IST565 Data Mining
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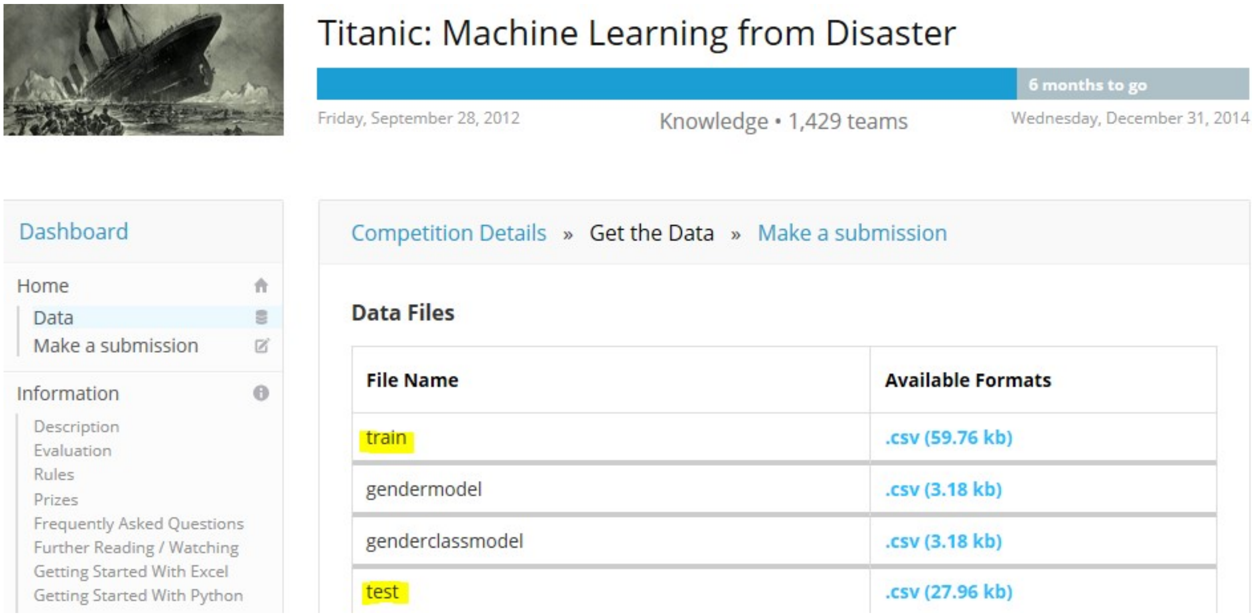
Tutorial on Building Decision Tree for Kaggle Titanic Competition Using Weka

This tutorial will walk you through the process of preparing Kaggle Titanic data for Weka, and then using Weka's J48 algorithm to build a decision tree to predict Titanic survivors, and how to visualize the decision tree to observe what patterns/rules the decision tree model has learned from the training data. This tutorial will also demonstrate how to use information gain as feature ranking methods to explore the relevance between features and prediction target.

1. Go to Kaggle. Download **test** and **training** data CSV files.



Titanic: Machine Learning from Disaster

Friday, September 28, 2012 — Knowledge • 1,429 teams — Wednesday, December 31, 2014

Data Files

File Name	Available Formats
train	.csv (59.76 kb)
gendermodel	.csv (3.18 kb)
genderclassmodel	.csv (3.18 kb)
test	.csv (27.96 kb)

