IBM Watson Machine Learning - Sample2 Deployment

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1 Document purpose

This document outlines how to configure and run the IBM Watson Machine Learning Sample2 (https://github.com/pmservice/predictive-modeling-samples).

- This document compliments the current documentation associated with Sample2.
- This document interfaces with an IBM SPSS Modeler stream, but the focus is on Bluemix. It's assumed that the reader has a basic understanding of predictive analytics used in IBM SPSS Modeler.
- While there are many supported runtimes in Bluemix (Liberty for Java, Python, Ruby, ASP.NET, Swift, Tomcat, etc.), this document uses SDK for Node.js.
- Other operating systems are supported, but this example uses Microsoft Windows.

2 Prerequisites

2.1 Bluemix

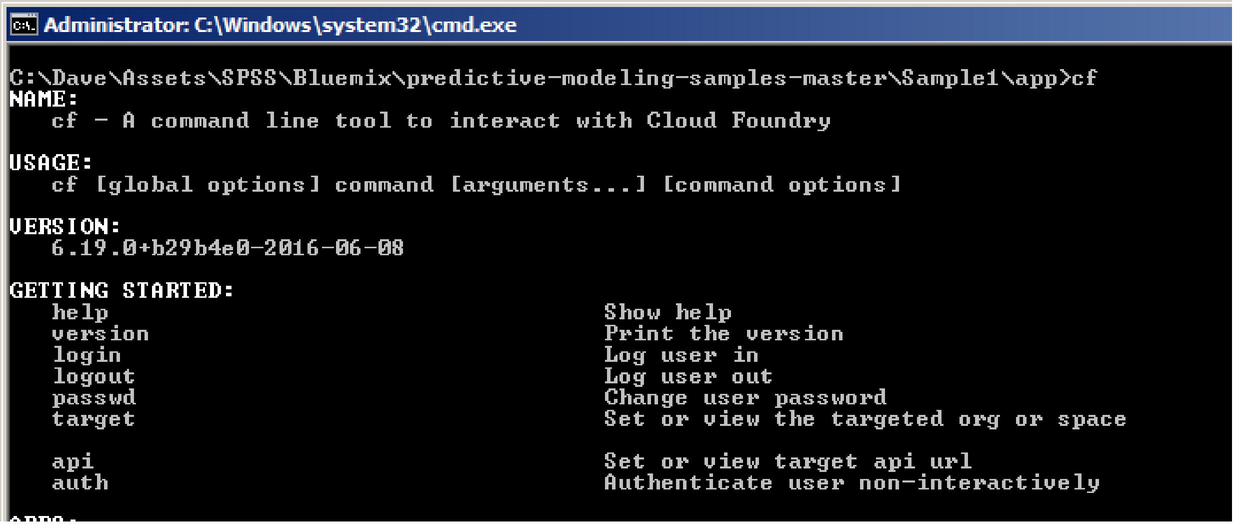
1. Ensure that you have a valid Bluemix account.

2.2 Cloud Foundry

2. Install the Cloud Foundry (CF) Command Line Interface from https://github.com/cloudfoundry/cli/releases.
3. Ensure that the tool is running properly by typing the following at a command prompt:

   cf

   You should receive output that looks similar to the following:



```
C:\Dave\Assets\SPSS\Bluemix\predictive-modeling-samples-master\Sample1\app>cf
NAME:
   cf - A command line tool to interact with Cloud Foundry

USAGE:
   cf [global options] command [arguments...] [command options]

VERSION:
   6.19.0+b29b4e0-2016-06-08

GETTING STARTED:
   help                                         Show help
   version                                      Print the version
   login                                        Log user in
   logout                                       Log user out
   passwd                                       Change user password
   target                                       Set or view the targeted org or space

   api                                          Set or view target api url
   auth                                         Authenticate user non-interactively
```

Note: You may need to reboot your system in order for it to locate the **cf** executable. Do not proceed until the **cf** command runs.

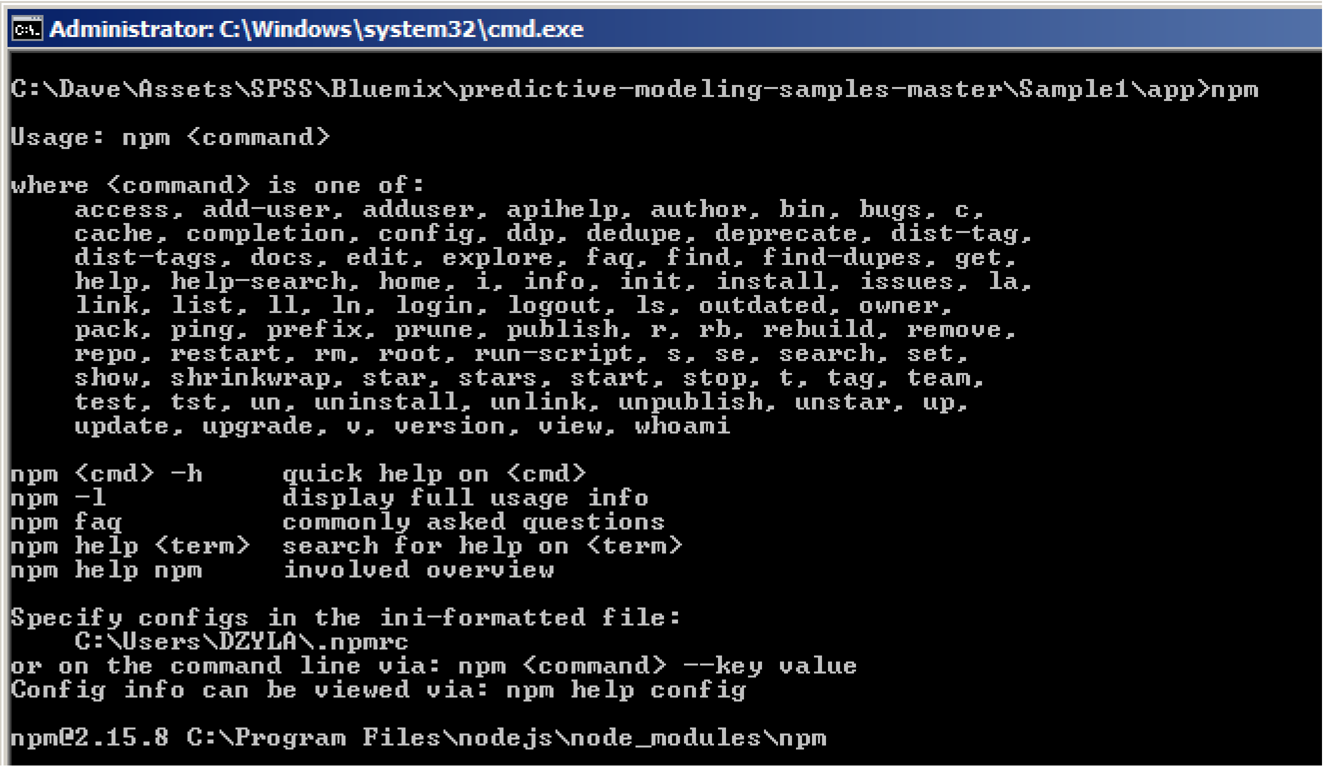
2.3 Node.js

Node.js is required to download supporting code from Bluemix to the local development environment. Additional information can be found at https://nodejs.org/en/about/.

