

Alpine Product Training

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NUMBER	DATE	DESCRIPTION	NAME

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Chapter 1

Overview

In the set of activities described in this document we are going to explore a subset of Alpine's rich feature set. We will use Alpine to explore a moderately large data set using descriptive statistics. Then we will create two different prediction models for this data set, using a question with a yes/no outcome. We will then evaluate these prediction models and compare them using a graph called an ROC.

The data set consists of details on airline arrivals and departures at Chicago's O'Hare International Airport in the year 2008. We will use this data set to create a predictive model one using Naive Bayes and another using Logistic Regression to predict the probability of a flight being delayed or alternately to answer the question "Will this flight be delayed?"

Before we set about this task we need to be able to reliably execute certain elementary atomic tasks that will be needed repeatedly. These tasks are identified in Appendix A. Please make sure you are familiar with these operations especially Alpine account name, password, and datasource properties for the datasource you will use.

Chapter 2

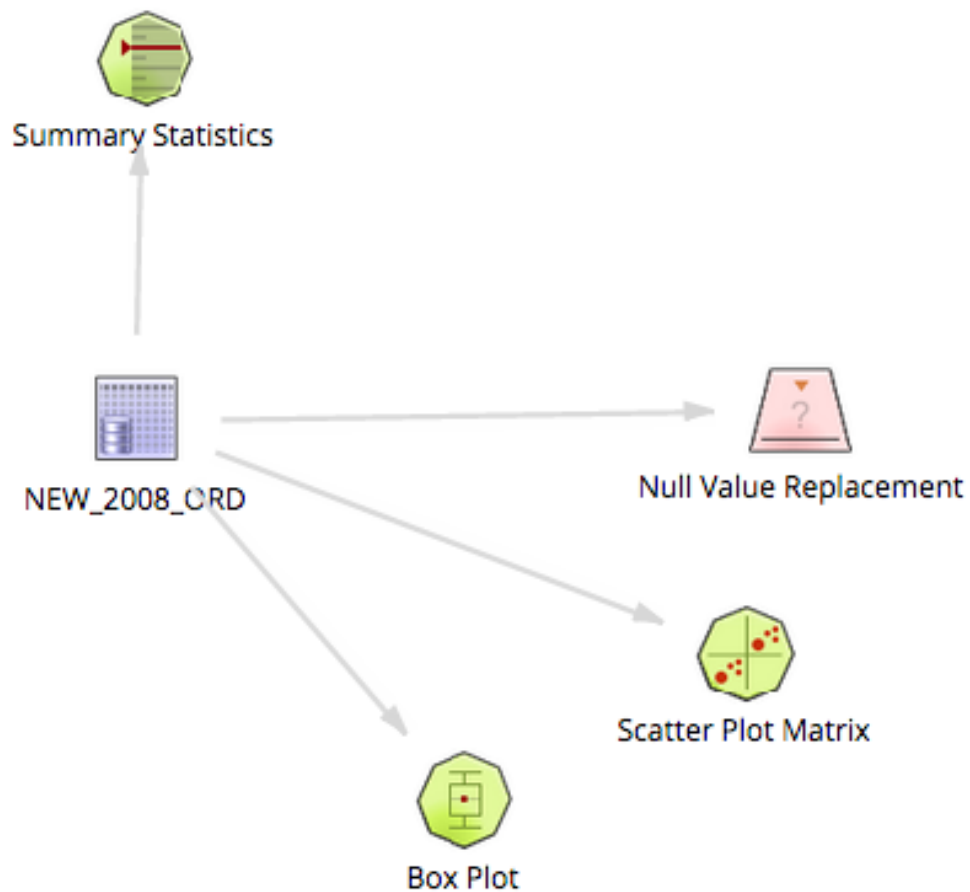
Data Exploration

In this stage we will import our data into an Alpine DataSource. Then we will do an initial exploration and simple cleanup of the data in preparation for modeling. This stage will introduce us to some of the visualization capabilities of Alpine.

