5
0.08	0.96	3
0.00	1.00	2
0.00	1.00	1
0.01	0.99	1
0.07	0.95	3
0.00	1.00	2
0.01	0.99	1
0.11	0.95	3
0.00	1.00	1
0.06	0.96	3
0.00	1.00	2
0.00	1.00	1

Table C.11: Channel reduction on Patient c) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.45	0.85	13
0.40	0.86	10
0.34	0.86	16
0.35	0.86	16
0.41	0.85	10
0.47	0.86	11
0.40	0.85	8
0.42	0.87	17
0.45	0.87	15
0.43	0.85	7
0.34	0.84	17
0.34	0.85	14
0.41	0.85	10
0.36	0.85	13
0.31	0.87	9
0.48	0.83	12
0.38	0.86	17
0.40	0.86	8
0.43	0.85	8
0.39	0.85	17
0.44	0.84	8
0.33	0.85	13
0.34	0.85	18
0.40	0.86	8
0.45	0.84	9
0.33	0.84	16
0.37	0.85	10
0.43	0.86	8
0.44	0.87	14
0.43	0.85	7
0.34	0.84	16
0.34	0.84	17
0.35	0.85	11
0.49	0.85	11
0.34	0.85	14
0.34	0.84	17
0.34	0.84	16
0.45	0.87	15
0.33	0.84	17
0.33	0.85	18
0.39	0.86	11
0.32	0.86	12
0.53	0.84	8
0.35	0.84	10
0.00	1.00	10
0.34	0.85	15
0.00	1.00	10
0.43	0.85	7
0.34	0.84	14
0.33	0.84	10

Table C.12: Channel reduction on Patient c) using 30 minutes preictal time - PSO

SS	SP	Channels
0.41	0.79	2
0.11	0.96	1
0.18	0.95	1
0.18	0.95	1
0.18	0.94	1
0.19	0.94	1
0.01	1.00	1
0.17	0.95	1
0.10	0.97	1
0.13	0.96	1
0.00	1.00	1
0.18	0.95	1
0.18	0.87	2
0.09	0.97	1
0.18	0.95	1
0.18	0.95	1
0.19	0.94	1
0.07	0.97	1
0.18	0.94	1
0.19	0.95	1
0.11	0.97	1
0.22	0.93	1
0.19	0.94	1
0.18	0.95	1
0.18	0.95	1
0.22	0.91	2
0.19	0.94	1
0.02	0.98	1
0.00	1.00	1
0.19	0.94	1
0.11	0.97	1
0.18	0.95	1
0.13	0.96	1
0.02	0.99	2
0.03	0.97	1
0.10	0.93	2
0.24	0.81	2
0.08	0.97	1
0.44	0.81	2
0.17	0.95	1
0.17	0.95	1
0.19	0.95	1
0.09	0.97	1
0.01	0.99	1
0.18	0.95	1
0.13	0.96	1
0.18	0.94	1
0.16	0.94	2
0.03	0.97	1
0.22	0.93	2

Table C.13: Channel reduction on Patient c) using 40 minutes preictal time - NSGA-II

SS	SP	Channels
0.00	1.00	3
0.63	0.77	6
0.34	0.74	1
0.62	0.78	5
0.41	0.85	16
0.14	0.97	2
0.56	0.82	6
0.51	0.82	7
0.44	0.83	12
0.49	0.78	8
0.44	0.84	13
0.41	0.84	16
0.66	0.59	2
0.43	0.84	16
0.60	0.78	6
0.64	0.59	3
0.42	0.85	9
0.55	0.65	1
0.41	0.81	3
0.39	0.81	9
0.54	0.81	5
0.45	0.84	8
0.38	0.86	13
0.41	0.85	14
0.36	0.83	10
0.41	0.84	5
0.62	0.78	4
0.43	0.84	4
0.40	0.84	11
0.54	0.81	7
0.66	0.59	2
0.37	0.86	5
0.44	0.80	11
0.56	0.82	7
0.36	0.85	6
0.41	0.85	14
0.44	0.80	11
0.61	0.77	6
0.53	0.74	4
0.39	0.88	10
0.58	0.79	5
0.56	0.83	6
0.42	0.84	15
0.66	0.59	2
0.45	0.84	9
0.42	0.84	15
0.50	0.83	5
0.58	0.80	4
0.35	0.87	5
0.45	0.84	9

Table C.14: Channel reduction on Patient c) using 40 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.41	0.78	10
0.38	0.84	10
0.39	0.86	9
0.39	0.87	12
0.39	0.83	5
0.44	0.84	15
0.41	0.80	11
0.36	0.87	10
0.41	0.85	13
0.45	0.81	12
0.40	0.83	10
0.39	0.87	11
0.43	0.72	5
0.45	0.80	8
0.44	0.75	9
0.41	0.86	15
0.43	0.79	8
0.36	0.82	7
0.38	0.86	10
0.39	0.77	7
0.48	0.77	12
0.40	0.85	11
0.40	0.82	9
0.43	0.75	5
0.41	0.84	9
0.31	0.84	3
0.49	0.77	10
0.41	0.85	13
0.53	0.78	11
0.47	0.78	11
0.43	0.75	9
0.42	0.78	10
0.42	0.84	11
0.35	0.80	6
0.37	0.84	9
0.30	0.85	3
0.47	0.78	13
0.44	0.78	10
0.38	0.87	11
0.37	0.80	4
0.44	0.85	15
0.37	0.78	9
0.42	0.83	12
0.34	0.81	6
0.39	0.79	8
0.44	0.77	9
0.43	0.75	6
0.43	0.76	6
0.45	0.75	5
0.00	1.00	4