1. Download and install Node.js from https://nodejs.org/en/download/.
2. Validate that Node.js is running properly by typing the following at a command prompt:

   npm

   You should receive output that looks similar to the following:

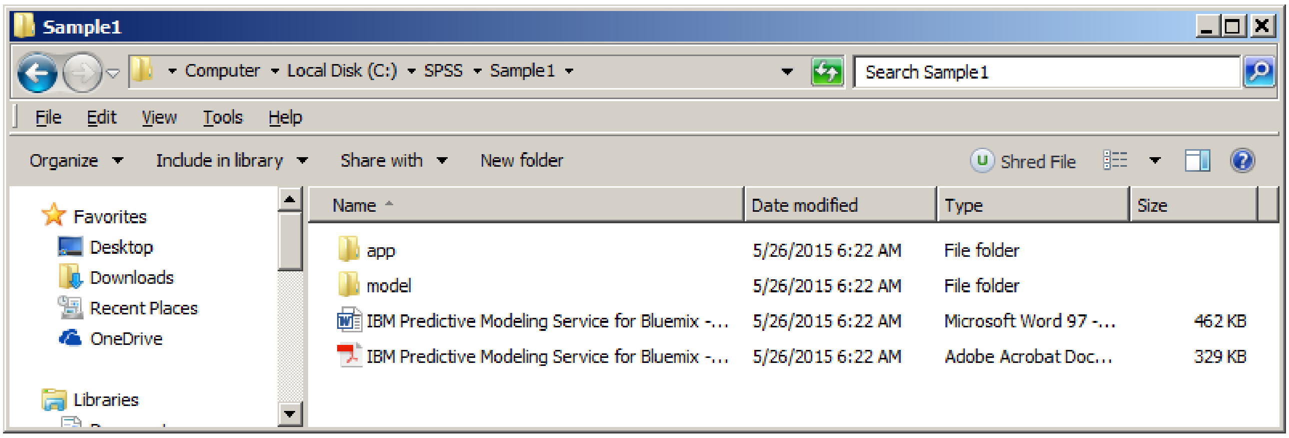


```
C:\Dave\Assets\SPSS\Bluemix\predictive-modeling-samples-master\Sample1\app>npm

Usage: npm <command>

where <command> is one of:
    access, add-user, adduser, apihelp, author, bin, bugs, c,
    cache, completion, config, ddp, dedupe, deprecate, dist-tag,
    dist-tags, docs, edit, explore, faq, find, find-dupes, get,
    help, help-search, home, i, info, init, install, issues, la,
    link, list, ll, ln, login, logout, ls, outdated, owner,
    pack, ping, prefix, prune, publish, r, rb, rebuild, remove,
    repo, restart, rm, root, run-script, s, se, search, set,
    show, shrinkwrap, star, stars, start, stop, t, tag, team,
    test, tst, un, uninstall, unlink, unpublish, unstar, up,
    update, upgrade, v, version, view, whoami

npm <cmd> -h     quick help on <cmd>
npm -l           display full usage info
npm faq          commonly asked questions
npm help <term>  search for help on <term>
npm help npm     involved overview

Specify configs in the ini-formatted file:
    C:\Users\DZYLA\.npmrc
or on the command line via: npm <command> --key value
Config info can be viewed via: npm help config

npm@2.15.8 C:\Program Files\nodejs\node_modules\npm
```

Note: You may need to reboot your system in order for it to locate the **npm** executable. Do not proceed until the **npm** command has run.

2.4 Downloading Sample 2

1. Download Sample 2 from https://github.com/pmservice/predictive-modeling-samples.
2. Extract the contents to a working directory. This example uses *C:\SPSS*.
3. Once extracted, your folder structure should look like this:

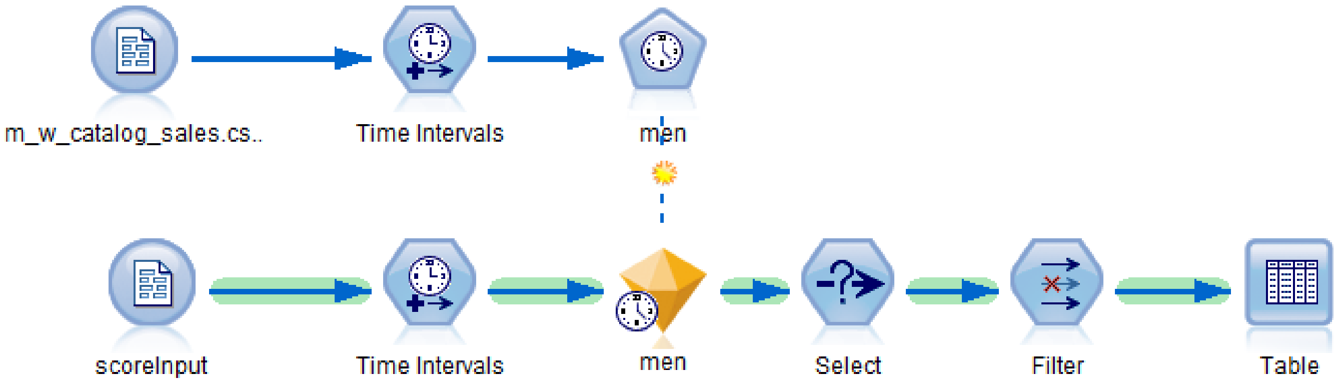


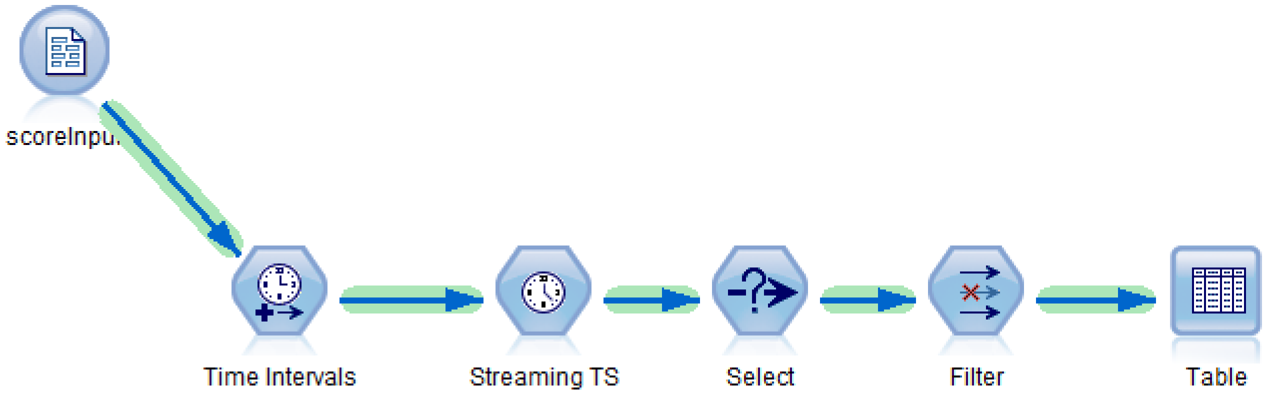
Name	Date modified	Type	Size
app	5/26/2015 6:22 AM	File folder	
model	5/26/2015 6:22 AM	File folder	
IBM Predictive Modeling Service for Bluemix -...	5/26/2015 6:22 AM	Microsoft Word 97 -...	462 KB
IBM Predictive Modeling Service for Bluemix -...	5/26/2015 6:22 AM	Adobe Acrobat Doc...	329 KB

3 IBM SPSS Modeler

The sample comes with an SPSS Modeler stream at *C:\SPSS\Sample1\model\Drug1n.str*.

It is important to note that a scoring branch has been set in the stream. Any model used in the Bluemix Machine Learning node must have a scoring branch set. This can simply be done by right-clicking the terminal node and selecting **Use as scoring branch**.



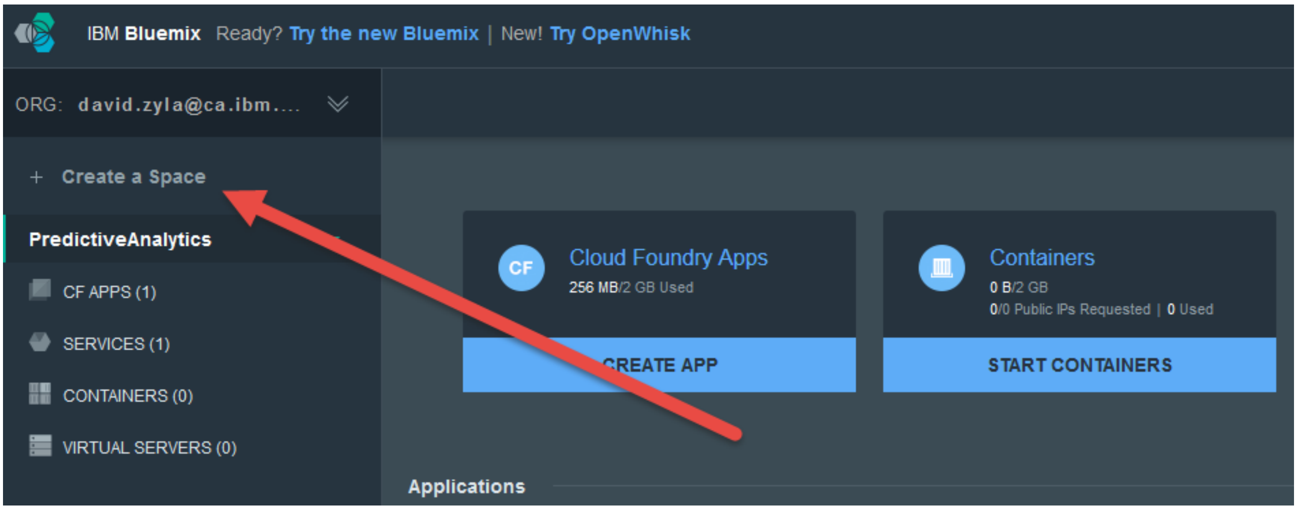


The Bluemix application must provide the same data items used in the input node. In this case, it's the **scoreInput** node.