2.1 Set Up Initial flow

We will set up a flow with multiple visualizations incrementally, one module at a time. When we are done we should have a flow in our workspace that looks like this.

Data Ingest and Data Exploration



We start by creating a Data Source.

2.2 Import data from csv file

- You should have with you a csv file called 2008_ORD.csv or a zipped version of this file.
 - Expand the zip file if necessary.
 - Create an Alpine Data Source by importing this file (see Appendix A Elementary Tasks)
 - Once you are done you should be able to see a data source called ORD_2008 under ConnectionDemo.
-

2.2.1 Summary Statistics

Once we have created a Data Source we will use it to do a sanity check of the data. The very first thing we do, something that is almost always the first step, is running Summary Statistics on the data. The Summary Statistics module in Alpine does an inventory and sanity check of the data provided by the Data Source. It then produces a tabular report with the results of its efforts.

We will use the Summary Statistics module operating on data from the Data Source.

Create a flow with the following schematic (see Appendix B for schematic syntax)

```
ORD 2008 |-----> Summary Statistics
```

Note that this requires you to drag and drop the modules for the two end points onto the workspace first and then make a connection between them as per the schematic.

Here just for clarification we will show the association between the schematic and the actual image in the workspace. The schematic is above and the corresponding flow diagram is below.

Flow for Summary Statistics

Henceforth we'll just use the schematic for brevity and show the state of the full flow only at a few intermediate checkpoints.

Now we will need to run the flow.

For this click on the "RUN" item on the top right of the menu bar.

Now you will see status messages at the bottom in a console.

RESULTS - Status

```
[10:43:44] ORD_2008 started running.....  
[10:43:44] ORD_2008 finished  
[10:43:44] Summary Statistics started running.....
```

Once the messages show that the flow has completed running,

RESULTS - Status

```
[10:43:44] ORD_2008 started running.....  
[10:43:44] ORD_2008 finished  
[10:43:44] Summary Statistics started running.....  
[10:48:31] Summary Statistics finished  
[10:48:31] Analytic Flow finished  
Click on individual operators to see their output.
```

click on the Summary Statistics module icon in the flow.

You will see the results that look similar to the following

name	data type	count	unique	null value	empty	zero
taxiout	integer	333331	229	0	N/A	0
cancelled	integer	333331	1	0	N/A	333331
cancellationcode	integer	0	0	333331	N/A	0
diverted	integer	333331	1	0	N/A	333331
carrierdelay	integer	95961	522	237370	N/A	73309
weatherdelay	integer	95961	312	237370	N/A	91535
nasdelay	integer	95961	455	237370	N/A	26818
securitydelay	integer	95961	53	237370	N/A	95842
lateaircraftdelay	integer	95961	396	237370	N/A	51116

Thumbnail linked to full image Summary Flow

2.2.2 Null Value Replacement

The output of the Summary Statistics run output will tell us how many null values there were and where. We need to replace null values with some concrete value such as 0 for numeric columns and "" for character columns. The Null Value Replacement module does this en masse over the whole Data Source.

We add a segment to our existing flow. The new segment has the following schematic

```
ORD 2008 |-----> Null Value Replacement
```

Double click on the Null Value Replacement module and see a dialog box for configuration. We set the values in the dialog as follows

Null Value Replacement Configuration

<input checked="" type="checkbox"/>	Select Columns	Value
<input checked="" type="checkbox"/>	year	0
<input checked="" type="checkbox"/>	month	0
<input checked="" type="checkbox"/>	dayofmonth	0
<input checked="" type="checkbox"/>	dayofweek	0
<input checked="" type="checkbox"/>	deptime	0
<input checked="" type="checkbox"/>	crsdeptime	0
<input checked="" type="checkbox"/>	arrtime	0
<input checked="" type="checkbox"/>	crsarrrtime	0
<input checked="" type="checkbox"/>	uniquecarrier	"
<input checked="" type="checkbox"/>	flightnum	0
<input checked="" type="checkbox"/>	tailnum	"
<input checked="" type="checkbox"/>	actualelapsedtime	0
<input checked="" type="checkbox"/>	crselapsedtime	0