Table C.15: Channel reduction on Patient c) using 40 minutes preictal time - PSO

SS	SP	Channels
0.01	0.99	1
0.00	1.00	1
0.02	0.98	1
0.00	1.00	1
0.01	0.99	1
0.00	1.00	1
0.10	0.91	1
0.29	0.82	1
0.01	0.98	1
0.32	0.85	2
0.01	0.99	1
0.31	0.85	2
0.00	1.00	1
0.01	0.99	1
0.00	1.00	1
0.00	1.00	1
0.01	0.99	1
0.00	1.00	1
0.00	1.00	1
0.00	1.00	1
0.01	0.99	1
0.00	1.00	1
0.01	0.99	1
0.00	1.00	1
0.00	1.00	1
0.37	0.71	1
0.01	0.99	1
0.00	1.00	1
0.68	0.61	1
0.00	1.00	1
0.01	0.99	1
0.00	1.00	1
0.02	0.98	1
0.00	1.00	1
0.29	0.81	1
0.24	0.80	2
0.00	1.00	1
0.01	0.99	1
0.64	0.71	2
0.00	1.00	1
0.24	0.80	2
0.00	1.00	1
0.00	1.00	1
0.00	1.00	1
0.24	0.80	2
0.01	0.99	1
0.01	0.99	1
0.26	0.88	2
0.04	0.97	2
0.01	0.99	1

Table C.16: Channel reduction on Patient d) using 30 minutes preictal time - NSGA-II

SS	SP	Channels
0.08	0.89	1
0.13	0.88	5
0.02	0.89	2
0.16	0.92	11
0.08	0.89	1
0.16	0.92	6
0.20	0.87	7
0.17	0.92	9
0.08	0.89	2
0.01	0.92	3
0.16	0.91	9
0.16	0.92	8
0.20	0.89	7
0.21	0.82	3
0.16	0.92	11
0.17	0.91	10
0.16	0.92	8
0.11	0.93	4
0.02	0.89	2
0.06	0.87	2
0.17	0.91	10
0.19	0.83	2
0.00	1.00	1
0.00	1.00	2
0.09	0.90	4
0.00	1.00	1
0.00	1.00	1
0.20	0.89	5
0.15	0.91	6
0.12	0.85	2
0.14	0.85	4
0.12	0.94	7
0.10	0.89	4
0.15	0.86	4
0.19	0.90	6
0.13	0.85	2
0.13	0.84	1
0.08	0.89	2
0.19	0.83	3
0.09	0.90	5
0.07	0.86	2
0.00	0.97	2
0.16	0.92	9
0.16	0.91	10
0.15	0.93	7
0.14	0.84	3
0.13	0.86	4
0.00	1.00	2
0.10	0.89	4
0.08	0.89	2

Table C.17: Channel reduction on Patient d) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.15	0.92	10
0.14	0.89	12
0.14	0.92	8
0.11	0.91	7
0.20	0.86	7
0.11	0.93	10
0.16	0.90	8
0.15	0.89	10
0.17	0.91	5
0.09	0.95	4
0.14	0.91	5
0.17	0.91	5
0.15	0.91	8
0.12	0.94	9
0.10	0.92	7
0.29	0.89	8
0.14	0.92	7
0.09	0.93	7
0.12	0.92	6
0.10	0.92	7
0.23	0.91	8
0.14	0.89	12
0.00	1.00	5
0.37	0.84	10
0.19	0.89	6
0.14	0.91	6
0.16	0.89	11
0.12	0.94	8
0.16	0.88	9
0.19	0.89	6
0.16	0.89	10
0.14	0.92	8
0.29	0.89	8
0.11	0.94	9
0.29	0.90	6
0.11	0.94	7
0.15	0.91	6
0.17	0.91	5
0.17	0.89	9
0.15	0.91	6
0.16	0.89	11
0.15	0.92	10
0.12	0.93	6
0.15	0.89	11
0.16	0.89	11
0.16	0.91	6
0.17	0.89	9
0.24	0.91	7
0.09	0.94	6
0.08	0.96	4