6 months to go
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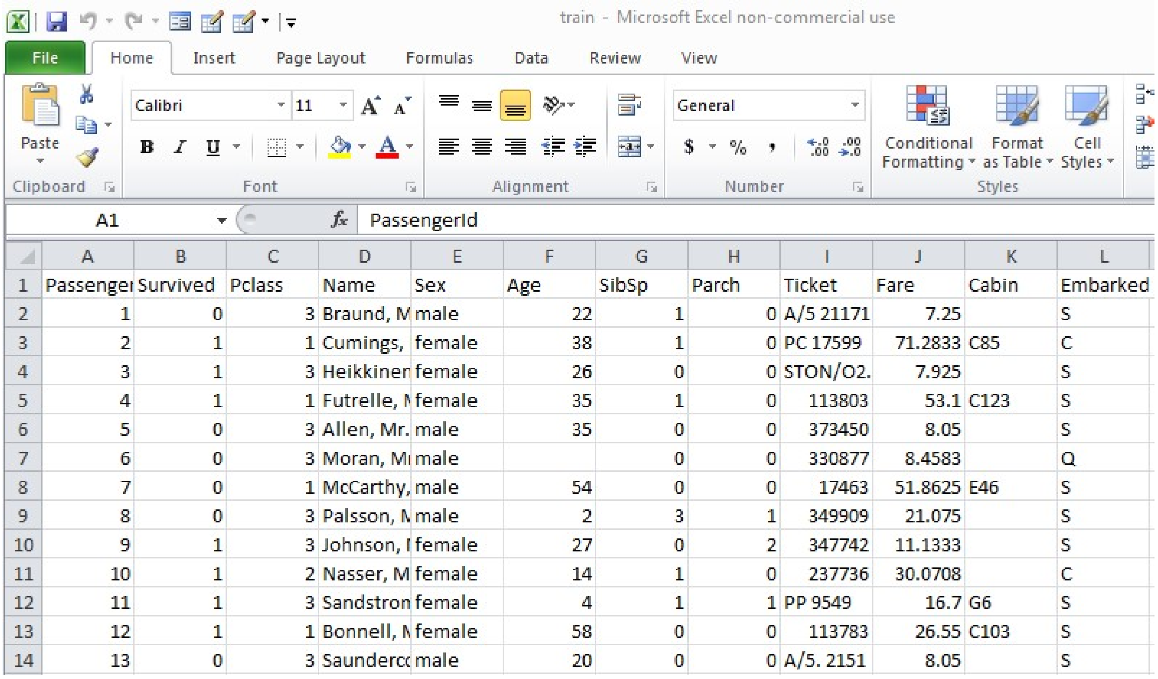
Getting Started With Python
Competition Details » Get the Data » Make a submission

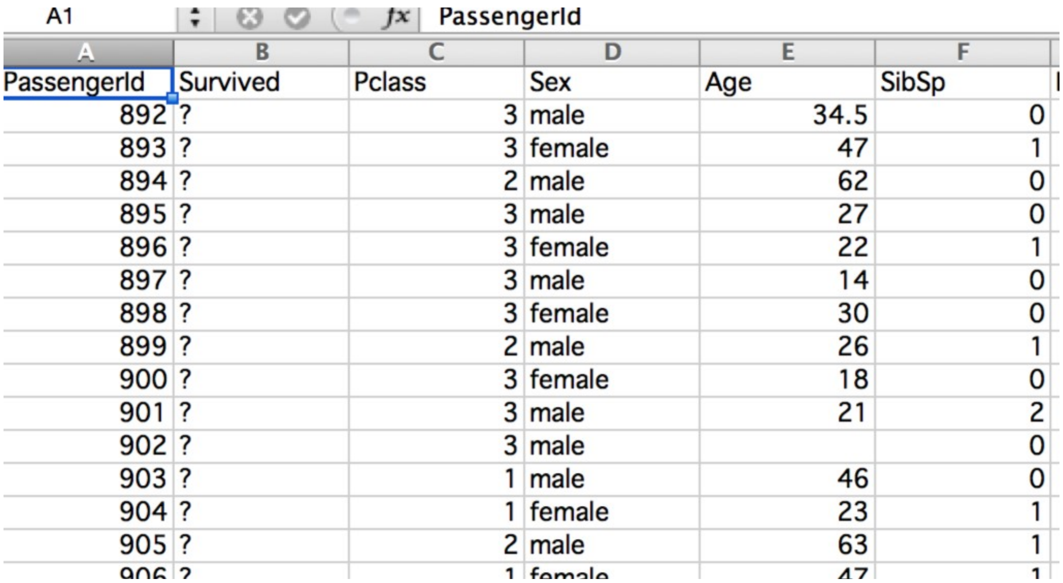
2. Prepare data files.
    a. Open **training** CSV data file in MS Excel.
    b. There are 12 columns (attributes).



A1 PassengerId

	A	B	C	D	E	F	G	H	I	J	K	L
1	Passengei	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
2	1	0	3	Braund, M	male	22	1	0	A/5 21171	7.25		S
3	2	1	1	Cumings,	female	38	1	0	PC 17599	71.2833	C85	C
4	3	1	3	Heikkinen	female	26	0	0	STON/O2.	7.925		S
5	4	1	1	Futrelle, M	female	35	1	0	113803	53.1	C123	S
6	5	0	3	Allen, Mr.	male	35	0	0	373450	8.05		S
7	6	0	3	Moran, Mı	male		0	0	330877	8.4583		Q
8	7	0	1	McCarthy,	male	54	0	0	17463	51.8625	E46	S
9	8	0	3	Palsson, M	male	2	3	1	349909	21.075		S
10	9	1	3	Johnson, I	female	27	0	2	347742	11.1333		S
11	10	1	2	Nasser, M	female	14	1	0	237736	30.0708		C
12	11	1	3	Sandstron	female	4	1	1	PP 9549	16.7	G6	S
13	12	1	1	Bonnell, M	female	58	0	0	113783	26.55	C103	S
14	13	0	3	Saunderco	male	20	0	0	A/5. 2151	8.05		S