CANCEL

OK

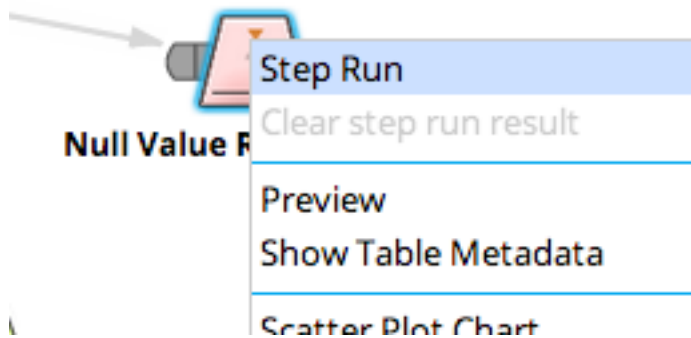
Now we run the flow again and when the flow has completed the values will have been replaced.

We are now ready to do some exploratory visualization.

2.2.3 Step run vs Run

When running complicated flows with large data, it is time effective to run each step of the flow separately once we know that the previous steps have been successful. Otherwise all the previous steps will be run redundantly and with large data sets this will be wasteful of resources.

To run a single module in the flow (assuming all the previous inputs have been computed and are ready) alt-click on the module and pick the "Step run" option.



2.2.4 Box plot

We now explore arrival delay on different days of the week and their distribution using the Box Plot module.

Add the following segment to the flow

ORD 2008 |-----> Box Plot

Set the Box Plot configuration by double-clicking on the Box Plot module.



Box Plot

Analysis Value (Y-axis)

arrdelay



Analysis Series



Analysis Type (X-axis)