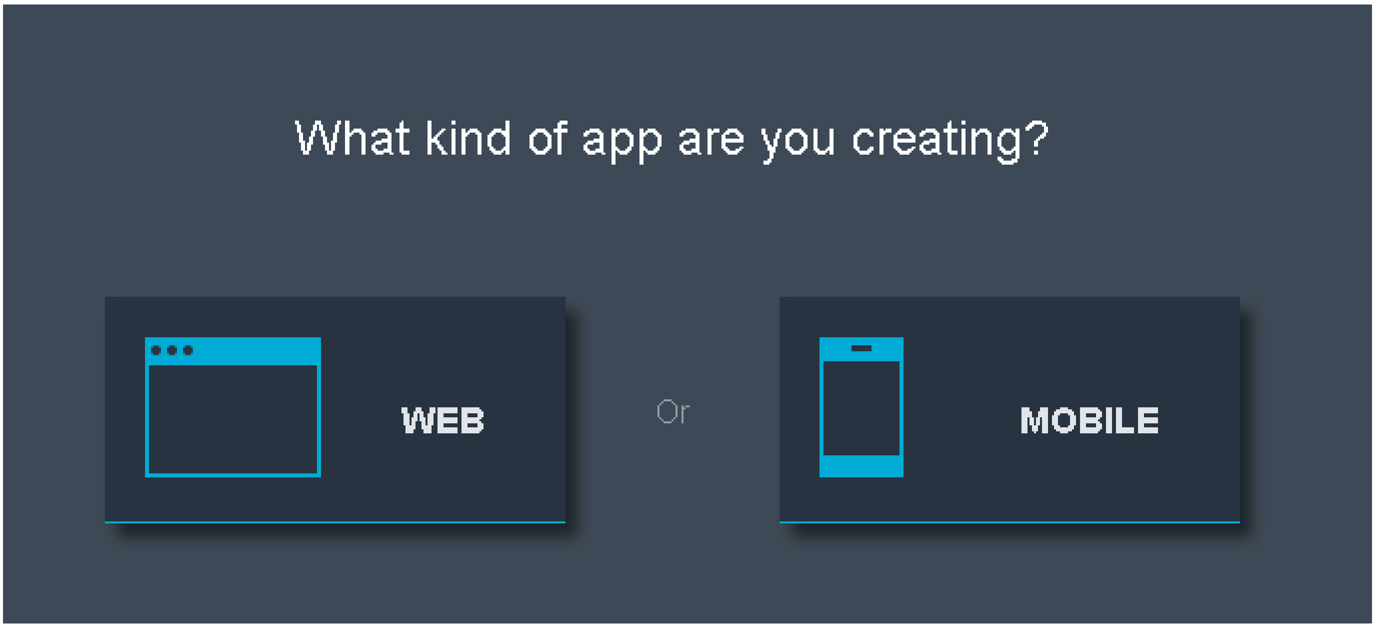
4 Bluemix application and service

4.1 Creating the application

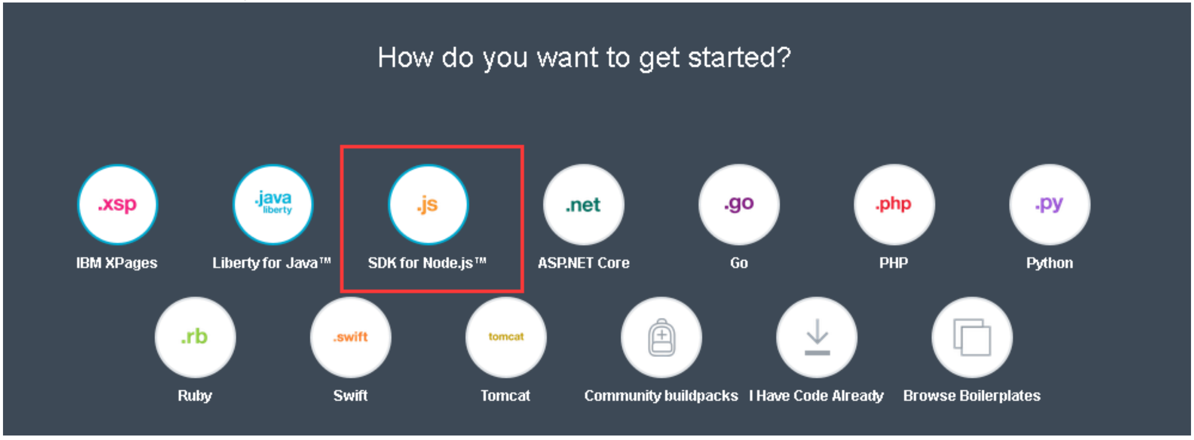
1. Log in to Bluemix.
2. If you don't already have a space created, create one now. You can use whatever name you'd like, but make note of the name for future reference.



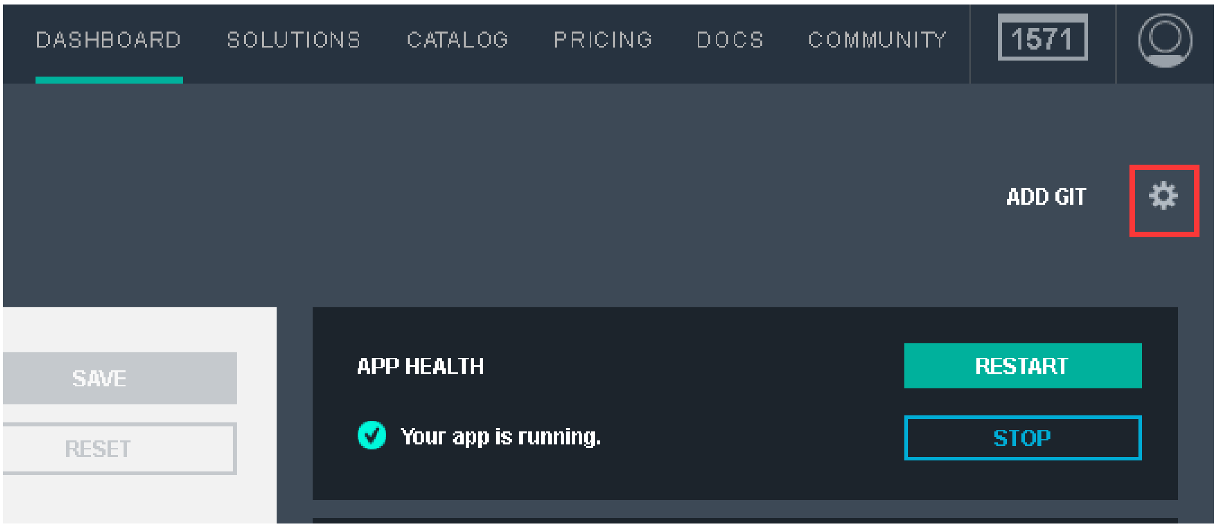
3. After creating the new space, click it on the left side of your screen.
4. On the top of the page, click **Create app**.
5. Choose **WEB**.



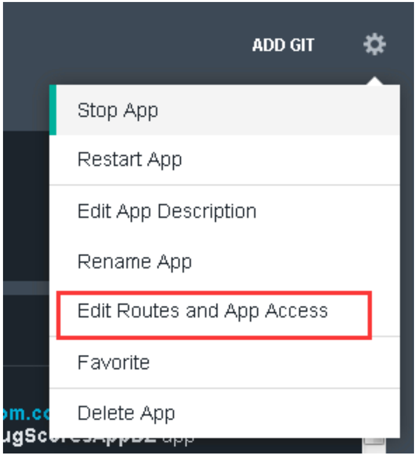
6. Select **SDK for Node.js**.



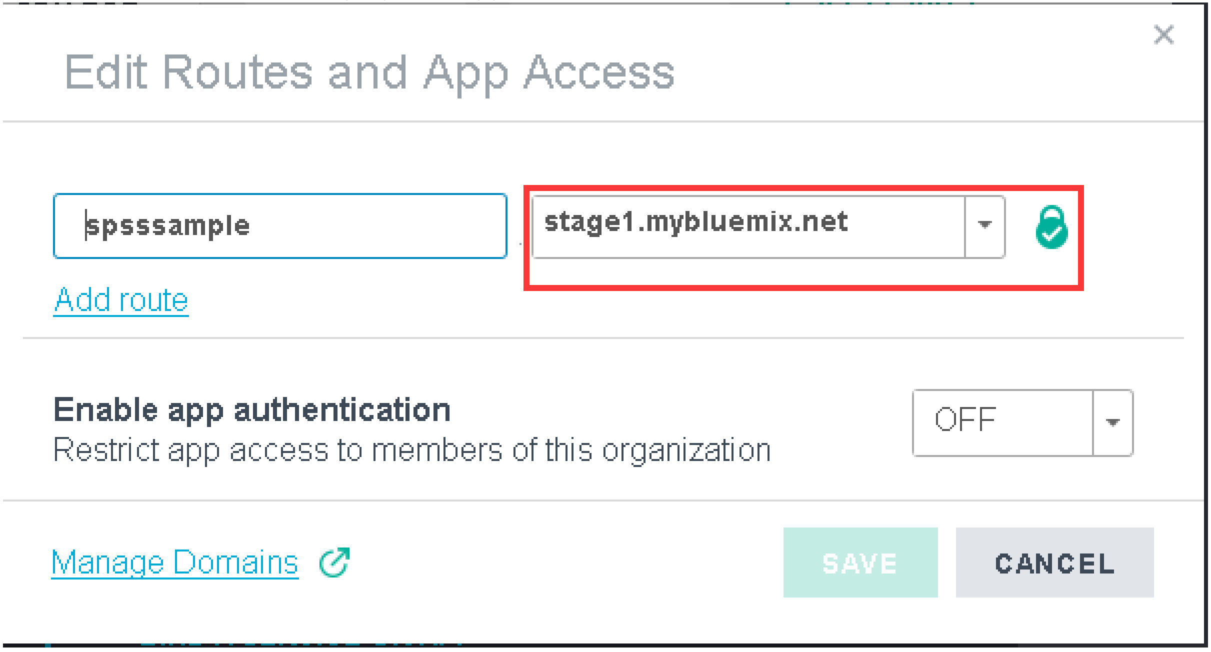
7. Name the new application as desired, but use a short name. This example uses **SPSSSample**.
8. Click **Create** to stage and create the application. This process may take a minute or two to complete.
9. After the application is created, go back to the dashboard. You should see the new application.
10. Click the application, and then go to the application overview page. In the top right corner, find the settings icon.



