

Creating Statistical Web Services Using ASP.NET

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The Challenge



Making statistical and graphical capabilities of STATGRAPHICS accessible by user-written web applications.

(STATGRAPHICS is a menu and dialog-box driven application written in C++ using MFC).

Earlier Approach



Rewrite procedures in Java and expose routines as JavaBeans (“STATBEANS”).

```
import STATBEANS.FileDataSource;
fileDataSource1 = new FileDataSource();
fileDataSource1.setFileName("c:\\statbeans\\samples\\cardata.txt");

import STATBEANS.SimpleRegression;
simpleRegression1 = new STATBEANS.SimpleRegression();
simpleRegression1.setYVariableName("mpg");
simpleRegression1.setXVariableName("weight");

import STATBEANS.SimpleRegressionTable;
import STATBEANS.SimpleRegressionPlot;
simpleRegressionTable1 = new STATBEANS.SimpleRegressionTable();
simpleRegressionPlot1 = new STATBEANS.SimpleRegressionPlot();
simpleRegressionPlot1.setConfidenceLevel(99.0);

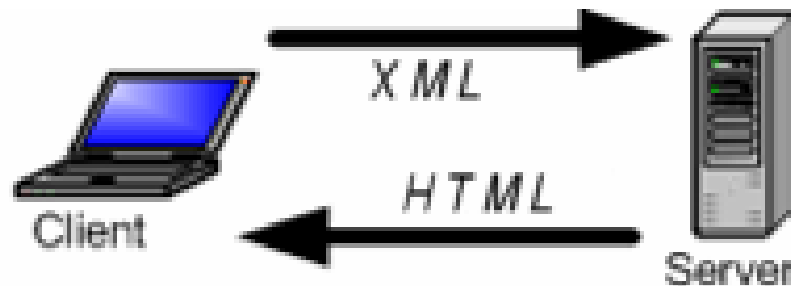
fileDataSource1.addDataChangeListener(simpleRegression1.listenerForDataChange);
simpleRegression1.addDataChangeListener(simpleRegressionTable1.listenerForDataChange);
simpleRegression1.addDataChangeListener(simpleRegressionPlot1.listenerForDataChange);

fileDataSource1.readData();
```

Current Approach



Create an ASP.NET Web Service that interprets scripts created by web applications and returns results as HTML.



ASP.NET Web Services



Statgraphics.asmx:

```
<%@ WebService Language="C#" CodeBehind="~/App_Code/Statgraphics.cs"
    Class="Statgraphics" %>
```

```
public class Statgraphics : System.Web.Services.WebService
{
    [WebMethod(Description = "Interprets an SG XML instruction file and returns name of
    HTML output page.", EnableSession = true)]
    public string RunProcs(string InputFileName)
    {
        ...
    }
}
```

SG XML Scripts - Layout



```
<statgraphics>
  <globals>
    <OutputLanguage>English</OutputLanguage>
    <SigDigits>6</SigDigits>
    <GraphWidth>4.0</GraphWidth>
    <GraphHeight>4.0</GraphHeight>
    <HTMLFileName>temp/myoutput.htm</HTMLFileName>
  </globals>
  <data>
    <FileName>temp/nonlin.xml</FileName>
    <DecimalSeparator>.</DecimalSeparator>
    <DateFormat>MM/DD/YYYY</DateFormat>
    <MissingValue>NA</MissingValue>
  </data>
  <proc>
    ...
  </proc>
</statgraphics>
```

SG XML Scripts - Procedures



```
<proc name="SREG">
  <input>
    <Y>Chlorine</Y>
    <X>Weeks</X>
  </input>
  <options>
    <Model>Linear</Model>
  </options>
  <output>
    <table>Summary</table>
    <graph name="Model">
      <ConfLimits>Yes</ConfLimits>
      <ConfLevel>95</ConfLevel>
      <Limits>TwoSided</Limits>
    </graph>
  </output>
  <results>
    <Predicted>PREDICTED</Predicted>
    <Residual>RESIDUALS</Residual>
  </results>
</proc>
```

Web Application Client



SGNETDemo.aspx:

```
private static localhost.Statgraphics mySvc = new localhost.Statgraphics();  
  
String HTMLFileName = mySvc.RunProcs((string)Session["XMLScriptFileName"]);
```


Sample Web Application



Enter Data - Windows Internet Explorer

http://localhost:1160/SGNETDemo/DataEntry.aspx

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.NET web services demo

Welcome
ENTER DATA
[Set Global Options](#)
[Select Procedure](#)
[Specify Procedure Inputs](#)
[Calculate](#)

[Previous](#) [Next](#)

Enter your data in the data table below and assign each column a meaningful name. Or leave the datasheet empty and press **Next** to run the procedures using automatically selected datasets.