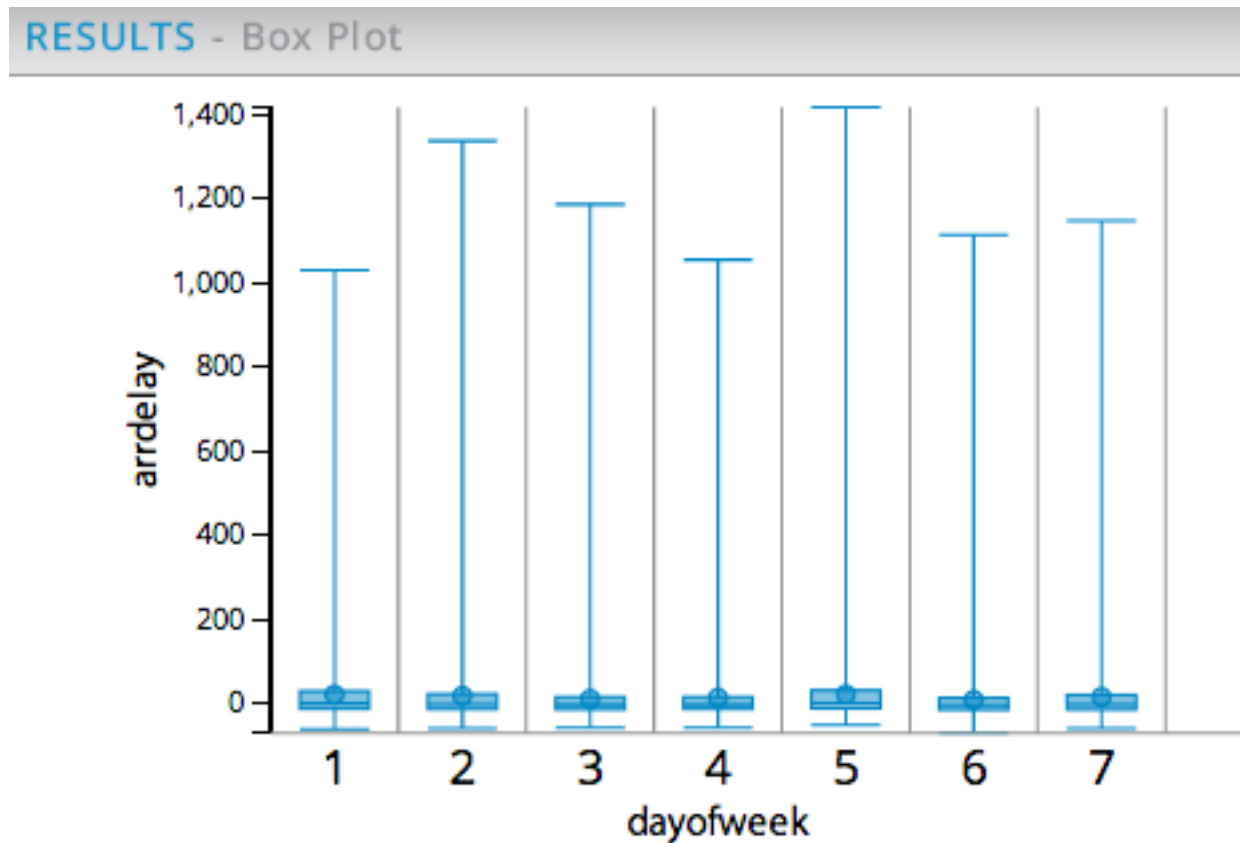
dayofweek



CANCEL

OK

Step run the Box Plot module. You will see a result similar to the following.



2.2.5 Scatterplot matrix

We want to explore correlations between variables to see which ones we might use in our predictive model.

Add the following segment to the flow.

```
ORD 2008 |-----> Scatter Plot Matrix
```

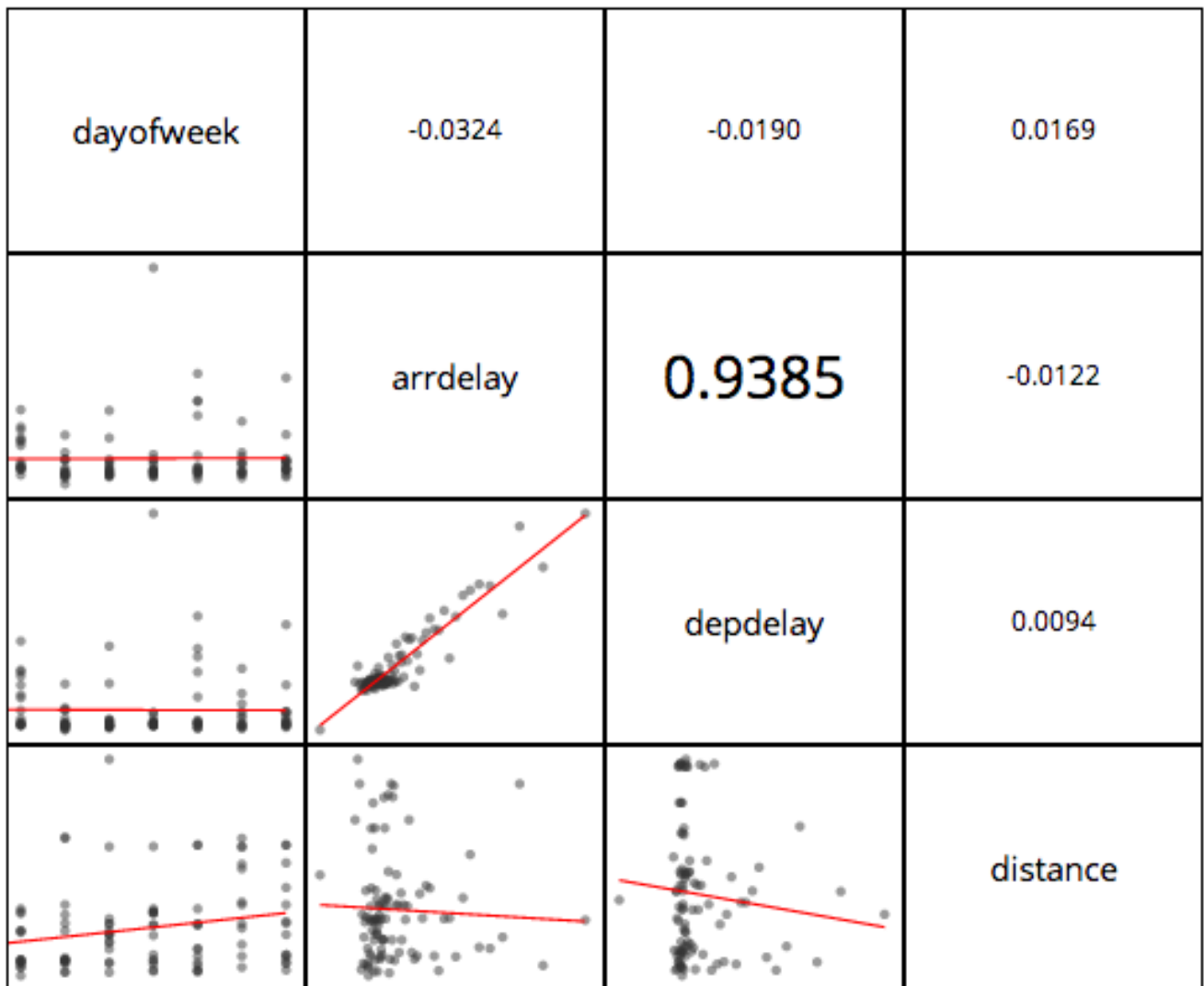
Set the Scatter Plot Matrix configuration as follows