Table C.18: Channel reduction on Patient d) using 30 minutes preictal time - PSO

SS	SP	Channels
0.18	0.93	3
0.38	0.79	4
0.37	0.82	2
0.36	0.79	6
0.00	0.98	3
0.31	0.80	1
0.01	0.99	2
0.07	0.96	2
0.37	0.83	2
0.31	0.80	6
0.38	0.77	2
0.31	0.80	2
0.21	0.89	2
0.26	0.86	3
0.34	0.85	2
0.00	1.00	3
0.41	0.86	3
0.38	0.80	5
0.01	1.00	2
0.28	0.78	4
0.44	0.61	3
0.23	0.87	1
0.07	0.97	1
0.25	0.84	6
0.36	0.80	3
0.30	0.83	3
0.33	0.78	2
0.18	0.86	1
0.25	0.80	2
0.48	0.74	3
0.15	0.93	3
0.46	0.76	3
0.25	0.84	2
0.51	0.74	3
0.47	0.76	3
0.00	0.99	2
0.55	0.67	3
0.27	0.86	5
0.12	0.93	5
0.37	0.77	4
0.43	0.82	5
0.38	0.79	3
0.22	0.86	5
0.30	0.88	3
0.39	0.80	5
0.42	0.80	3
0.45	0.81	4
0.45	0.79	5
0.42	0.78	3
0.38	0.84	4

Table C.19: Channel reduction on Patient d) using 40 minutes preictal time - NSGA-II

SS	SP	Channels
0.00	1.00	1
0.28	0.73	12
0.00	1.00	1
0.20	0.79	7
0.12	0.94	14
0.20	0.79	7
0.17	0.90	6
0.20	0.83	9
0.11	0.87	14
0.20	0.92	4
0.10	0.96	2
0.23	0.85	10
0.21	0.86	8
0.15	0.86	8
0.25	0.85	13
0.11	0.95	12
0.26	0.81	11
0.19	0.90	6
0.25	0.85	13
0.21	0.87	9
0.29	0.88	1
0.12	0.95	2
0.23	0.85	9
0.18	0.93	3
0.21	0.92	3
0.26	0.88	10
0.28	0.75	10
0.20	0.79	7
0.21	0.92	3
0.16	0.88	6
0.19	0.92	3
0.26	0.81	11
0.18	0.93	3
0.23	0.80	9
0.21	0.91	4
0.20	0.92	3
0.13	0.91	6
0.33	0.85	1
0.04	0.98	1
0.25	0.90	5
0.28	0.91	4
0.11	0.95	10
0.19	0.87	6
0.16	0.87	5
0.27	0.76	9
0.19	0.80	8
0.27	0.80	9
0.29	0.80	11
0.10	0.95	11
0.11	0.89	4

Table C.20: Channel reduction on Patient d) using 40 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.16	0.88	15
0.01	1.00	11
0.10	0.92	16
0.10	0.92	10
0.21	0.87	9
0.10	0.92	9
0.13	0.93	12
0.14	0.92	10
0.14	0.94	11
0.09	0.81	8
0.12	0.94	9
0.16	0.88	15
0.03	0.98	9
0.17	0.79	12
0.10	0.92	10
0.10	0.92	10
0.07	0.95	10
0.06	0.94	15
0.01	1.00	10
0.08	0.92	10
0.04	0.97	11
0.20	0.86	10
0.20	0.84	13
0.22	0.86	11
0.14	0.92	10
0.08	0.95	14
0.22	0.86	11
0.09	0.85	15
0.07	0.95	9
0.06	0.96	12
0.09	0.82	9
0.21	0.90	9
0.12	0.95	11
0.10	0.92	13
0.00	1.00	10
0.02	1.00	9
0.12	0.90	12
0.10	0.92	15
0.10	0.92	13
0.00	1.00	9
0.06	0.96	12
0.09	0.82	9
0.07	0.95	8
0.32	0.85	14
0.08	0.82	9
0.11	0.89	10
0.13	0.93	9
0.10	0.92	12
0.22	0.83	10
0.09	0.90	9

Table C.21: Channel reduction on Patient d) using 40 minutes preictal time - PSO

SS	SP	Channels
0.43	0.78	1
0.41	0.75	1
0.10	0.92	2
0.43	0.76	1
0.48	0.77	2
0.45	0.78	2
0.44	0.75	1
0.44	0.76	1
0.48	0.78	2
0.38	0.78	2
0.39	0.77	1
0.44	0.75	1
0.47	0.78	2
0.37	0.81	1
0.47	0.77	2
0.43	0.76	1
0.34	0.84	2
0.44	0.75	1
0.41	0.76	1
0.42	0.74	1
0.43	0.76	1
0.44	0.76	1
0.43	0.76	1
0.44	0.76	1
0.38	0.74	1
0.44	0.76	1
0.43	0.76	1
0.42	0.78	1
0.43	0.76	1
0.44	0.76	1
0.44	0.77	1
0.49	0.77	2
0.47	0.74	1
0.43	0.79	1
0.34	0.83	1
0.44	0.76	1
0.46	0.77	1
0.33	0.84	1
0.43	0.76	1
0.42	0.78	1
0.45	0.77	1
0.43	0.76	1
0.26	0.72	1
0.48	0.77	2
0.44	0.76	1
0.43	0.74	1
0.43	0.76	1
0.42	0.76	1
0.42	0.76	1
0.36	0.81	1

Table C.22: Channel reduction on Patient e) using 30 minutes preictal time - NSGA-II

