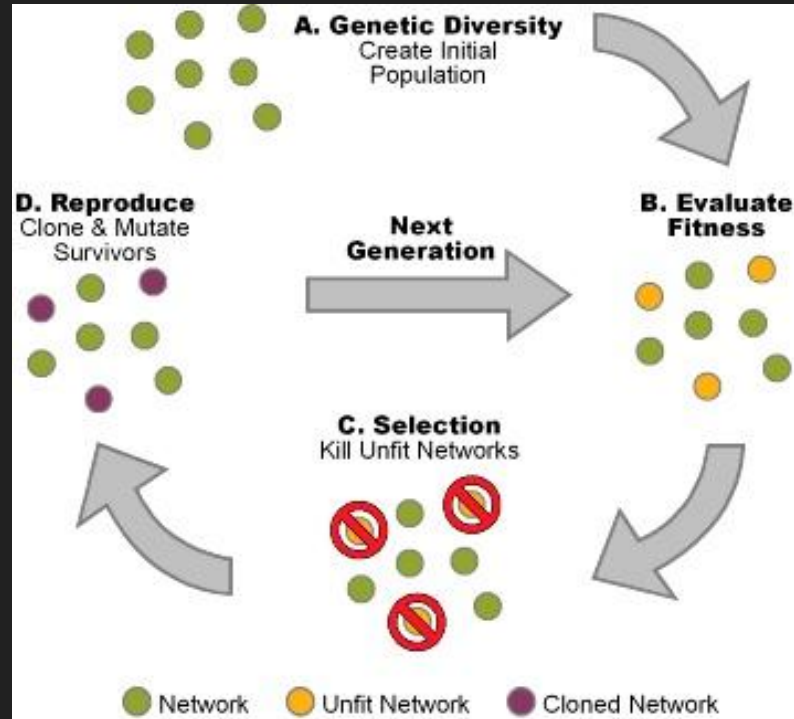# Time Series Prediction using Genetic Algorithms and FFNN implemented with Tensorflow

Aguilera Mauricio, Armijos Daniel, Betancourt Hugo, Brito Carlos, Correa Lorena and Martínez Paola
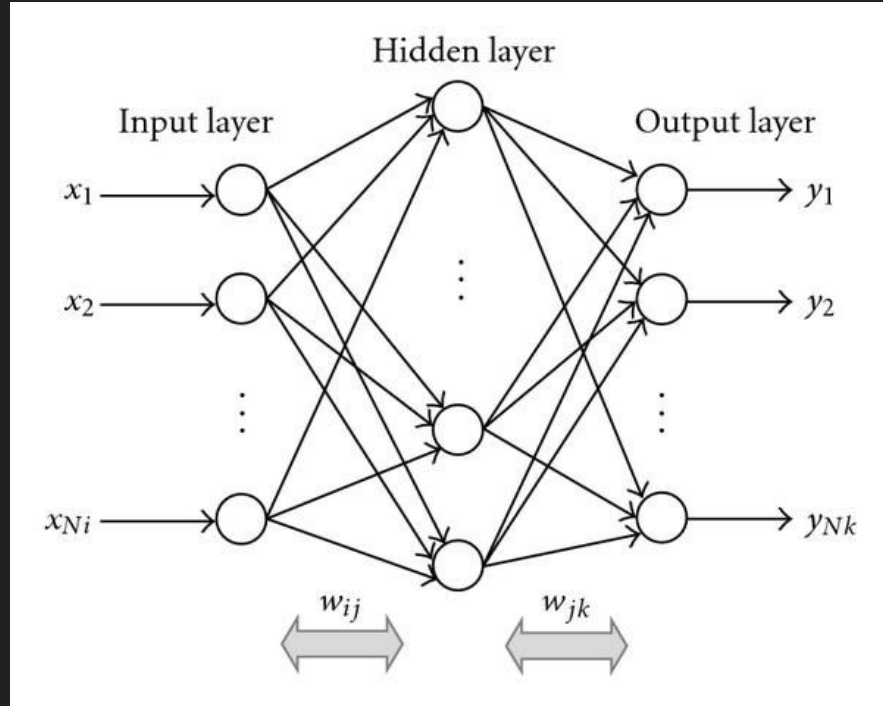
OUTLINE