Double click on the Scatter Plot Matrix module icon and select the following columns, dayofweek, arrdelay, depdelay, distance.

Then save.

Now step run the Scatter Plot Matrix module. This may take a while. Look at the console messages to tell you when you will be done.

When done you should see a diagram similar to this.



To be able to see the diagram fully, click on the arrow at the far right of the console menu. This is an arrow pointing up and to the right and on clicking will expand the window to give you a full view of the Scatter Plot Matrix.

This tells us that depdelay and arrdelay are strongly correlated, i.e. if the plane took off late it is most likely to arrive late at the next destination. This is insightful but we don't need data science to tell us this. However this is a very useful training exercise so we continue using this correlation for the predictive model. In reality we would want to predict the delay long before the flight took off late from the previous destination.

Chapter 3

Model Creation

In this phase we will create our two different predictive models and in the next phase we will evaluate them. As usual we will create our flow incrementally and Step Run each new module. Each segment will be created according to a schematic for that segment.

At the end of this phase the full flow should look like

3.1 Variable Creation

Schematic for flow.

Null Value Replacement |-----> Variable

Define Variables

create

Variable Name	Data Type	SQL Expression
SrsArrDelay	BIGINT	CASE WHEN "ArrDelay" > 15...

delete

Select existing columns as variables

all | none

☐ departure

☒ deptime

☒ crsdeptime

☒ arrtime

☒ crsarrrtime

☐ uniquecarrier

☐ flightnum

☐ tailnum

☒ actualelapsedtime

☒ crselapsedtime

☐ airtime

☐ arrdelay

☐ depdelay

☐ origin

☐ dest

☐ distance

☐ taxiin

☐ taxiout

CANCEL

OK

Define Variables

Variable Name	Data Type	SQL Expression	
SrsArrDelay	BIGINT	CASE WHEN "ArrDelay" > 15...	create delete

Select existing columns as variables [all](#) | [none](#)
☐ arrdelay
☒ deptime
☒ credentime

```
1 CASE WHEN "ArrDelay" > 15 THEN 1 ELSE 0 END
```

3.2 Random Sampling

Now we create two data sets by random sampling from original data. We want to use one as training set to create our model and the other as a validation set to see how good our model turned out.

