Clementine Tutorial

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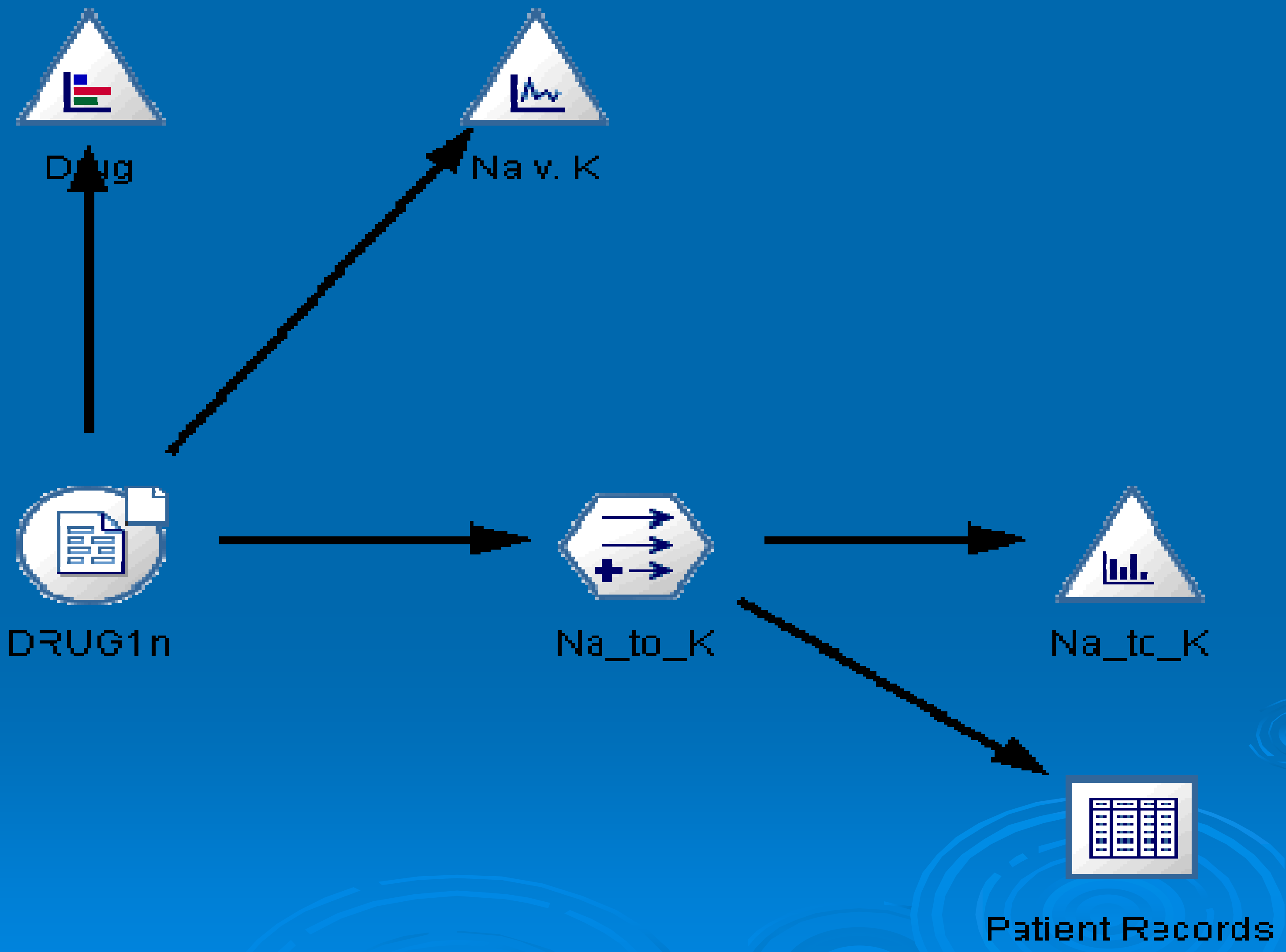
<http://fsktm.um.edu.my/~tehyw/6317_lab1.ppt>

- This tutorial will introduce you to the Clementine toolkit for data mining and show you how to get started with your own data mining project.