[Clear Datable](#) [Edit Column Names](#) [Clipboard Paste](#)

Row	Make	Model	Type	Min Price	Mid Price	Max Price	MPG City	MPG Highway	Air Bags	Drive Train	Cylinders	Eng S
1	Acura	Integra	Small	12.9	15.9	18.8	25	31	0	front	4	1.
2	Acura	Legend	Midsize	29.2	33.9	38.7	18	25	2	front	6	3.

System Globals



System Options - Windows Internet Explorer

http://localhost:1160/SGNETDemo/DataEntry.aspx

Google

System Options

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Welcome
Enter Data
SET GLOBAL OPTIONS
Select Procedure
Specify Procedure Inputs
Calculate

Previous Next

The following options apply to all statistical procedures:

System Options

Significant digits:	Rows to display in tables: 1000	Output language:	Date separator
☐ 3	Table width in characters: 100	☒ English	☒ slash (/)
☐ 4	Graph width: 600 pixels	☐ French	☐ period (.)
☐ 5	Graph height: 400 pixels	☐ German	☐ dash (-)
☒ 6	Function resolution:	☐ Spanish	Date format
☐ 7		StatAdvisor:	☐ m d yy
☐ 8		☐ Tables	☒ m d yyyy
☐ 9		☐ Graphs	☐ d m yy

Procedure Selection



Untitled Page - Windows Internet Explorer

http://localhost:1160/SGNETDemo/SystemOptions.aspx

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Welcome
Enter Data
Set Global Options
SELECT PROCEDURE
Specify Procedure Inputs
Calculate

Previous Next

Select any of the following STATGRAPHICS procedures:

☐ Data - Display Data Table	☐ Compare - Two Sample Comparison
☐ Plot - X Plot	☐ Compare - Paired Sample Comparison
☐ Plot - X-Y Plot	☐ Compare - Multiple Sample Comparison
☐ Plot - X-Y-Z Plot	☐ Compare - Oneway ANOVA
☐ Plot - Matrix Plot	☐ Compare - Multifactor ANOVA
☐ Plot - Multiple X-Y Plot	☒ Relate - Simple Regression
☐ Plot - Multiple X-Y-Z Plot	☐ Relate - Multiple Regression
☐ Plot - Frequency Table	☐ SPC - X Chart
☐ Plot - Contingency Table	☐ SPC - X-bar or Median Chart

Procedure Options



Simple Regression - Windows Internet Explorer

http://localhost:1160/SGNETDemo/SelectProcedure.aspx

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Simple Regression

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Welcome
Enter Data
Set Global Options
Select Procedure
SPECIFY PROCEDURE INPUTS
Calculate

Previous Next

Simple Regression Procedure

This procedure fits a linear or nonlinear model relating a dependent variable Y to an independent variable X. [Documentation](#)

Dependent variable (Y): MPG City Edit

Independent variable (X): Weight Edit

(Select) Help

Model:

Output (Tabular)

STATGRAPHICS Output - Windows Internet Explorer

http://localhost:1160/SGNETDemo/SystemOptions.aspx

STATGRAPHICS Output

STATGRAPHICS Web Services
Generated: 7/27/2007 9:23:21 AM

Data file: 93cars.xml

Simple Regression - MPG City vs. Weight
Dependent variable: MPG City
Independent variable: Weight
S-curve model: $Y = \exp(a + b/X)$