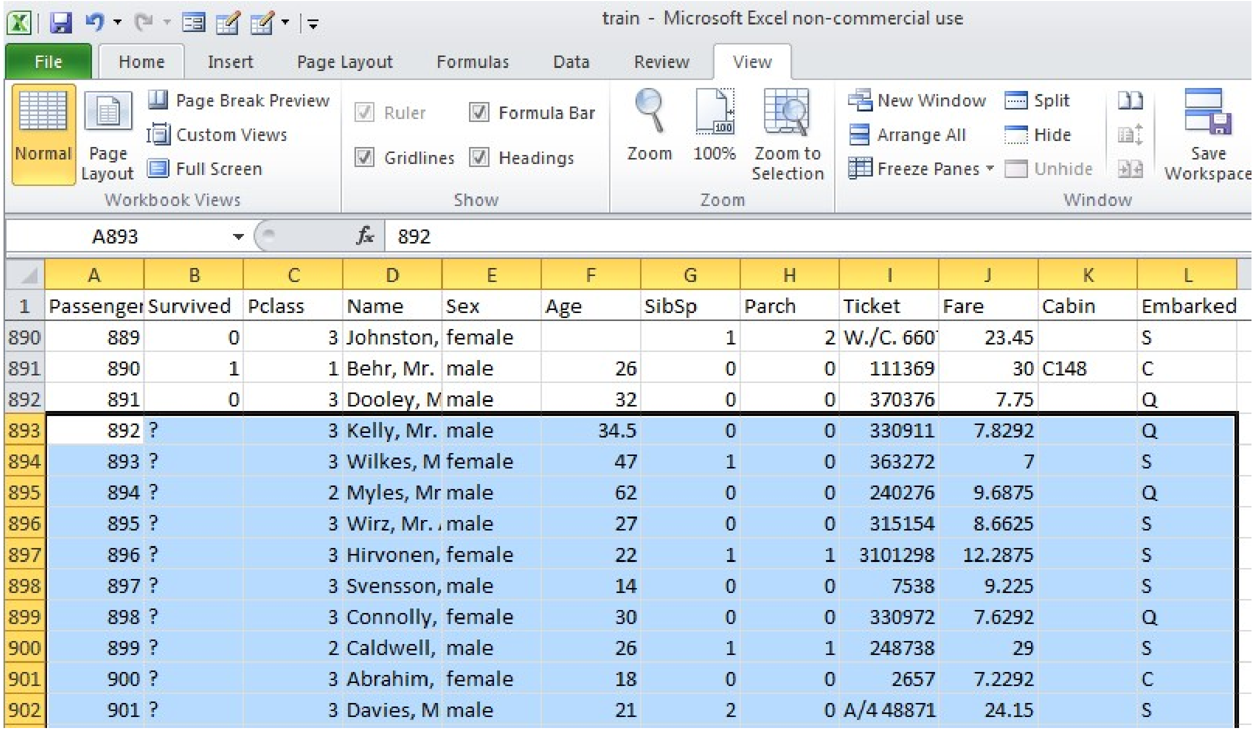
    c. Open **test** CSV data file in MS Excel.
    d. Add a new column "Survived" in **test** data file.
    e. Populate "Survived" column with question marks ("?") in **test** data.



A1 PassengerId

A	B	C	D	E	F
PassengerId	Survived	Pclass	Sex	Age	SibSp
892	?	3	male	34.5	0
893	?	3	female	47	1
894	?	2	male	62	0
895	?	3	male	27	0
896	?	3	female	22	1
897	?	3	male	14	0
898	?	3	female	30	0
899	?	2	male	26	1
900	?	3	female	18	0
901	?	3	male	21	2
902	?	3	male		0
903	?	1	male	46	0
904	?	1	female	23	1
905	?	2	male	63	1
906	?	1	female	47	1

3. Merge training and test data.
    a. Weka will allow us to read in CSV files. But when we read in one training data and one test data Weka will report an error their formats are not compatible, even though they appear identical. In order to allow Weka to recognize both of them as the same data format, we can copy both training and test examples into one file and let Weka read it in, and convert it to its own arff file. Then we separate it again back into train and test in Weka.
    b. Now copy all records from **test** CSV(but **not** the first row of headings) into the **training** CSV file.