- INTRODUCTION

- OBJECTIVES

- METHODOLOGY

- RESULTS

- CONCLUSIONS AND FUTURE WORK

INTRODUCTION: Genetic Algorithm

INTRODUCTION: FFNN and Backpropagation

INTRODUCTION: Dataset

- All of the data for prediction was obtained from FRED

- Information about crude oil prices from public and private companies though years
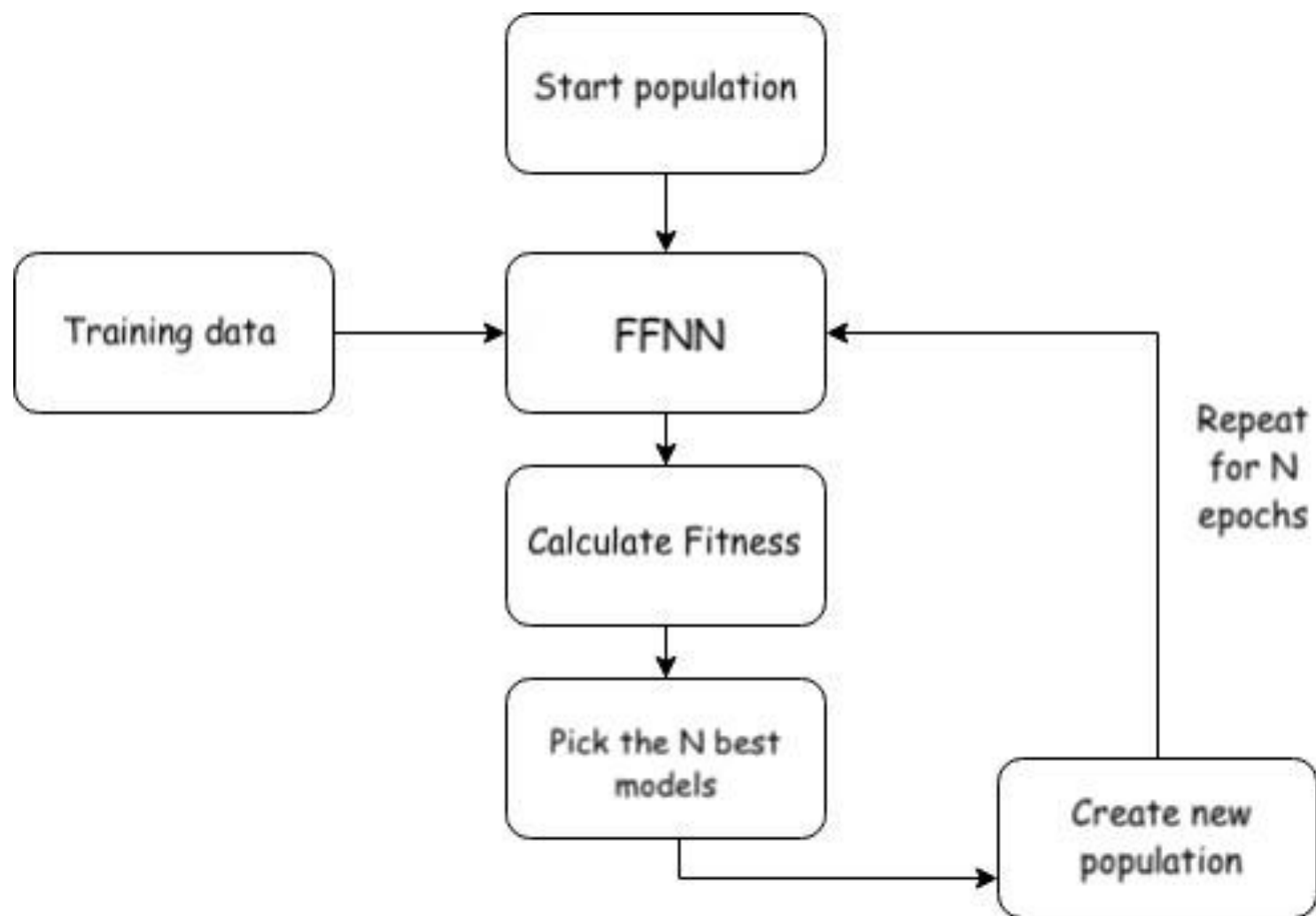
OBJECTIVES

- Develop an optimized artificial neural network model (backpropagation) using a genetic algorithm to modify its hyper parameters.