SS	SP	Channels
0.00	1.00	1
0.00	1.00	1
0.24	0.80	11
0.23	0.80	10
0.20	0.84	16
0.00	1.00	1
0.00	0.96	6
0.00	1.00	7
0.00	1.00	9
0.03	0.98	11
0.24	0.83	14
0.00	1.00	7
0.23	0.82	9
0.22	0.83	15
0.00	1.00	4
0.00	1.00	6
0.29	0.82	13
0.00	1.00	12
0.24	0.83	14
0.22	0.82	12
0.01	1.00	8
0.24	0.83	15
0.21	0.80	9
0.24	0.80	12
0.00	1.00	5
0.00	1.00	6
0.02	0.97	8
0.02	0.98	14
0.00	1.00	1
0.00	1.00	5
0.04	0.96	10
0.23	0.79	10
0.22	0.82	13
0.00	1.00	2
0.00	1.00	7
0.00	1.00	7
0.02	0.98	7
0.00	1.00	4
0.01	0.99	11
0.24	0.80	11
0.00	0.99	10
0.23	0.80	10
0.01	0.98	10
0.22	0.82	13
0.00	1.00	9
0.00	0.96	3
0.20	0.80	4
0.00	1.00	9
0.21	0.81	11
0.00	1.00	8

Table C.23: Channel reduction on Patient e) using 30 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.09	0.89	8
0.14	0.87	5
0.20	0.84	6
0.10	0.84	6
0.12	0.90	6
0.10	0.83	6
0.10	0.90	3
0.23	0.79	7
0.11	0.88	2
0.12	0.89	5
0.03	0.97	1
0.09	0.90	2
0.01	0.99	1
0.00	0.99	1
0.12	0.90	6
0.16	0.86	1
0.21	0.84	4
0.24	0.79	7
0.12	0.89	4
0.19	0.85	6
0.10	0.91	2
0.19	0.83	5
0.18	0.85	6
0.12	0.90	7
0.08	0.91	3
0.11	0.84	6
0.07	0.96	1
0.07	0.91	9
0.23	0.79	8
0.10	0.84	6
0.10	0.87	3
0.12	0.89	3
0.09	0.87	4
0.18	0.82	7
0.11	0.89	4
0.09	0.90	4
0.07	0.97	1
0.00	1.00	2
0.21	0.84	4
0.10	0.87	3
0.23	0.80	7
0.21	0.85	3
0.17	0.85	5
0.08	0.88	4
0.09	0.91	2
0.15	0.84	7
0.10	0.83	6
0.11	0.89	4
0.09	0.91	3
0.10	0.86	3

Table C.24: Channel reduction on Patient e) using 30 minutes preictal time - PSO

SS	SP	Channels
0.21	0.88	1
0.21	0.87	1
0.18	0.89	1
0.18	0.88	1
0.25	0.84	1
0.21	0.86	1
0.18	0.89	1
0.22	0.86	1
0.19	0.88	1
0.19	0.88	1
0.20	0.87	1
0.23	0.85	1
0.18	0.89	1
0.20	0.88	1
0.21	0.87	1
0.18	0.89	1
0.16	0.90	1
0.21	0.87	1
0.20	0.87	1
0.20	0.88	1
0.20	0.87	1
0.18	0.88	1
0.20	0.87	1
0.20	0.87	1
0.19	0.89	1
0.22	0.85	1
0.19	0.88	1
0.21	0.87	1
0.21	0.87	1
0.19	0.88	1
0.23	0.86	1
0.20	0.87	1
0.19	0.88	1
0.21	0.87	1
0.19	0.88	1
0.20	0.88	1
0.20	0.87	1
0.20	0.87	1
0.18	0.88	1
0.19	0.88	1
0.21	0.87	1
0.17	0.89	1
0.17	0.89	1
0.23	0.86	1
0.19	0.87	1
0.20	0.87	1
0.21	0.87	1
0.20	0.87	1
0.19	0.88	1
0.19	0.88	1

Table C.25: Channel reduction on Patient e) using 40 minutes preictal time - NSGA-II

SS	SP	Channels
0.00	1.00	1
0.25	0.67	5
0.30	0.73	2
0.00	1.00	1
0.16	0.80	13
0.24	0.75	7
0.13	0.80	6
0.21	0.76	11
0.22	0.74	8
0.14	0.79	7
0.14	0.86	1
0.18	0.77	8
0.12	0.88	1
0.15	0.79	9
0.18	0.77	9
0.15	0.80	12
0.17	0.82	1
0.17	0.80	11
0.03	0.95	2
0.15	0.80	12
0.17	0.80	10
0.22	0.74	3
0.12	0.90	2
0.14	0.87	3
0.25	0.70	4
0.18	0.85	2
0.16	0.80	10
0.28	0.74	3
0.05	0.95	1
0.18	0.80	3
0.12	0.87	1
0.06	0.95	2
0.15	0.77	10
0.21	0.78	10
0.04	0.94	2
0.08	0.91	1
0.22	0.74	3
0.24	0.69	5
0.18	0.84	2
0.17	0.82	1
0.28	0.74	3
0.10	0.81	6
0.19	0.82	2
0.13	0.84	3
0.06	0.96	2
0.04	0.94	2
0.19	0.77	7
0.24	0.68	5
0.01	0.99	1
0.28	0.68	3

Table C.26: Channel reduction on Patient e) using 40 minutes preictal time - SMS-EMOA