11. Click the settings icon and select **Edit Routes and App Access**.



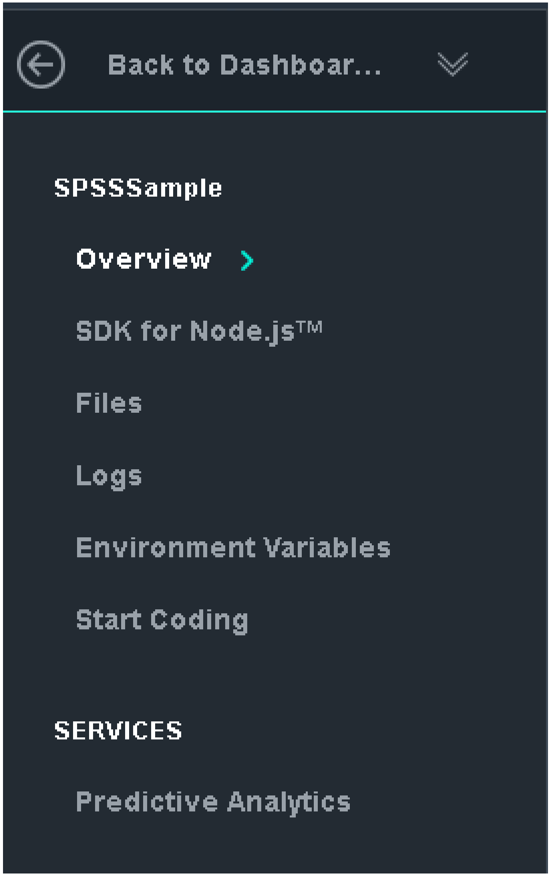
12. The second selection box displays this app's domain name:


Edit Routes and App Access
spsssample
stage1.mybluemix.net
Add route
Enable app authentication
Restrict app access to members of this organization
OFF
Manage Domains
SAVE
CANCEL

13. Take note of the Space, App Name, Host, and Domain as they will be referred to later on.

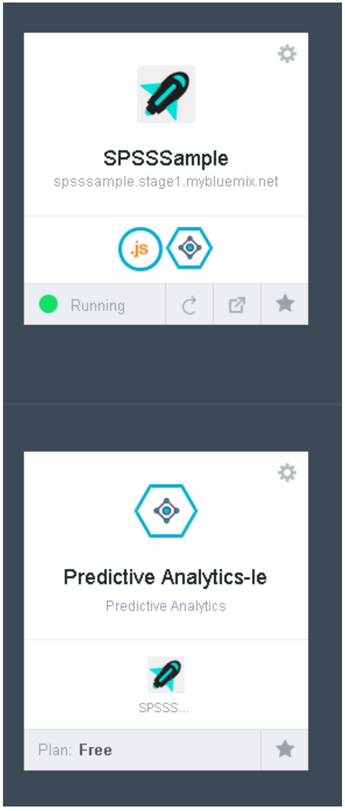
4.2 Creating the service

1. Ensure that the SDK for Node.js application is running and is selected on the left side of the screen.



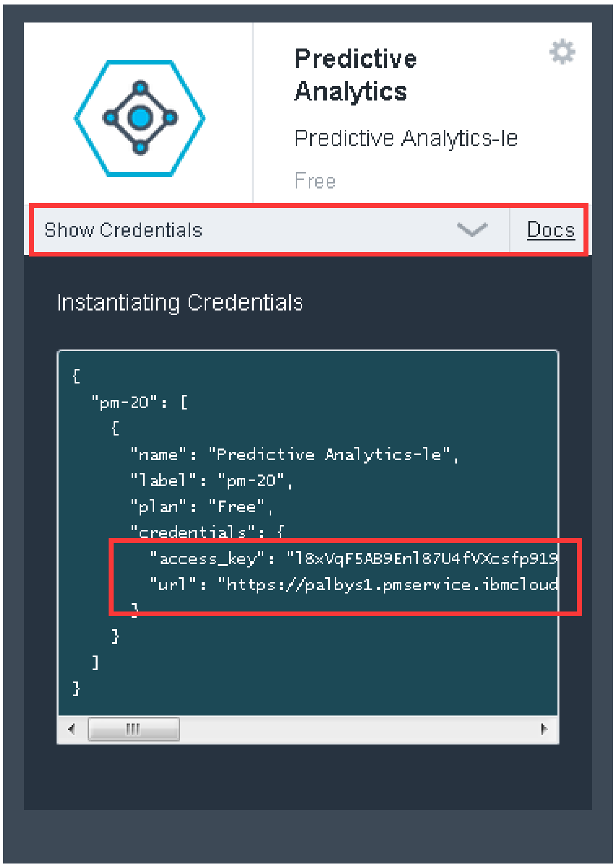
2. On the upper toolbar, click **Catalog**.
3. To filter the number of services displayed, select **Data and Analytics** under **Services** on the left side of the screen.
4. Click **IBM Watson Machine Learning**.

5. On the **Add Service** screen, ensure that the **App** drop down is changed from **Leave Unbound** to the application you created previously. This binds the service to the application.
6. Take note of the app and service names.
7. Click **Create**. If prompted to re-stage, select **Yes**.
8. Navigate back to the top dashboard page to display both the application and service.



9. Click the application (**SPSSSample**).

10. When we score the input data in this example, credentials must be supplied to Bluemix at runtime. Click the up arrow to show the credentials.