- The first part provides a tour of the workspace, including an update of what's new in this version of Clementine.
- The second part is a step-by-step guide to data mining in Clementine. All of the files shown in the examples are installed with Clementine so that you can follow along.

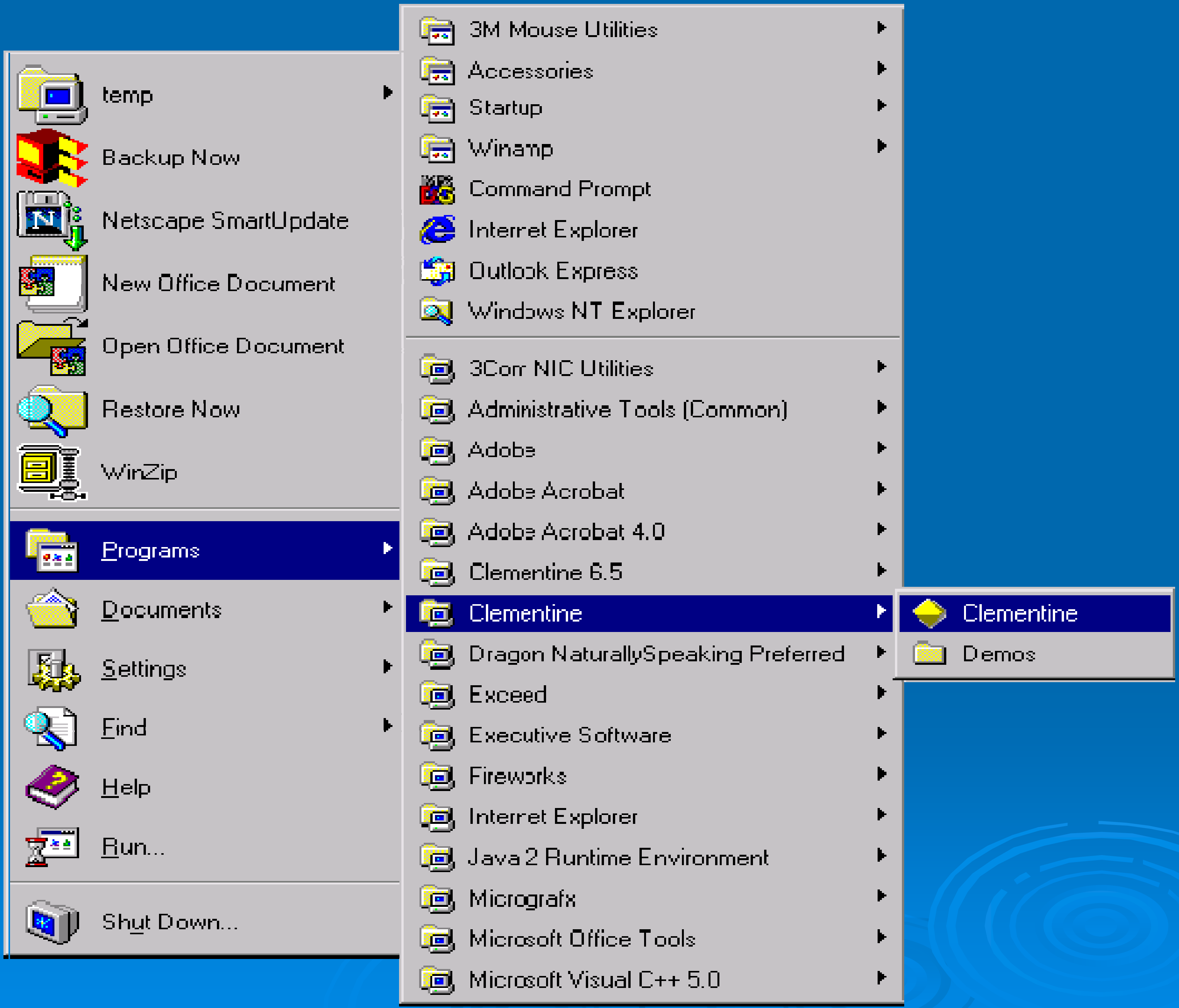
- Clementine uses a visual approach to data mining that provides a tangible way to work with data.
- Each process in Clementine is represented by an icon, or **node**, that you connect to form a **stream** representing the flow of data through a variety of processes.