SS	SP	Channels
0.10	0.87	11
0.13	0.86	7
0.24	0.75	5
0.16	0.84	8
0.13	0.86	10
0.25	0.75	5
0.10	0.86	11
0.00	1.00	5
0.00	1.00	5
0.14	0.87	6
0.16	0.85	8
0.10	0.86	10
0.14	0.86	10
0.13	0.86	7
0.17	0.79	5
0.15	0.87	7
0.19	0.81	7
0.15	0.86	9
0.10	0.87	11
0.14	0.85	8
0.15	0.86	7
0.00	1.00	5
0.12	0.88	9
0.14	0.88	7
0.14	0.85	8
0.12	0.88	11
0.19	0.81	7
0.12	0.88	13
0.13	0.85	9
0.12	0.86	11
0.12	0.88	9
0.23	0.80	4
0.15	0.84	6
0.12	0.84	9
0.21	0.87	4
0.16	0.84	8
0.15	0.86	7
0.17	0.84	6
0.22	0.80	4
0.10	0.86	10
0.10	0.87	11
0.15	0.87	8
0.00	1.00	5
0.15	0.84	7
0.14	0.85	10
0.26	0.75	6
0.10	0.86	9
0.16	0.84	6
0.10	0.87	10
0.15	0.80	5

Table C.27: Channel reduction on Patient e) using 40 minutes preictal time - PSO

SS	SP	Channels
0.10	0.81	1
0.11	0.81	1
0.10	0.81	1
0.11	0.81	1
0.10	0.81	1
0.11	0.81	1
0.10	0.81	1
0.10	0.81	1
0.10	0.81	1
0.10	0.82	1
0.10	0.81	1
0.10	0.82	1
0.11	0.82	1
0.11	0.81	1
0.11	0.81	1
0.11	0.81	1
0.11	0.81	1
0.10	0.82	1
0.10	0.81	1
0.12	0.82	1
0.10	0.81	1
0.10	0.81	1
0.12	0.82	1
0.11	0.81	1
0.11	0.81	1
0.11	0.81	1
0.10	0.81	1
0.11	0.81	1
0.11	0.81	1
0.10	0.81	1
0.10	0.82	1
0.11	0.81	1
0.11	0.81	1
0.11	0.81	1
0.10	0.81	1
0.15	0.82	1
0.11	0.81	1
0.11	0.81	1
-0.01	-0.01	0
0.10	0.82	1
0.11	0.82	1
0.11	0.81	1
0.11	0.82	1
0.11	0.81	1
0.11	0.81	1
0.11	0.82	1
0.11	0.82	1
0.18	0.80	2
0.11	0.81	1
0.10	0.82	1

Appendix D

Channel and input reduction results

Table D.1: Channel and input reduction on Patient a) - NSGA-II

SS	SP	Inputs	Cost	Gamma
0.00	1.00	3	76880	2178.00
0.60	0.88	12	76880	7296.00
0.01	0.98	5	11344	0.00
0.00	1.00	3	11344	0.00
0.60	0.88	12	76880	7296.00
0.64	0.90	18	76880	2690.00
0.00	1.00	4	11344	0.00
0.60	0.88	10	76880	7298.00
0.00	1.00	3	11344	2176.00
0.00	1.00	4	76880	0.00
0.00	1.00	3	76880	0.00
0.60	0.88	11	76880	7296.00
0.65	0.90	15	76880	2178.00
0.60	0.88	13	76880	7296.00
0.64	0.91	17	76880	3074.00
0.70	0.86	6	76880	6274.00
0.68	0.81	16	76880	2050.00
0.65	0.90	16	76880	2178.00
0.00	1.00	7	76880	2178.00
0.29	0.89	5	76880	0.00
0.78	0.83	5	76880	3202.00
0.58	0.87	14	76880	7296.00
0.64	0.90	17	76880	2690.00
0.65	0.90	9	76880	2178.00
0.58	0.87	6	76880	7296.00

Table D.2: Channel and input reduction on Patient a) - SMS-EMOA

SS	SP	Inputs	Cost	Gamma
0.67	0.73	20	179750	4016.00
0.65	0.89	17	4366	1932.00
0.65	0.66	14	86300	7996.00
0.92	0.75	24	48424	0.00
0.77	0.84	25	44968	62.00
0.95	0.75	13	239902	0.00
0.73	0.71	15	78350	7988.00
0.75	0.79	18	110506	2420.00
0.73	0.71	17	78382	8076.00
0.85	0.83	22	44968	62.00
0.75	0.62	11	239646	0.00
0.77	0.79	13	44980	2418.00
0.63	0.91	19	44968	4026.00
0.66	0.87	20	241566	562.00
0.72	0.67	12	22030	7988.00
0.88	0.61	14	49068	0.00
0.66	0.88	18	12202	1084.00
0.65	0.89	14	4382	1852.00
0.64	0.88	19	241578	766.00
0.66	0.88	16	12206	1404.00
0.92	0.80	18	253870	0.00
0.79	0.55	10	110510	2428.00
0.64	0.89	15	10526	1404.00
0.91	0.84	18	44972	14.00
0.92	0.75	17	49068	0.00