Instantiating Credentials

```
{
  "pm-20": [
    {
      "name": "Predictive Analytics-le",
      "label": "pm-20",
      "plan": "Free",
      "credentials": {
        "access_key": "l8xVqF5AB9En187U4fVXcsfp919
        "url": "https://palbys1.pmservice.ibmcloud
      }
    }
  ]
}
```

11. In the fly-out window, take note of the the access key and URL. You will need these later.
12. At this point in time, the application and service containers are ready.

5 Customizing files

This section discusses customization of the files that were downloaded to the SPSS working directory *C:\SPSS\Sample1*.

5.1 \app\manifest.yml

Manifest.yml contains information about the deployment, and is typically used to reduce the number of deployment details you must specify every time you deploy an application to Bluemix.

1. Open the file *C:\SPSS\Sample2\app\manifest.yml* in a text editor.
2. Change the value of the **host** variable to reflect what was used in the *Creating the application* section previously. In this example, **SPSSSample** was used.
3. Change the value of the **name** variable to reflect what was used in the *Creating the application* section previously. In this example, **SPSSSample** was used.
4. Change the value of the **domain** variable to reflect what was used in the *Creating the application* section previously. In this example, **mybluemix.net** was used
5. Change the value of the **memory** variable to 256M.
6. Add the following line:
   disk_quota: 1024M
7. Save and close the file.

5.2 \app\app.js

1. Open the file *C:\SPSS\Sample2\app\app.js* in a text editor.
2. Navigate to line 21 and update the **defaultBaseURL** that was recorded in the *Creating the service* section previously. Note that the <> must be removed and the entire string value must be enclosed in single quotes (‘’).

   var defaultBaseURL = 'https://palbyp.pmservice.ibmcloud.com/pm/v1';

3. Similar to the previous step, update the **defaultAccessKey** value key on line 22.
4. Save and close the file.

5.3 \app\public\js\app.js

1. Open the file *C:\SPSS\Sample2\app\public\js\app.js* in a text editor.
2. Navigate to line 8.
3. Note that the value of the **$scope.context** variable is **['catalogTS', 'catalogSTS']**. While no change is required in this file, be aware that every SPSS model scored in Bluemix must have a unique context ID. This will be discussed further in the *Uploading SPSS Models* section.
4. Close the file. No change is required.

5.4 \app\public\js\srv.js

1. Open the file *C:\SPSS\Sample1\app\public\js\srv.js* in a text editor.
2. Navigate to line 14. Note that the **tablename** variable matches the name of the source node in the SPSS Modeler model.

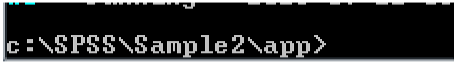
3. Close the file. No change is required.

6 Porting source code

6.1 Node Package Manager

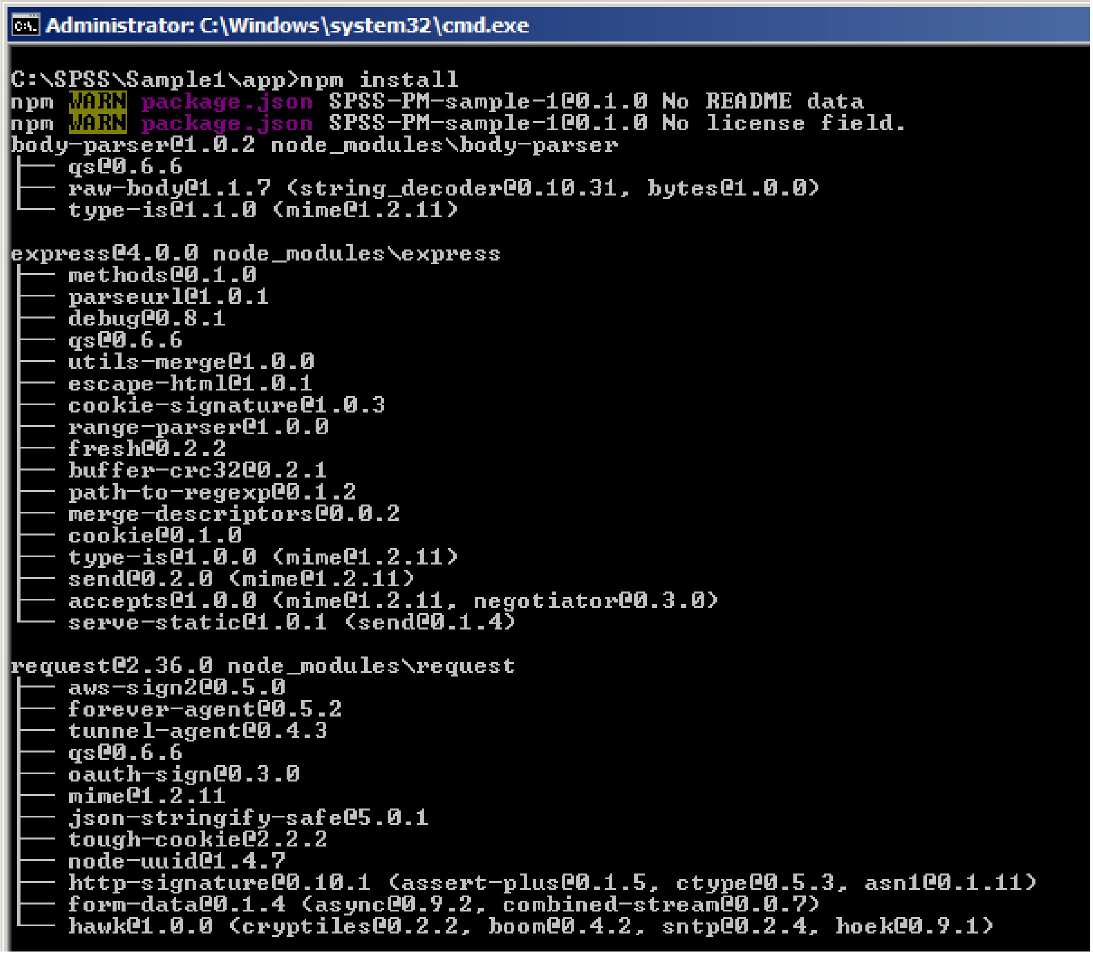
The Node Package Manager utility downloads supplemental files from Bluemix. The **Start Coding** section of the Bluemix application provides some of the commands that will help you connect to your Bluemix environment. It may be easier to use the commands there than to customize the following steps.