Schematic for flow.

Variable |-----> Random Sampling

Configuration



Random Sampling

Number of Samples

Sample by ☒ Percentage ☐ Number of Rows

Sample Size


Random Seed

Consistent ☐ true ☒ false

Replacement ☐ true ☒ false

Disjoint ☒ true ☐ false

Key Columns

Output Schema 

Output Table

Storage Parameters

Drop If Exists ☒ Yes ☐ No

CANCEL

OK



Random Sampling

Number of Samples

Sample by ☒ Percentage ☐ Number of Rows

Sample Size

Random Seed

Consistent ☐ true ☒ false

Replacement ☐ true ☒ false

Disjoint ☒ true ☐ false

Key Columns

Output Schema ▼

Output Table

Storage Parameters

Drop If Exists ☒ Yes ☐ No

CANCEL

OK

3.3 Training

Schematic for flow.

Random Sampling |-----> Training



Training

Selected Sample ☒ Sample 1 (80%)
☐ Sample 2 (20%)

3.4 Validation

Schematic for flow.

Random Sampling |-----> Validation



Validation

Selected Sample ☐ Sample 1 (80%)
☒ Sample 2 (20%)

3.4.1 Logistic Regression

Schematic for flow.

Training |-----> Logistic Regression

Configuration.



Logistic Regression

Dependent Column	SrsArrDelay	▼
Value to Predict	1	
Force Retrain	<input checked="" type="radio"/> Yes <input type="radio"/> No	
Maximum Number of Iterations	25	
Epsilon	0.00000001	
Interaction Parameters	Interaction Parameters	
Columns	Select Columns	
Stepwise Feature Selection	<input type="radio"/> true <input checked="" type="radio"/> false	
Stepwise Type	FORWARD	▼
Criterion Type		▼
Check Value	0.05	
Group By		▼

Select Columns

Filter list

all | none

- ☒ deptime
- ☒ crsdeptime
- ☒ arrtime
- ☒ crsarrrtime
- ☒ actualelapsedtime
- ☒ crselapsedtime

3.4.2 Naive Bayes

Schematic for flow.

Training |-----> Naive Bayes

Configuration.



Naive Bayes

Dependent Column SrsArrDelay ▼

Force Retrain ☒ Yes ☐ No

Calculate Deviance ☐ true ☒ false

Columns Select Columns

Select Columns

Filter list

[all](#) | [none](#)

- ☒ deptime
- ☒ crsdeptime
- ☒ arrtime
- ☒ crsarrrtime
- ☒ actualelapsedtime
- ☒ crselapsedtime

Chapter 4

Model Evaluation

4.1 ROC

Schematic for flow.