Table D.3: Channel and input reduction on Patient a) - PSO

SS	SP	Inputs	Cost	Gamma
0.89	0.65	1	249844	0.00
0.90	0.63	1	116396	0.00
0.89	0.65	1	89676	0.01
0.89	0.72	2	247548	0.00
0.89	0.71	3	204724	0.00
0.89	0.65	3	251900	0.00
0.89	0.65	2	202334	0.00
0.89	0.65	2	231420	0.00
0.87	0.67	2	249596	0.00
0.88	0.72	3	183798	0.00
0.87	0.67	2	247550	1512.00
0.96	0.65	3	202996	0.00
0.88	0.73	4	259288	0.00
0.85	0.76	3	182012	3578.00
0.89	0.65	3	249750	0.00
0.00	1.00	3	207416	0.01
0.88	0.66	2	260852	0.00
0.89	0.65	1	247548	0.00
0.86	0.69	2	236530	1760.00
0.88	0.66	2	223484	0.01
0.89	0.65	1	247548	0.00
0.89	0.65	3	121086	0.00
0.88	0.67	2	223464	0.00
0.89	0.65	2	233468	0.00
0.88	0.65	2	158404	0.00

Table D.4: Channel and input reduction on Patient b) - NSGA-II

SS	SP	Inputs	Cost	Gamma
0.02	0.99	45	56726	0.00
0.02	0.99	31	251262	0.00
0.01	0.99	48	18578	0.00
0.00	1.00	48	21954	0.00
0.00	1.00	37	251262	0.00
0.01	0.99	45	28030	0.00
0.02	0.99	30	232830	0.00
0.00	1.00	40	56718	0.00
0.01	1.00	30	21886	0.00
0.00	1.00	33	21962	0.00
0.02	0.99	39	251246	0.00
0.01	1.00	36	19838	0.00
0.00	1.00	44	11650	0.00
0.02	0.99	33	251262	0.00
0.02	0.99	32	208254	0.00
0.00	1.00	42	251330	0.00
0.00	1.00	27	11646	0.00
0.00	1.00	35	21962	0.00
0.00	1.00	36	251262	0.00
0.02	0.99	36	251258	0.00
0.01	1.00	41	21890	0.00
0.00	1.00	32	11646	0.00
0.01	1.00	43	21890	0.00
0.01	1.00	26	28030	0.00
0.01	1.00	27	28030	0.00

Table D.5: Channel and input reduction on Patient b) - SMS-EMOA

SS	SP	Inputs	Cost	Gamma
0.14	0.89	26	191326	2614.00
0.00	1.00	27	133982	0.00
0.27	0.77	25	196414	182.00
0.00	1.00	28	215814	0.00
0.34	0.70	20	130278	212.00
0.39	0.62	31	134026	0.01
0.29	0.76	24	130278	580.00
0.42	0.60	25	133910	0.00
0.33	0.71	24	130278	212.00
0.44	0.64	30	215876	0.00
0.07	0.94	20	130278	4676.00
0.44	0.60	26	211684	0.00
0.51	0.50	20	196374	0.00
0.44	0.59	31	133958	0.00
0.27	0.78	22	196374	646.00
0.46	0.53	20	133990	0.01
0.27	0.77	28	196414	182.00
0.42	0.60	36	133958	0.00
0.55	0.56	25	199484	0.00
0.20	0.83	21	130278	1236.00
0.39	0.63	27	199484	0.00
0.40	0.63	31	199492	0.00
0.55	0.56	24	199484	0.00
0.35	0.69	20	130838	132.00
0.40	0.64	19	199524	0.00

Table D.6: Channel and input reduction on Patient b) - PSO

SS	SP	Inputs	Cost	Gamma
0.57	0.54	12	232924	0.02
0.52	0.61	12	243846	0.02
0.58	0.55	9	261288	0.00
0.62	0.47	8	147436	0.01
0.58	0.47	13	244892	0.00
0.58	0.55	9	178308	0.01
0.49	0.62	11	244974	0.04
0.59	0.55	8	244876	0.01
0.54	0.55	11	244870	0.00
0.51	0.56	13	243116	0.00
0.57	0.55	13	236716	0.00
0.49	0.62	11	236552	52.00
0.50	0.51	12	112028	0.00
0.62	0.49	12	171404	0.00
0.55	0.57	12	244936	0.01
0.54	0.48	10	76984	0.00
0.59	0.53	11	245198	0.00
0.61	0.49	8	212156	0.00
0.50	0.63	12	244380	0.05
0.57	0.56	12	242828	0.01
0.51	0.63	13	179452	0.01
0.59	0.50	8	228236	0.01
0.53	0.62	12	241294	0.01
0.55	0.60	13	169372	0.02
0.44	0.57	10	244846	0.01