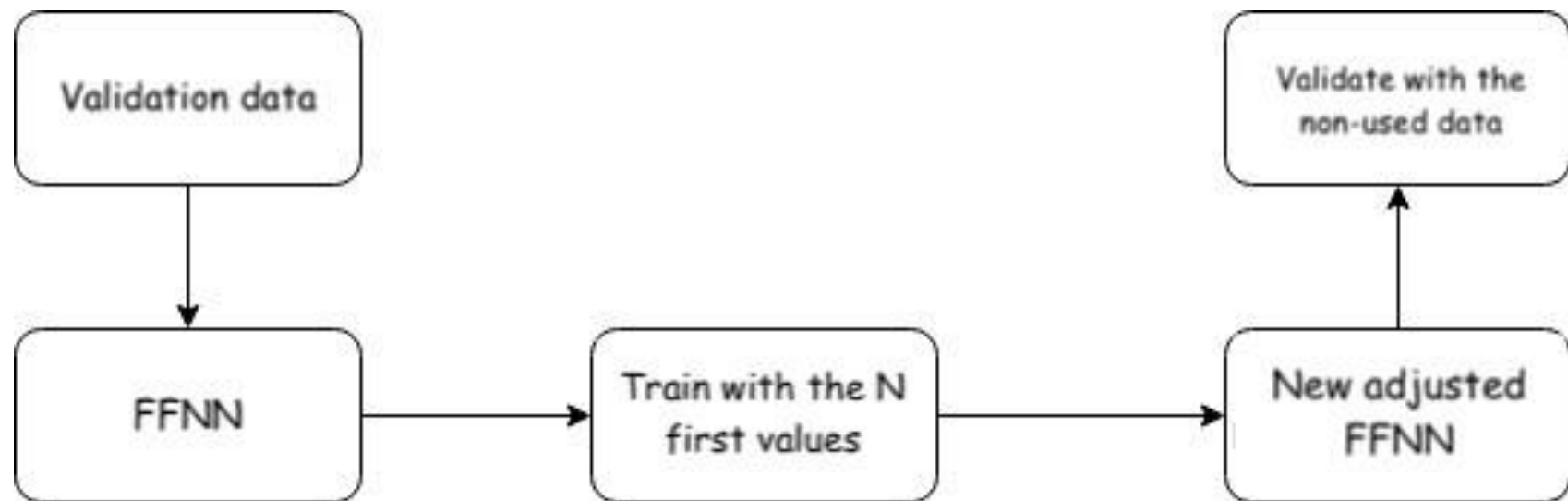- Predict Ecuadorian oil crude price using the network mentioned above.

METHODOLOGY

Try to find the best hyper parameters to be used in the time series prediction:

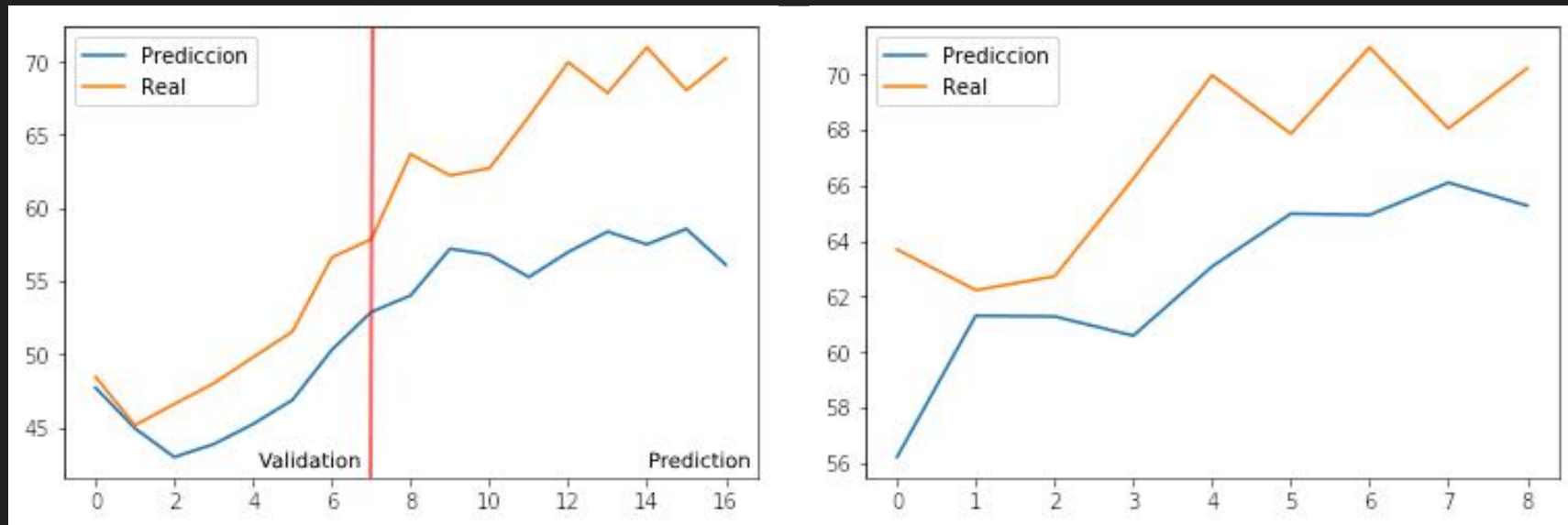- Number of neurons (INPUT AND HIDDEN)
- Learning rate
- Window size

```
┌─────────────────┐                                                    ┌─────────────────┐
│                 │                                                    │  Validate with the
│  Validation data│                                                    │   non-used data │
│                 │                                                    │                 │
└────────┬────────┘                                                    └────────▲────────┘
         │                                                                      │
         ▼                                                                      │
┌─────────────────┐          ┌─────────────────┐              ┌─────────────────┐
│                 │          │  Train with the N│              │  New adjusted   │
│      FFNN       │─────────▶│  first values    │─────────────▶│      FFNN       │
│                 │          │                  │              │                 │
└─────────────────┘          └─────────────────┘              └─────────────────┘
```

