CIS 607 EC
Graduate Seminar on Evolutionary Computation

Programming Assignment 2
Time Series Forecasting

Due date: Nov. 30th, 2012
A Time Series represents a set of measurements of a variable that is observable from a, generally physical, process.

Those measurements are taken at equidistant points in time.
Time Series Data

In this programming assignment you will be dealing with a single-variable TS obtained using Mathematica.

Time Series Data
ARMA Models

- In this programming assignment, you will be producing AR and ARMA forecasting models for the given TS

- AR
  \[ y_t = \sum_{i=1}^{p} a_i y_{t-i} + \varepsilon_t \]

- ARMA
  \[ y_t = \sum_{i=1}^{p} a_i y_{t-i} + \sum_{i=1}^{q} b_i \varepsilon_{t-i} + \varepsilon_t \]
ARMA Models

• Fitness function

\[ MSE = \frac{1}{N} \sum_{i=1}^{N} (y_i - \hat{y}_i)^2 \]
Assignment

1. Select the EC tool you will be using (ECJ and CILIB contain the meta-heuristics required in this assignment).
2. Design the chromosome structure, encoding a variable-length model, which includes the number of terms in the model (p for AR, and p and q for ARMA), and its coefficients.
3. Program the fitness function.
4. Run a first experiment using GA and AR.
5. Run a second one using ARMA.
6. Plot the results, check the fitness of the best model.
Assignment

7. Solve the same problem using ES, PSO, and DE for AR and ARMA models.

8. Perform (30) independent runs for each meta-heuristic.

9. Record performance
   – Fitness
   – Time
   – No. Evaluations
   – Convergence (best individual of each generation) for best run

10. Draw conclusions
Report

• Report:
  – Platform and EC tool or package used
  – Implementation details
  – Experiments details
  – Results
  – Comparisons
  – Conclusions
• Write in journal/conference paper format (not optional)
• Submit written report and source code
• Send to juan@cs.uoregon.edu by Nov. 30th, 2012
• May work on teams (0 < |team| <= 3)