Table D.7: Channel and input reduction on Patient c) - NSGA-II

SS	SP	Inputs	Cost	Gamma
0.00	1.00	12	0.000247	2020.00
0.00	1.00	30	0.000702	148964.00
0.00	1.00	49	0.000247	2020.00
0.00	1.00	30	0.000702	148964.00
0.00	1.00	12	0.000247	2020.00
0.00	1.00	39	0.000702	10212.00
0.00	1.00	23	0.0005	18404.00
0.00	1.00	45	0.000247	18404.00
0.00	1.00	37	0.000702	148964.00
0.00	1.00	19	0.000247	18404.00
0.00	1.00	33	0.000247	17892.00
0.00	1.00	13	0.000517	17380.00
0.00	1.00	27	0.0005	149476.00
0.01	0.99	25	0.000247	18404.00
0.00	1.00	46	0.000251	17892.00
0.00	1.00	16	0.000247	17380.00
0.00	1.00	26	0.000517	18404.00
0.00	1.00	26	0.000672	149476.00
0.00	1.00	28	0.000517	18404.00
0.00	1.00	13	0.0005	10212.00
0.00	1.00	31	0.000702	148964.00
0.00	1.00	29	0.000702	148964.00
0.00	1.00	16	0.000702	18404.00
0.00	1.00	31	0.000702	148964.00
0.00	1.00	45	0.000251	17892.00

Table D.8: Channel and input reduction on Patient c) - SMS-EMOA

SS	SP	Inputs	Cost	Gamma
0.02	0.99	45	56726	0.00
0.02	0.99	31	251262	0.00
0.01	0.99	48	18578	0.00
0.00	1.00	48	21954	0.00
0.00	1.00	37	251262	0.00
0.01	0.99	45	28030	0.00
0.02	0.99	30	232830	0.00
0.00	1.00	40	56718	0.00
0.01	1.00	30	21886	0.00
0.00	1.00	33	21962	0.00
0.02	0.99	39	251246	0.00
0.01	1.00	36	19838	0.00
0.00	1.00	44	11650	0.00
0.02	0.99	33	251262	0.00
0.02	0.99	32	208254	0.00
0.00	1.00	42	251330	0.00
0.00	1.00	27	11646	0.00
0.00	1.00	35	21962	0.00
0.00	1.00	36	251262	0.00
0.02	0.99	36	251258	0.00
0.01	1.00	41	21890	0.00
0.00	1.00	32	11646	0.00
0.01	1.00	43	21890	0.00
0.01	1.00	26	28030	0.00
0.01	1.00	27	28030	0.00

Table D.9: Channel and input reduction on Patient c) - PSO

SS	SP	Inputs	Cost	Gamma
0.00	1.00	19	253836	0.00
0.00	1.00	17	251484	0.00
0.00	1.00	15	187680	0.00
0.00	1.00	18	220972	0.00
0.00	1.00	21	251708	0.00
0.00	1.00	19	258936	0.00
0.01	0.99	18	187746	0.00
0.00	1.00	19	261548	0.00
0.00	1.00	21	253216	0.00
0.00	1.00	20	181508	0.00
0.00	1.00	19	261988	0.00
0.00	1.00	21	187704	0.00
0.00	1.00	18	248080	0.00
0.00	1.00	16	251236	0.00
0.00	1.00	21	159676	0.00
0.00	1.00	17	253740	0.00
0.00	1.00	17	251172	0.00
0.00	1.00	17	247072	0.00
0.00	1.00	20	262068	0.00
0.00	0.99	19	185640	0.00
0.00	0.99	21	185632	0.00
0.00	1.00	18	252512	0.00
0.00	1.00	21	251752	0.00
0.01	0.99	17	253740	0.00
0.00	0.99	22	237350	0.00

Table D.10: Channel and input reduction on Patient d) - NSGA-II

SS	SP	Inputs	Cost	Gamma
0.02	0.99	1	31096	0.00
0.02	0.99	20	227704	0.01
0.01	0.99	1	31096	0.00
0.00	1.00	5	227704	0.01
0.00	1.00	23	223608	0.00
0.01	0.99	14	227704	0.01
0.02	0.99	12	227704	0.00
0.00	1.00	10	223608	0.00
0.01	1.00	3	227704	0.00
0.00	1.00	6	227704	0.00
0.02	0.99	20	31096	0.00
0.01	1.00	6	211320	0.00
0.00	1.00	11	207224	0.00
0.02	0.99	18	227704	0.00
0.02	0.99	3	207224	0.00
0.00	1.00	22	223608	0.00
0.00	1.00	16	227704	0.01
0.00	1.00	4	211320	0.00
0.00	1.00	4	227704	0.00
0.02	0.99	6	207224	0.00
0.01	1.00	17	227704	0.01
0.00	1.00	3	227704	0.00
0.01	1.00	11	227704	0.00
0.01	1.00	9	227704	0.00
0.01	1.00	3	227704	0.00

Table D.11: Channel and input reduction on Patient d) - SMS-EMOA

SS	SP	Inputs	Cost	Gamma
0.36	0.61	17	248854	3458.00
0.00	1.00	19	18	0.00
0.42	0.72	18	249426	766.00
0.41	0.72	17	248850	766.00
0.01	1.00	16	74676	0.00
0.44	0.71	16	217106	4734.00
0.45	0.70	20	248850	510.00
0.39	0.84	23	224272	0.00
0.47	0.71	14	249458	766.00
0.43	0.70	13	249458	446.00
0.38	0.84	19	224336	0.00
0.40	0.85	24	218064	0.00
0.50	0.69	13	216082	4222.00
0.38	0.85	23	224848	0.00
0.40	0.85	17	218000	0.00
0.50	0.69	11	217682	4222.00
0.41	0.72	16	249458	766.00
0.40	0.85	17	218000	0.00
0.44	0.83	11	150098	0.00
0.49	0.66	11	249426	126.00
0.42	0.72	20	249426	766.00
0.39	0.84	14	218000	0.00
0.40	0.85	21	218000	0.00
0.40	0.85	19	218064	0.00
0.40	0.85	15	218000	0.00