Coefficients

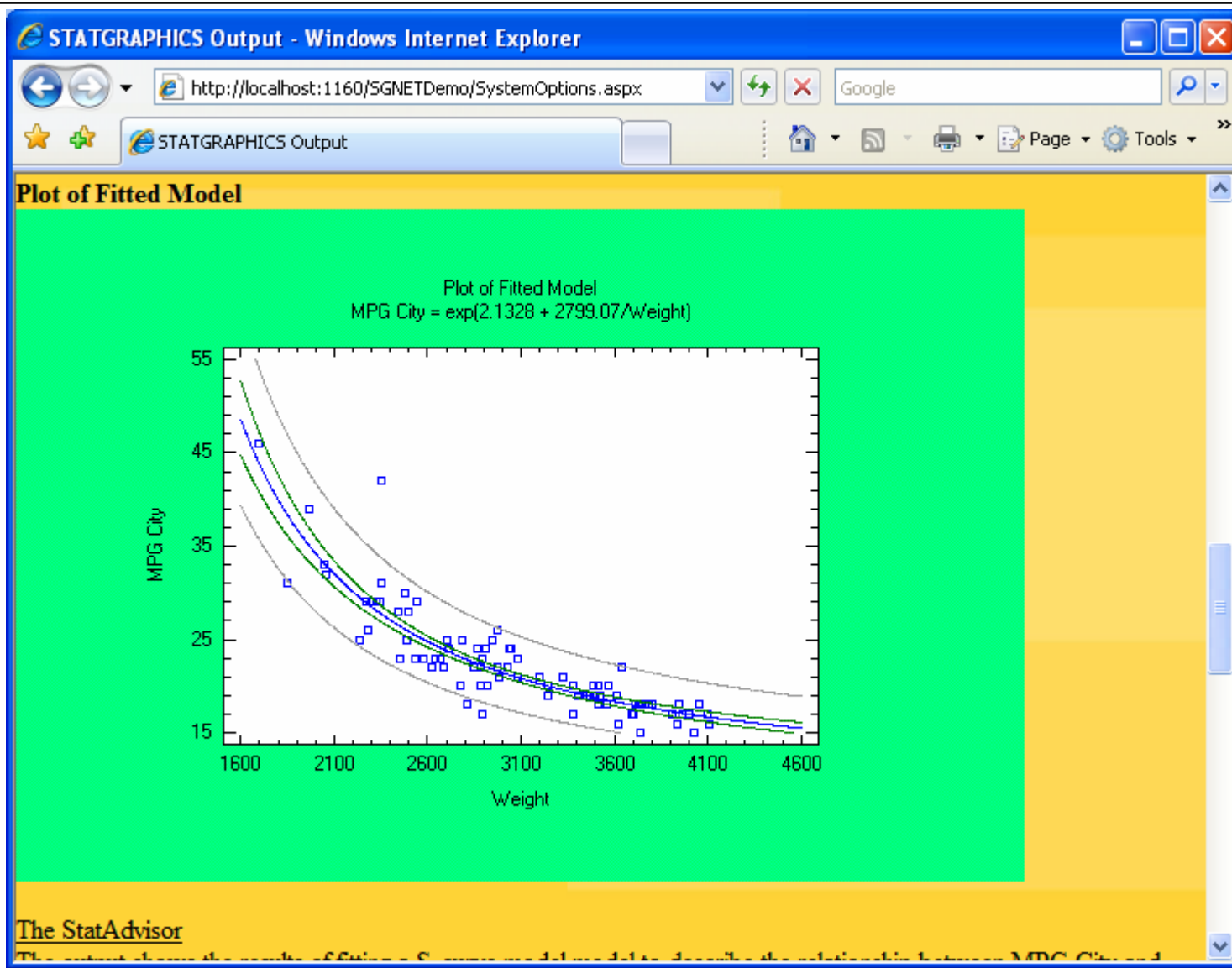
	<i>Least Squares</i>	<i>Standard</i>	<i>T</i>	
<i>Parameter</i>	<i>Estimate</i>	<i>Error</i>	<i>Statistic</i>	<i>P-Value</i>
Intercept	2.1328	0.0487371	43.7614	0.0000
Slope	2799.07	140.752	19.8865	0.0000

NOTE: intercept = $\ln(a)$

Analysis of Variance

<i>Source</i>	<i>Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F-Ratio</i>	<i>P-Value</i>
Model	3.74905	1	3.74905	395.47	0.0000
Residual	0.862676	91	0.00947996		
Total (Corr.)	4.61173	92			

Output (Graphical)



Numerical Results



```
http://localhost:1160/sgnetdemo/temp/p1lwvboxsznqsl55kzzfi245_$g$_results.xml - Windows Int...
http://localhost:1160/sgnetdemo/temp/p1lwvboxsznqsl55kzzfi2
Google
http://localhost:1160/sgnetdemo/temp/p1lwvboxsznq...
<?xml version="1.0" standalone="yes" ?>
- <dataSet xmlns="NetFrameWork">
- <table>
  <Row>1</Row>
  <PREDICTED>23.7499</PREDICTED>
  <LOWERPLIMS>28.853</LOWERPLIMS>
  <UPPERPLIMS>19.5494</UPPERPLIMS>
  <RESIDUALS>1.25008</RESIDUALS>
  <SRESIDUALS>0.528135</SRESIDUALS>
  <LEVERAGES>0.0127527</LEVERAGES>
</table>
- <table>
  <Row>2</Row>
  <PREDICTED>18.5238</PREDICTED>
  <LOWERPLIMS>22.5148</LOWERPLIMS>
  <UPPERPLIMS>15.2403</UPPERPLIMS>
  <RESIDUALS>-0.523846</RESIDUALS>
  <SRESIDUALS>-0.29579</SRESIDUALS>
  <LEVERAGES>0.0177467</LEVERAGES>
</table>
- <table>
  <Row>3</Row>
  <PREDICTED>19.3396</PREDICTED>
  <LOWERPLIMS>23.4991</LOWERPLIMS>
  <UPPERPLIMS>15.9165</UPPERPLIMS>
  <RESIDUALS>0.660353</RESIDUALS>
  <SRESIDUALS>0.345683</SRESIDUALS>
```

References



Slides and paper are online at www.statgraphics.com/documents.htm.

Demo is online at www.statgraphics.com/webservices.htm.