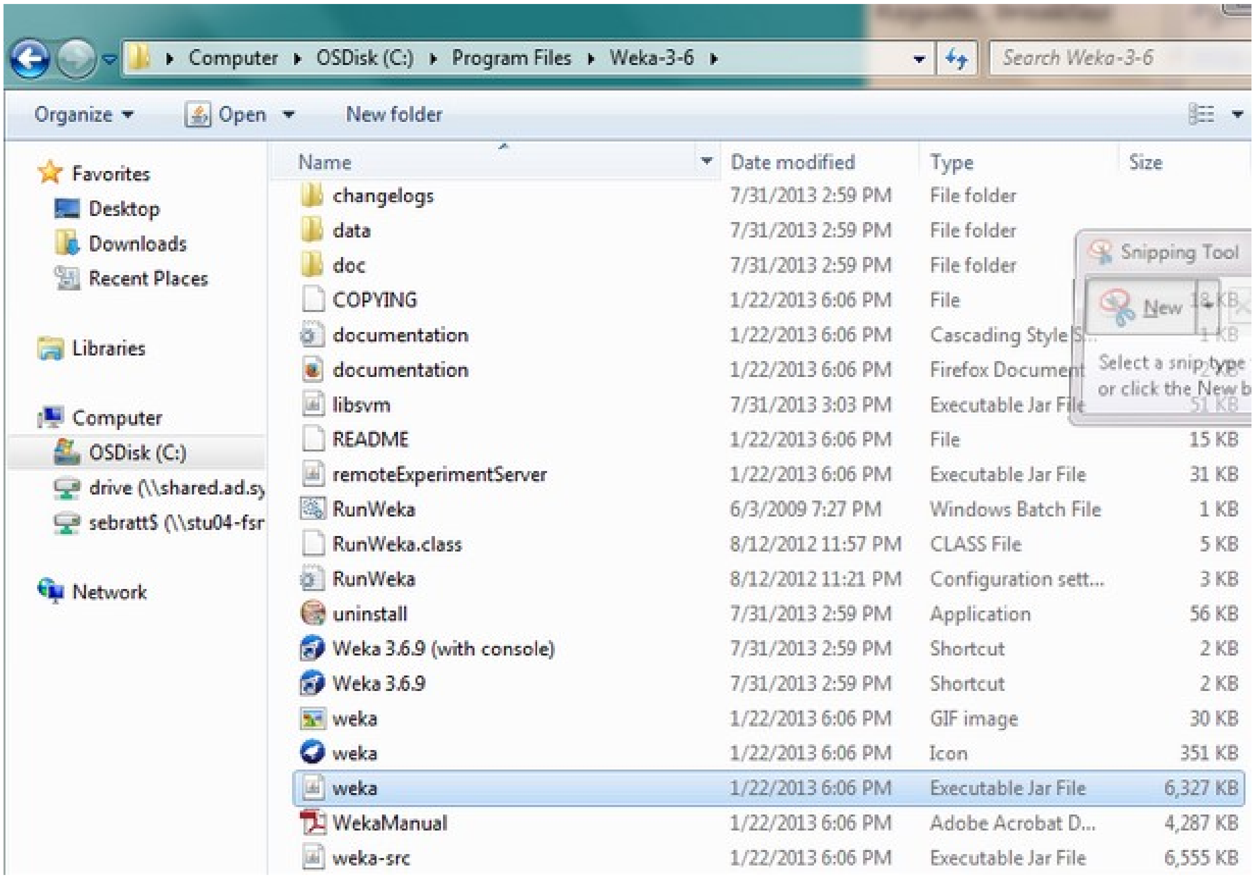


	A	B	C	D	E	F	G	H	I	J	K	L
1	Passenger	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
890	889	0	3	Johnston,	female		1	2	W./C. 660	23.45		S
891	890	1	1	Behr, Mr.	male	26	0	0	111369	30	C148	C
892	891	0	3	Dooley, M	male	32	0	0	370376	7.75		Q
893	892	?	3	Kelly, Mr.	male	34.5	0	0	330911	7.8292		Q
894	893	?	3	Wilkes, M	female	47	1	0	363272	7		S
895	894	?	2	Myles, Mr	male	62	0	0	240276	9.6875		Q
896	895	?	3	Wirz, Mr.	male	27	0	0	315154	8.6625		S
897	896	?	3	Hirvonen,	female	22	1	1	3101298	12.2875		S
898	897	?	3	Svensson,	male	14	0	0	7538	9.225		S
899	898	?	3	Connolly,	female	30	0	0	330972	7.6292		Q
900	899	?	2	Caldwell,	male	26	1	1	248738	29		S
901	900	?	3	Abrahim,	female	18	0	0	2657	7.2292		C
902	901	?	3	Davies, M	male	21	2	0	A/4 48871	24.15		S

    c. Delete unnecessary columns (optional). I got rid of “Name” and “Ticket” because these are not relevant or helpful attributes to our classification task.