Logistic Regression |-----> ROC

Naive Bayes |-----> ROC

Validation |-----> ROC



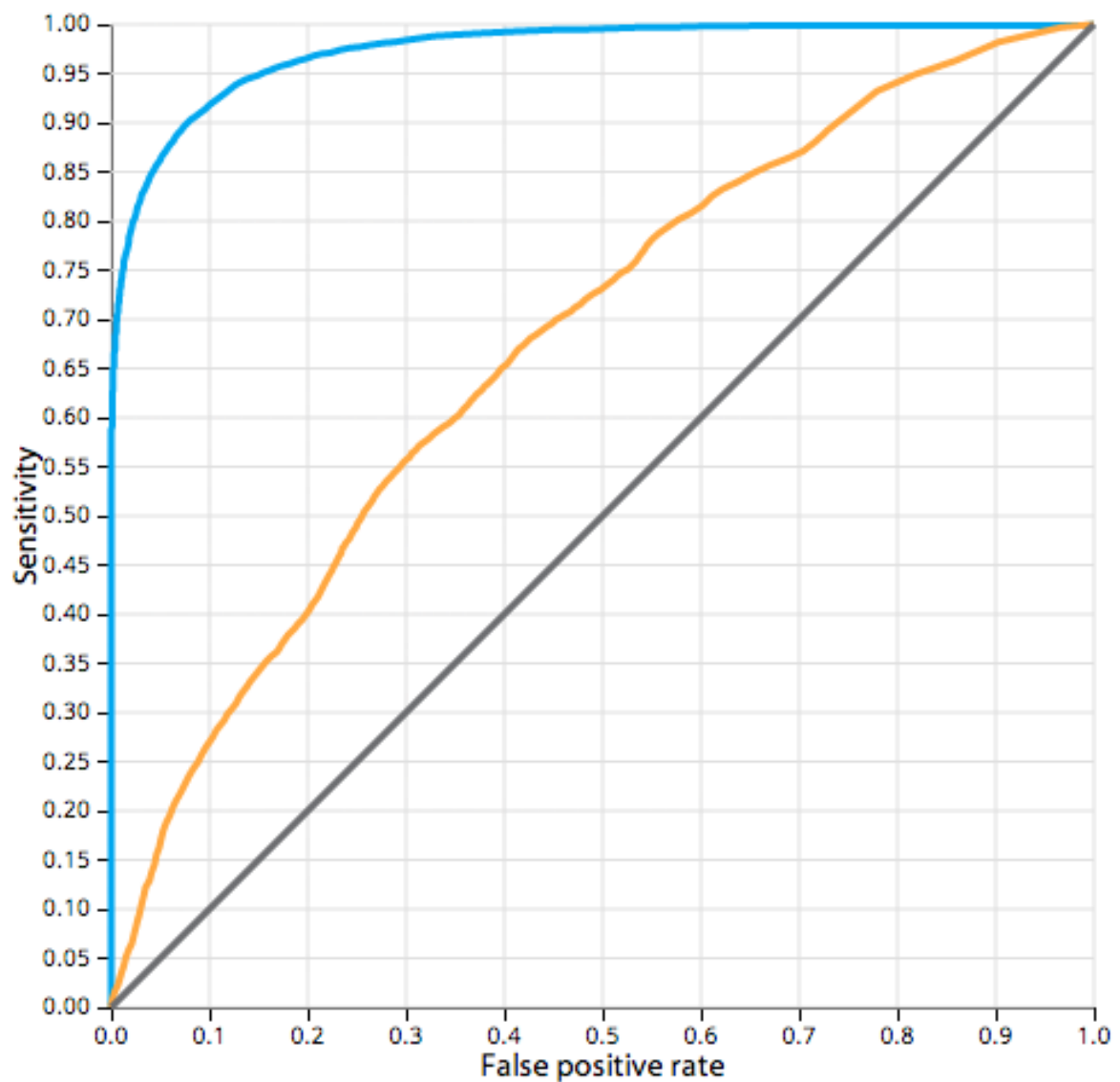
ROC

Dependent Column SrsArrDelay

Value to Predict 1

Use Model ☒ true ☐ false

Logistic Regression AUC = 0.974 Naive Bayes AUC = 0.6761



☒  Logistic Regression ROC curve ☒  Naive Bayes ROC curve ☒  Random

4.2 LogReg Predictor

Schematic for flow.

Logistic Regression |-----> LogReg Predictor

Variable |-----> LogReg Predictor

Chapter 5

Iterating on the Model

5.1 Overview

Here we follow the steps in the Model Creation exercise but use more realistic predictors.

Note

Need more specifics now that we have the rest pretty much covered

Chapter 6

Appendix A Elementary Tasks

- Log in to Alpine Miner
- Create a connection
- Create a Flow
- Set properties on a module
- Create a Data source by importing from a CSV file

Note

Figure with properties dialog for Import File

- Join two data sources
 - Run a flow
-

Chapter 7

Appendix B (Schematic syntax)

- A Flow Segment

```
SourceModuleName |---> TargetModuleName  
e.g. ORD2008 |---> Summary Statistics
```

- The corresponding flow in the workspace
-