1. Launch a command prompt.
2. Change to the directory *C:\SPSS\Sample2\app.*

   ```
   c:\SPSS\Sample2\app>
   ```
3. Type the following command to connect to IBM Bluemix:
   bluemix api https://api.ng.bluemix.net
4. Type the following command to log in to Bluemix:
   bluemix login -u david.zyla@ca.ibm.com -o david.zyla@ca.ibm.com -s SPSS_RT_Scoring
5. Type your password when prompted.
6. Type the following command to download the supplemental files:
   npm install

   This creates the directory *C:\SPSS\Sample2\app\node_modules*.



```
C:\SPSS\Sample1\app>npm install
npm WARN package.json SPSS-PM-sample-1@0.1.0 No README data
npm WARN package.json SPSS-PM-sample-1@0.1.0 No license field.
body-parser@1.0.2 node_modules\body-parser
├── qs@0.6.6
├── raw-body@1.1.7 (string_decoder@0.10.31, bytes@1.0.0)
└── type-is@1.1.0 (mime@1.2.11)

express@4.0.0 node_modules\express
├── methods@0.1.0
├── parseurl@1.0.1
├── debug@0.8.1
├── qs@0.6.6
├── utils-merge@1.0.0
├── escape-html@1.0.1
├── cookie-signature@1.0.3
├── range-parser@1.0.0
├── fresh@0.2.2
├── buffer-crc32@0.2.1
├── path-to-regexp@0.1.2
├── merge-descriptors@0.0.2
├── cookie@0.1.0
├── type-is@1.0.0 (mime@1.2.11)
├── send@0.2.0 (mime@1.2.11)
├── accepts@1.0.0 (mime@1.2.11, negotiator@0.3.0)
└── serve-static@1.0.1 (send@0.1.4)

request@2.36.0 node_modules\request
├── aws-sign2@0.5.0
├── forever-agent@0.5.2
├── tunnel-agent@0.4.3
├── qs@0.6.6
├── oauth-sign@0.3.0
├── mime@1.2.11
├── json-stringify-safe@5.0.1
├── tough-cookie@2.2.2
├── node-uuid@1.4.7
├── http-signature@0.10.1 (assert-plus@0.1.5, ctype@0.5.3, asn1@0.1.11)
├── form-data@0.1.4 (async@0.9.2, combined-stream@0.0.7)
└── hawk@1.0.0 (cryptiles@0.2.2, boom@0.4.2, sntp@0.2.4, hoek@0.9.1)
```

7. To push all files and the customizations that were made, run the following command:

   ```
   cf push <Application Name>
   cf push SPSSSample2
   ```

   The application is uploaded to Bluemix.

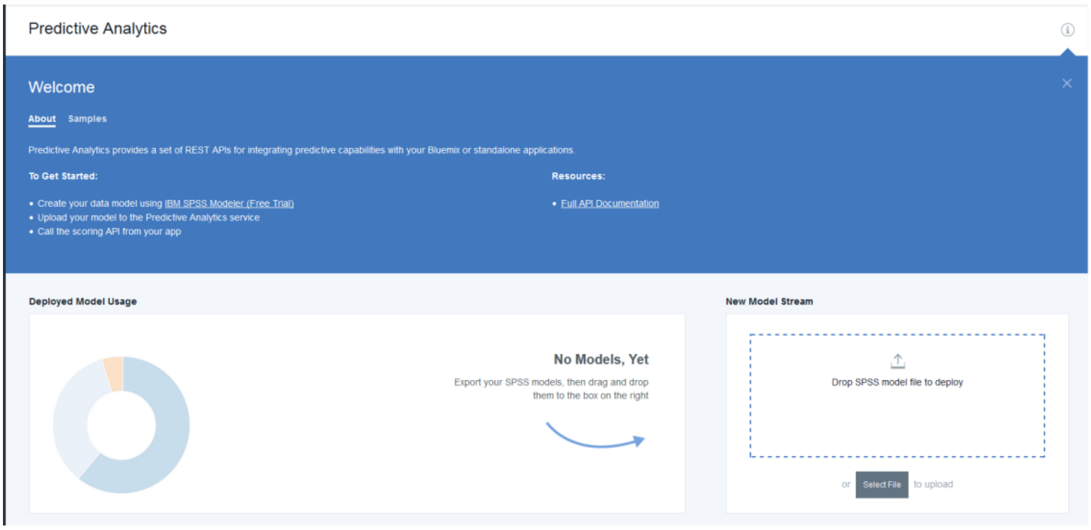
7 Uploading SPSS Models

At this point, we have uploaded our custom application to IBM Bluemix. But we still need to provide Bluemix with the SPSS models that we want to use.

1. Launch a browser and log in to Bluemix.
2. From the dashboard, click the Machine Learning service that was created previously.
3. In the bottom right corner, note there's a **New Model Stream** section. The SPSS model we're going to provide can be found in the following locations:
   C:\SPSS\Sample2\model\catalog_timeseries.str
   C:\SPSS\Sample2\model\ catalog_streaming_timeseries.str

   Upload the model either by dragging and dropping it or by using the **Select File** option.

4. You will be prompted to provide a **Context Id**. While this ID can be anything, for this example, . *catalog_timeseries.str* uses **catalogTS** and *catalog_streaming_timeseries*.str uses **catalogSTS**.



Predictive Analytics provides a set of REST APIs for integrating predictive capabilities with your Bluemix or standalone applications.

To Get Started:

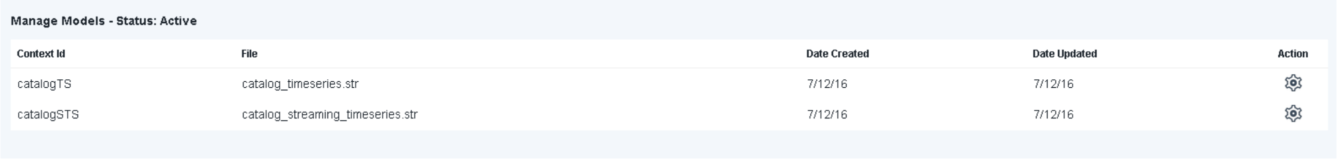
- Create your data model using IBM SPSS Modeler (Free Trial)
- Upload your model to the Predictive Analytics service
- Call the scoring API from your app

Resources:

- Full API Documentation

Export your SPSS models, then drag and drop them to the box on the right

5. Click **Deploy**.
6. The model is listed in the bottom section of the screen.

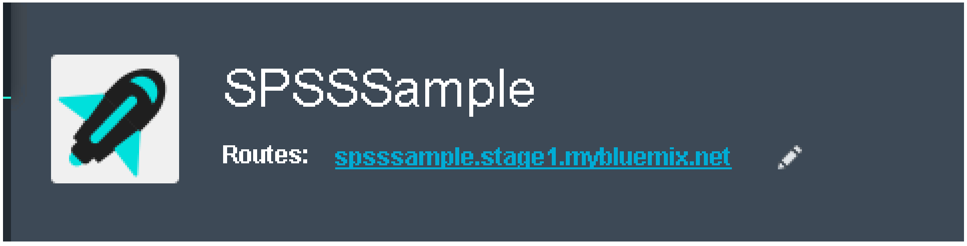


Manage Models - Status: Active

Context Id	File	Date Created	Date Updated	Action
catalogTS	catalog_timeseries.str	7/12/16	7/12/16	⚙
catalogSTS	catalog_streaming_timeseries.str	7/12/16	7/12/16	⚙