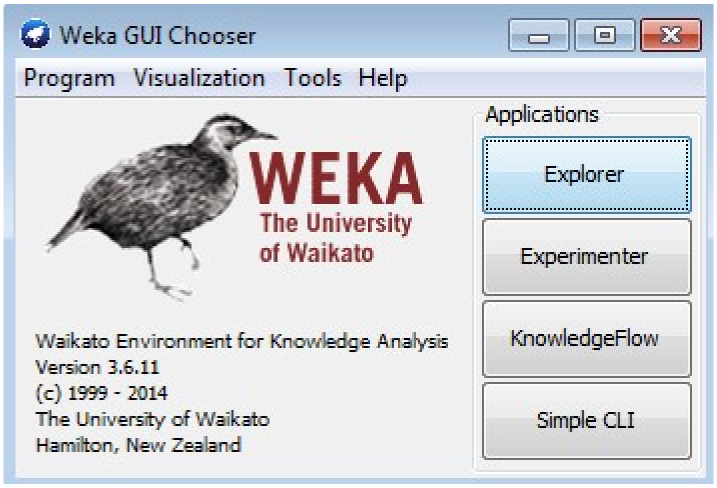
Now we have preprocessed and merged both files. Save this as a new file (I call mine: “TitanicAll.csv).

4. Read CSV into Weka
    a. You can use remote lab to access Weka or you can download Weka (free) onto your own device. On iSchool computers, you can find Weka by going to Computer-> OSdisk_> program files-> weka 3-6: then select the "executable jar file."