RESULTS

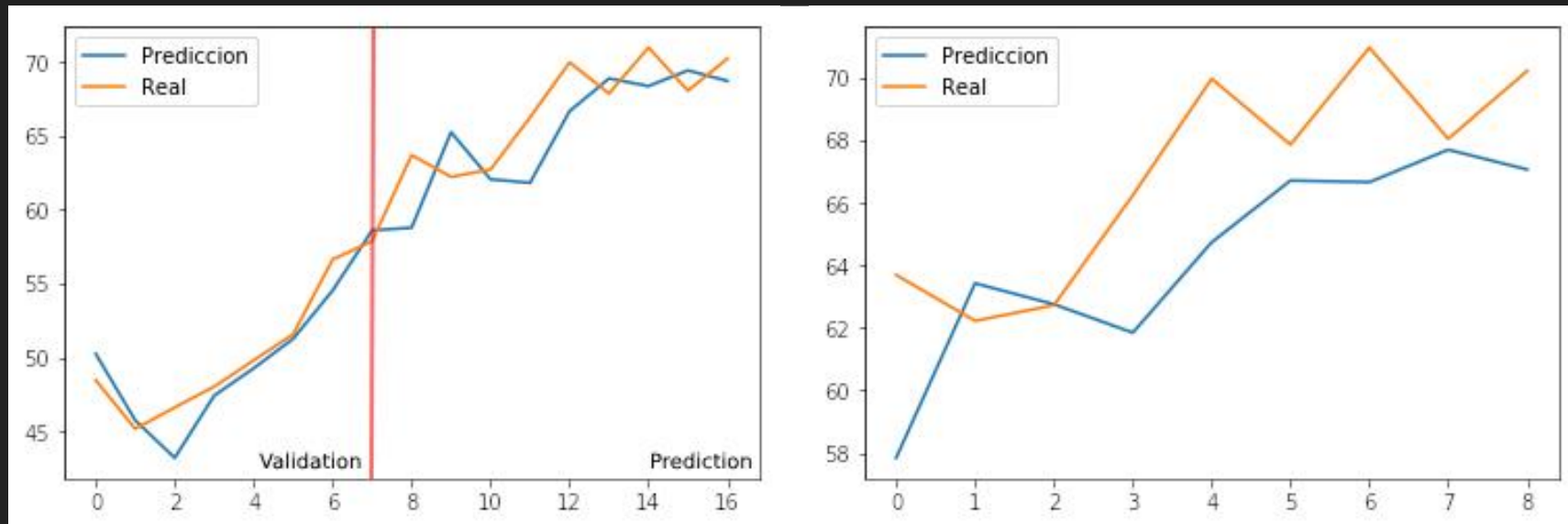*Figure 1:* Prediction of the price without adjustment

RESULTS

Figure 2: Prediction of the price with adjustment

RESULTS

Considering the average of the oil prices, the final error is shown in the table below:

Minimum error	Average of error	Maximum error
$0.34	$2.57	$5.80

CONCLUSIONS AND FUTURE WORK

- Choosing the best hyperparameters is one of the most important things to consider in the Back Propagation. To accomplish it, the Genetic Algorithm is of great utility.
- Relationship between the adjustment of the synaptic weights of the network and its performance needs further study.
- Future work: Using a hybrid system to automatically establish the synaptic weight adjustment without impairing its performance.