8 Real-Time scoring the sample

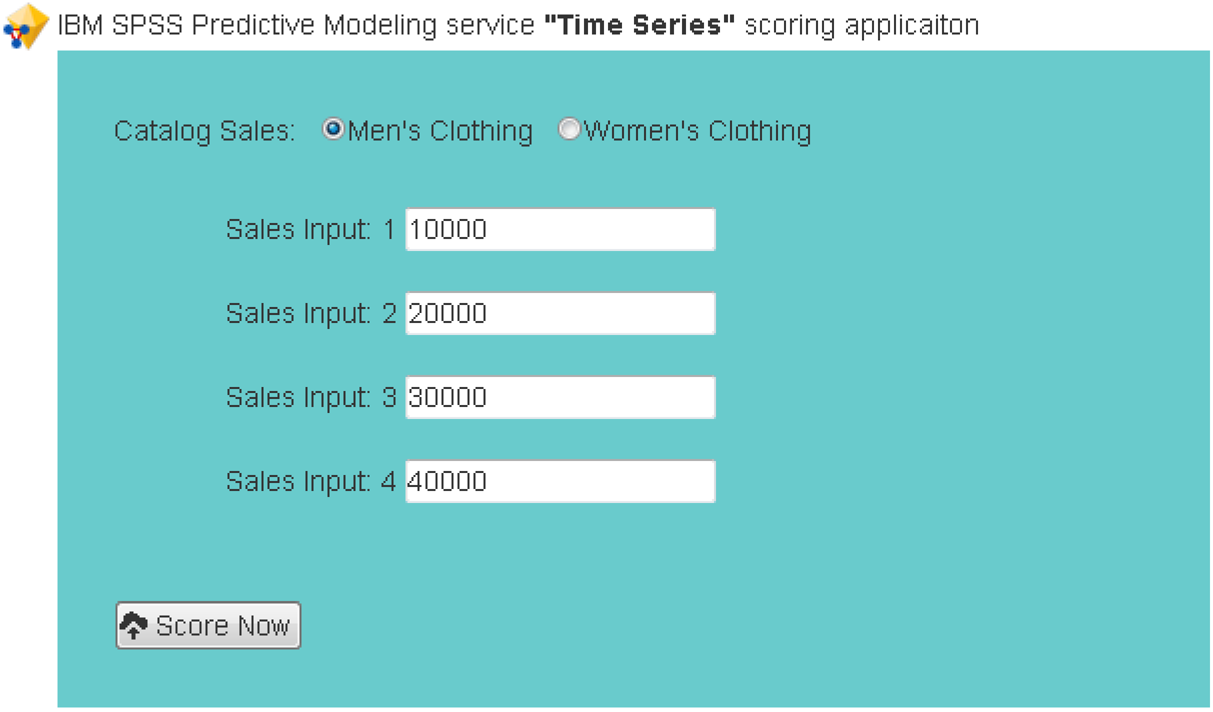
1. In Bluemix, navigate to your Dashboard.
2. Click the application you created. At the top of the screen, you can see the URL for accessing your application:



SPSSSample

Routes: spsssample.stage1.mybluemix.net

3. Click the URL. Your real-time scoring application opens:



IBM SPSS Predictive Modeling service **"Time Series"** scoring applicaiton

Catalog Sales: ● Men's Clothing ○ Women's Clothing

Sales Input: 1 10000

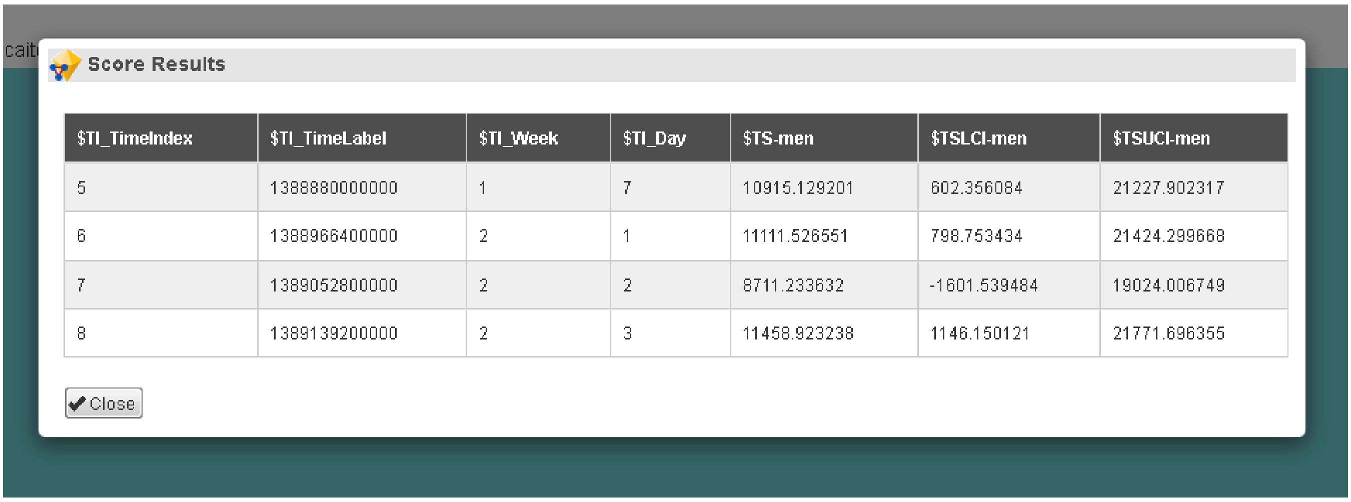
Sales Input: 2 20000

Sales Input: 3 30000

Sales Input: 4 40000

4. You can change any of the values as desired, then select **Men’s Clothing** or **Women’s Clothing** to simulate data being entered by a user of the application.

5. Click **Score Now**.



$TI_TimeIndex	$TI_TimeLabel	$TI_Week	$TI_Day	$TS-men	$TSLCI-men	$TSUCI-men
5	1388880000000	1	7	10915.129201	602.356084	21227.902317
6	1388966400000	2	1	11111.526551	798.753434	21424.299668
7	1389052800000	2	2	8711.233632	-1601.539484	19024.006749
8	1389139200000	2	3	11458.923238	1146.150121	21771.696355

This example displayes the input along with the predicted drug and predicted confidence.

This document has walked through the process of:

- Setting up the necessary development tools
- Customizing the sample code
- Uploading an SPSS model
- Scoring the SPSS model with data provided in real-time