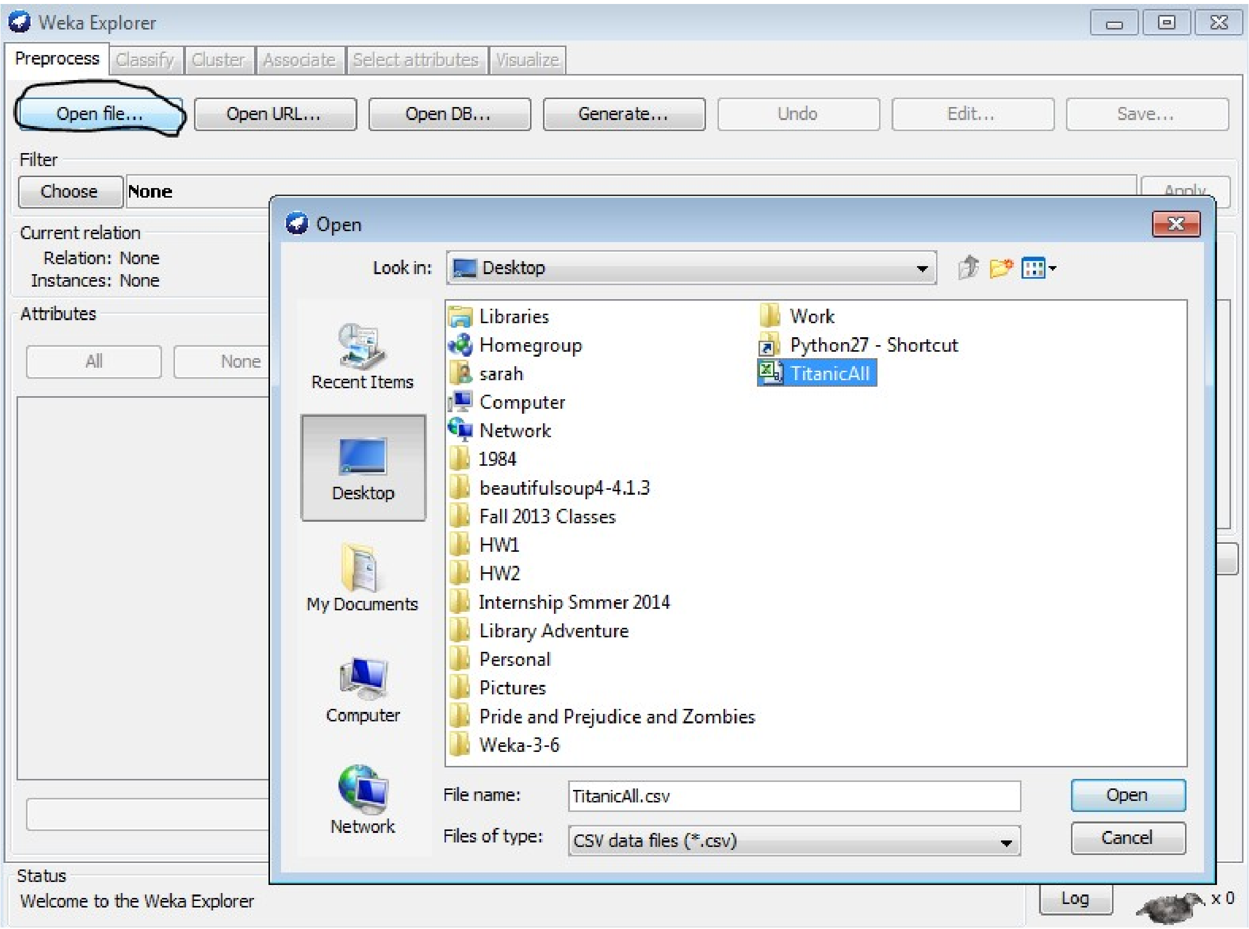
Name	Date modified	Type	Size
changelogs	7/31/2013 2:59 PM	File folder	
data	7/31/2013 2:59 PM	File folder	
doc	7/31/2013 2:59 PM	File folder	
COPYING	1/22/2013 6:06 PM	File	18 KB
documentation	1/22/2013 6:06 PM	Cascading Style S...	1 KB
documentation	1/22/2013 6:06 PM	Firefox Document	2 KB
libsvm	7/31/2013 3:03 PM	Executable Jar File	51 KB
README	1/22/2013 6:06 PM	File	15 KB
remoteExperimentServer	1/22/2013 6:06 PM	Executable Jar File	31 KB
RunWeka	6/3/2009 7:27 PM	Windows Batch File	1 KB
RunWeka.class	8/12/2012 11:57 PM	CLASS File	5 KB
RunWeka	8/12/2012 11:21 PM	Configuration sett...	3 KB
uninstall	7/31/2013 2:59 PM	Application	56 KB
Weka 3.6.9 (with console)	7/31/2013 2:59 PM	Shortcut	2 KB
Weka 3.6.9	7/31/2013 2:59 PM	Shortcut	2 KB
weka	1/22/2013 6:06 PM	GIF image	30 KB
weka	1/22/2013 6:06 PM	Icon	351 KB
weka	1/22/2013 6:06 PM	Executable Jar File	6,327 KB
WekaManual	1/22/2013 6:06 PM	Adobe Acrobat D...	4,287 KB
weka-src	1/22/2013 6:06 PM	Executable Jar File	6,555 KB

    b. Open Weka explorer.



Waikato Environment for Knowledge Analysis
Version 3.6.11
(c) 1999 - 2014
The University of Waikato
Hamilton, New Zealand

c. Click "Open File." Select "CSV" from "files of type." Select TitanicAll.csv.



Filter: None

Relation: None
Instances: None

Look in: Desktop

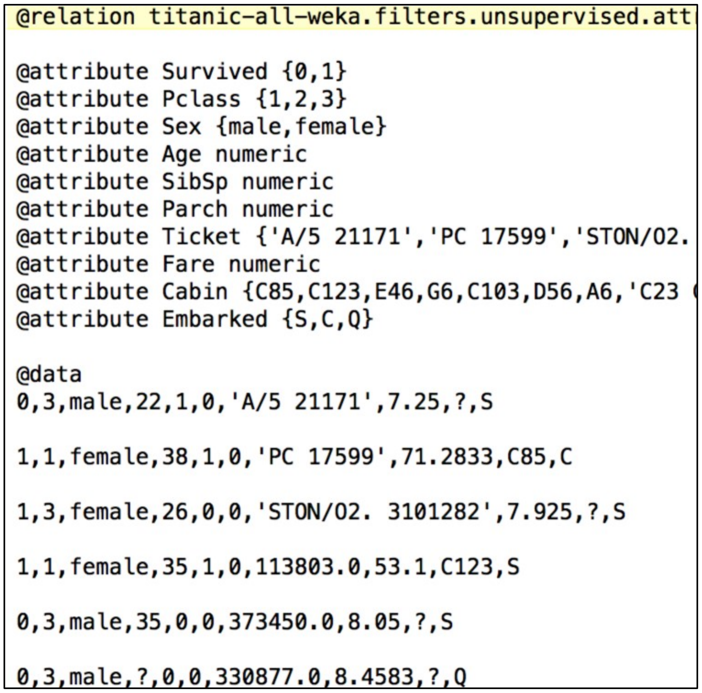
File name: TitanicAll.csv

Files of type: CSV data files (*.csv)