Table D.12: Channel and input reduction on Patient d) - PSO

SS	SP	Inputs	Cost	Gamma
0.44	0.84	10	168150	0.00
0.46	0.81	10	154210	0.00
0.00	1.00	9	55842	0.00
0.48	0.73	7	127202	0.00
0.48	0.76	11	251558	0.00
0.49	0.76	10	98022	0.00
0.00	1.00	8	184418	0.00
0.00	1.00	10	55846	0.00
0.47	0.80	7	192034	0.00
0.27	0.88	8	195118	0.00
0.47	0.79	9	195302	0.00
0.47	0.80	7	116902	0.00
0.47	0.74	9	55842	0.00
0.00	1.00	8	170226	0.00
0.00	1.00	10	251682	0.00
0.47	0.74	9	188194	0.00
0.00	1.00	12	104226	0.00
0.24	0.92	8	252256	0.00
0.00	1.00	7	252454	0.00
0.48	0.82	11	129696	0.00
0.33	0.84	12	185890	0.01
0.38	0.83	7	180778	0.00
0.00	1.00	8	196140	0.00
0.01	0.99	9	51234	0.00
0.12	0.95	8	259042	0.00

Table D.13: Channel and input reduction on Patient e) - NSGA-II

SS	SP	Inputs	Cost	Gamma
0.00	1.00	0	257648	0.00
0.00	1.00	1	257650	0.00
0.00	1.00	1	257650	0.00
0.00	1.00	0	257650	0.00
0.00	1.00	13	257648	4912.00
0.00	1.00	2	257650	0.00
0.00	1.00	3	257904	0.00
0.00	1.00	1	257650	0.00
0.00	1.00	3	257888	0.00
0.00	1.00	13	257650	0.00
0.00	1.00	9	257648	0.00
0.00	1.00	2	257648	4884.00
0.00	1.00	8	257650	0.00
0.00	1.00	4	257650	0.00
0.00	1.00	4	257648	0.00
0.00	1.00	7	257650	0.00
0.00	1.00	10	257650	0.00
0.00	1.00	12	257650	0.00
0.00	1.00	10	257648	0.00
0.00	1.00	5	257650	0.00
0.00	1.00	10	257650	0.00
0.00	1.00	5	257906	0.00
0.00	1.00	6	257648	0.00
0.00	1.00	1	257650	0.00
0.00	1.00	2	257650	0.00

Table D.14: Channel and input reduction on Patient e) - SMS-EMOA

SS	SP	Inputs	Cost	Gamma
0.02	0.99	45	56726	0.00
0.02	0.99	31	251262	0.00
0.01	0.99	48	18578	0.00
0.00	1.00	48	21954	0.00
0.00	1.00	37	251262	0.00
0.01	0.99	45	28030	0.00
0.02	0.99	30	232830	0.00
0.00	1.00	40	56718	0.00
0.01	1.00	30	21886	0.00
0.00	1.00	33	21962	0.00
0.02	0.99	39	251246	0.00
0.01	1.00	36	19838	0.00
0.00	1.00	44	11650	0.00
0.02	0.99	33	251262	0.00
0.02	0.99	32	208254	0.00
0.00	1.00	42	251330	0.00
0.00	1.00	27	11646	0.00
0.00	1.00	35	21962	0.00
0.00	1.00	36	251262	0.00
0.02	0.99	36	251258	0.00
0.01	1.00	41	21890	0.00
0.00	1.00	32	11646	0.00
0.01	1.00	43	21890	0.00
0.01	1.00	26	28030	0.00
0.01	1.00	27	28030	0.00

Table D.15: Channel and input reduction on Patient e) - PSO

SS	SP	Inputs	Cost	Gamma
0.00	1.00	3	238180	0.00
0.00	1.00	1	255404	0.00
0.00	1.00	1	124652	5214.00
0.00	1.00	2	254460	0.00
0.00	1.00	2	258516	0.00
0.00	1.00	1	254764	1662.00
0.00	1.00	1	192452	0.00
0.00	1.00	3	260028	0.00
0.00	1.00	2	247460	0.00
0.00	1.00	1	260996	0.00
0.00	1.00	2	254884	0.00
0.00	1.00	3	173236	0.00
0.00	1.00	1	257428	0.00
0.00	1.00	4	129420	0.00
0.00	1.00	1	255916	0.00
0.00	1.00	2	229292	0.00
0.00	1.00	3	259044	0.00
0.00	1.00	3	131058	6596.00
0.00	1.00	3	255056	0.00
0.00	1.00	2	123404	0.00
0.00	1.00	1	256704	0.00
0.00	1.00	1	127140	0.00
0.00	1.00	1	124836	0.00
0.00	1.00	2	249784	0.00
0.00	1.00	3	262092	0.00