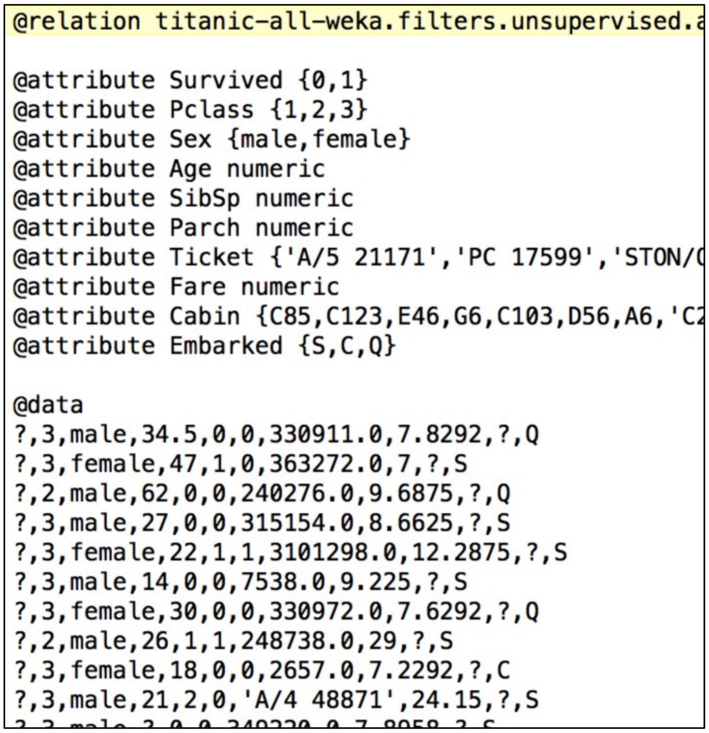
Welcome to the Weka Explorer

Now you have successfully read your merged training and test data file into Weka. Save this file in the .arff format, and then separate the train and test examples into two files. The two files should have the same heading and data description. Therefore, you need to make a copy of the merged file and name it

"Titanic-train.arff", and then delete all test example lines in it. Now you have your training arff file ready. Then make another copy of the merged file and name it "Titanic-test.arff", and then delete all training example lines in it. Now you have your test arff file ready.



```
@relation titanic-all-weka.filters.unsupervised.att

@attribute Survived {0,1}
@attribute Pclass {1,2,3}
@attribute Sex {male,female}
@attribute Age numeric
@attribute SibSp numeric
@attribute Parch numeric
@attribute Ticket {'A/5 21171','PC 17599','STON/O2.
@attribute Fare numeric
@attribute Cabin {C85,C123,E46,G6,C103,D56,A6,'C23 
@attribute Embarked {S,C,Q}

@data
0,3,male,22,1,0,'A/5 21171',7.25,?,S

1,1,female,38,1,0,'PC 17599',71.2833,C85,C

1,3,female,26,0,0,'STON/O2. 3101282',7.925,?,S

1,1,female,35,1,0,113803.0,53.1,C123,S

0,3,male,35,0,0,373450.0,8.05,?,S

0,3,male,?,0,0,330877.0,8.4583,?,Q
```

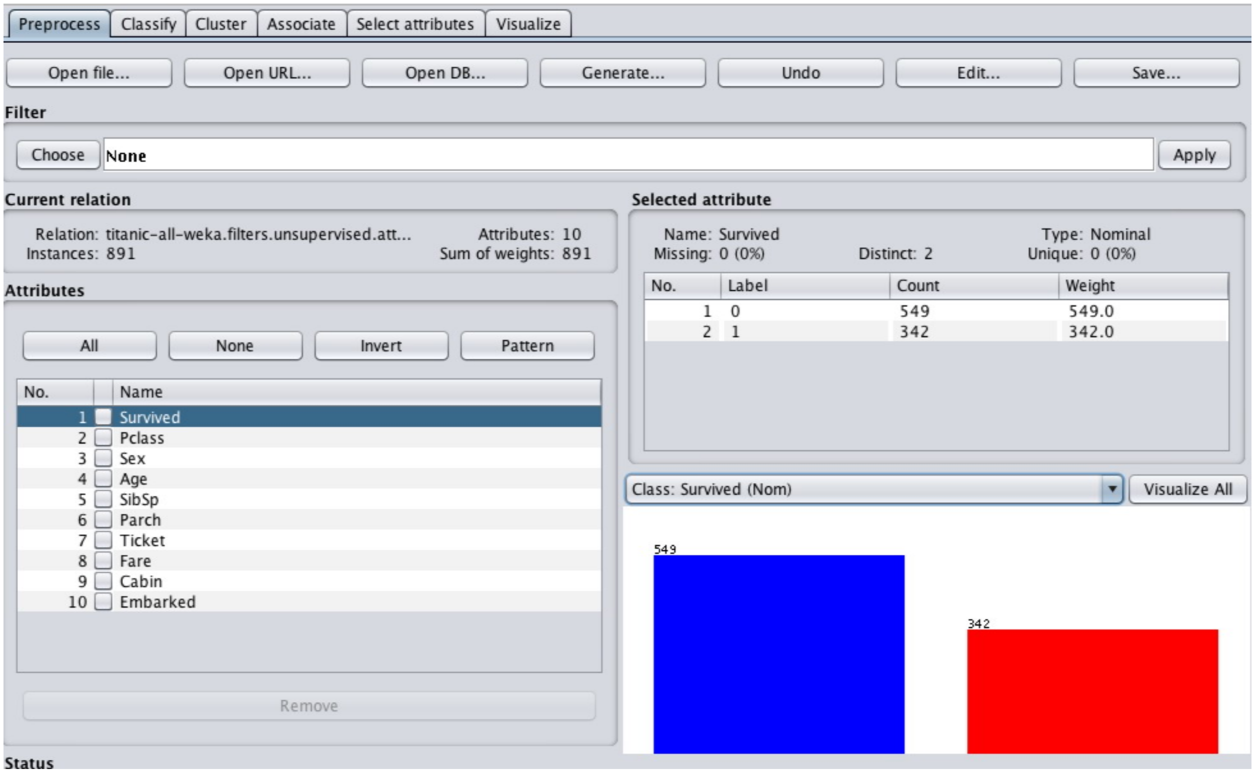


```
@relation titanic-all-weka.filters.unsupervised.a

@attribute Survived {0,1}
@attribute Pclass {1,2,3}
@attribute Sex {male,female}
@attribute Age numeric
@attribute SibSp numeric
@attribute Parch numeric
@attribute Ticket {'A/5 21171','PC 17599','STON/(
@attribute Fare numeric
@attribute Cabin {C85,C123,E46,G6,C103,D56,A6,'C2
@attribute Embarked {S,C,Q}

@data
?,3,male,34.5,0,0,330911.0,7.8292,?,Q
?,3,female,47,1,0,363272.0,7,?,S
?,2,male,62,0,0,240276.0,9.6875,?,Q
?,3,male,27,0,0,315154.0,8.6625,?,S
?,3,female,22,1,1,3101298.0,12.2875,?,S
?,3,male,14,0,0,7538.0,9.225,?,S
?,3,female,30,0,0,330972.0,7.6292,?,Q
?,2,male,26,1,1,248738.0,29,?,S
?,3,female,18,0,0,2657.0,7.2292,?,C
?,3,male,21,2,0,'A/4 48871',24.15,?,S
?,3,male,?,0,0,349220.0,7.8958,?,S
```

Now the Titanic training data is ready to be loaded into Weka to build decision tree. First, use the "open file" in "Preprocess" tab to load in the training data.

The upper right part of the interface shows some basic statistics of the feature highlighted on the left side. In the following screenshot, it is "Survived".

On the lower right part of the interface, choose "Class Survived (Nom)" in the pull down menu of all features, and you will see the category distribution, i.e. how many survived (Label "1" color red) and how many died (Label "0" color blue)



Filter

None

Current relation

Relation: titanic-all-weka.filters.unsupervised.att... Attributes: 10
Instances: 891 Sum of weights: 891

Attributes

No.		Name
1	□	Survived
2	□	Pclass
3	□	Sex
4	□	Age
5	□	SibSp
6	□	Parch
7	□	Ticket
8	□	Fare
9	□	Cabin
10	□	Embarked

Selected attribute

Name: Survived Type: Nominal
Missing: 0 (0%) Distinct: 2 Unique: 0 (0%)

No.	Label	Count	Weight
1	0	549	549.0
2	1	342	342.0

Class: Survived (Nom)

Now go to "Classify" tab, under "Classifiers", click the "Choose" button, and find J48 algorithm under the "trees" folder.

Maybe just add a screen flow