Drug
Na v. K
DRUG1n
Na_to_K
Na_tc_K
Patient Records

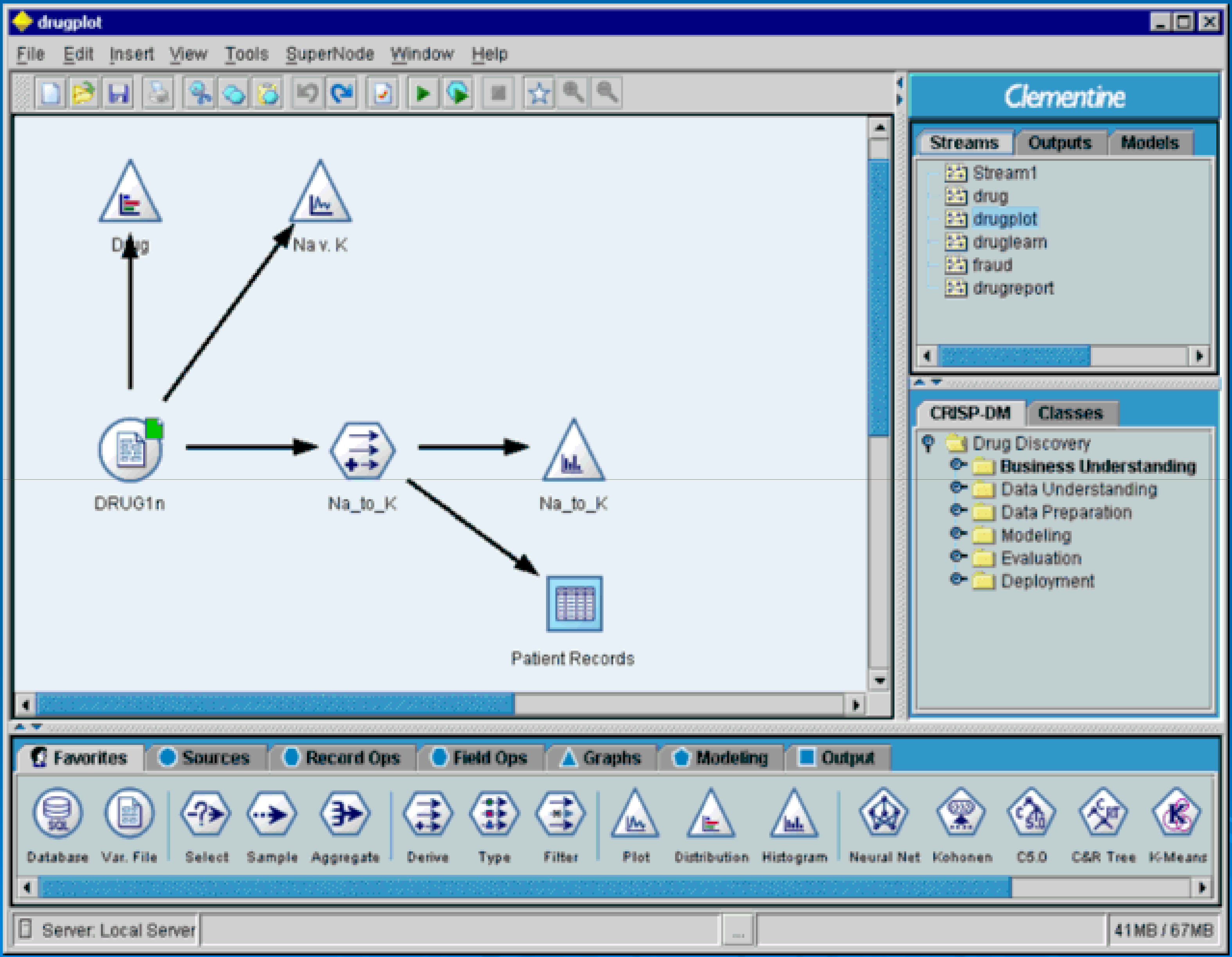
- Working in Clementine is essentially like using a visual metaphor to describe the world of data, statistics, and complex algorithms.

- Although it may take a minute to shift into this paradigm, you will soon find that Clementine's simplicity-of-use is exceedingly powerful. Let's take a closer look.

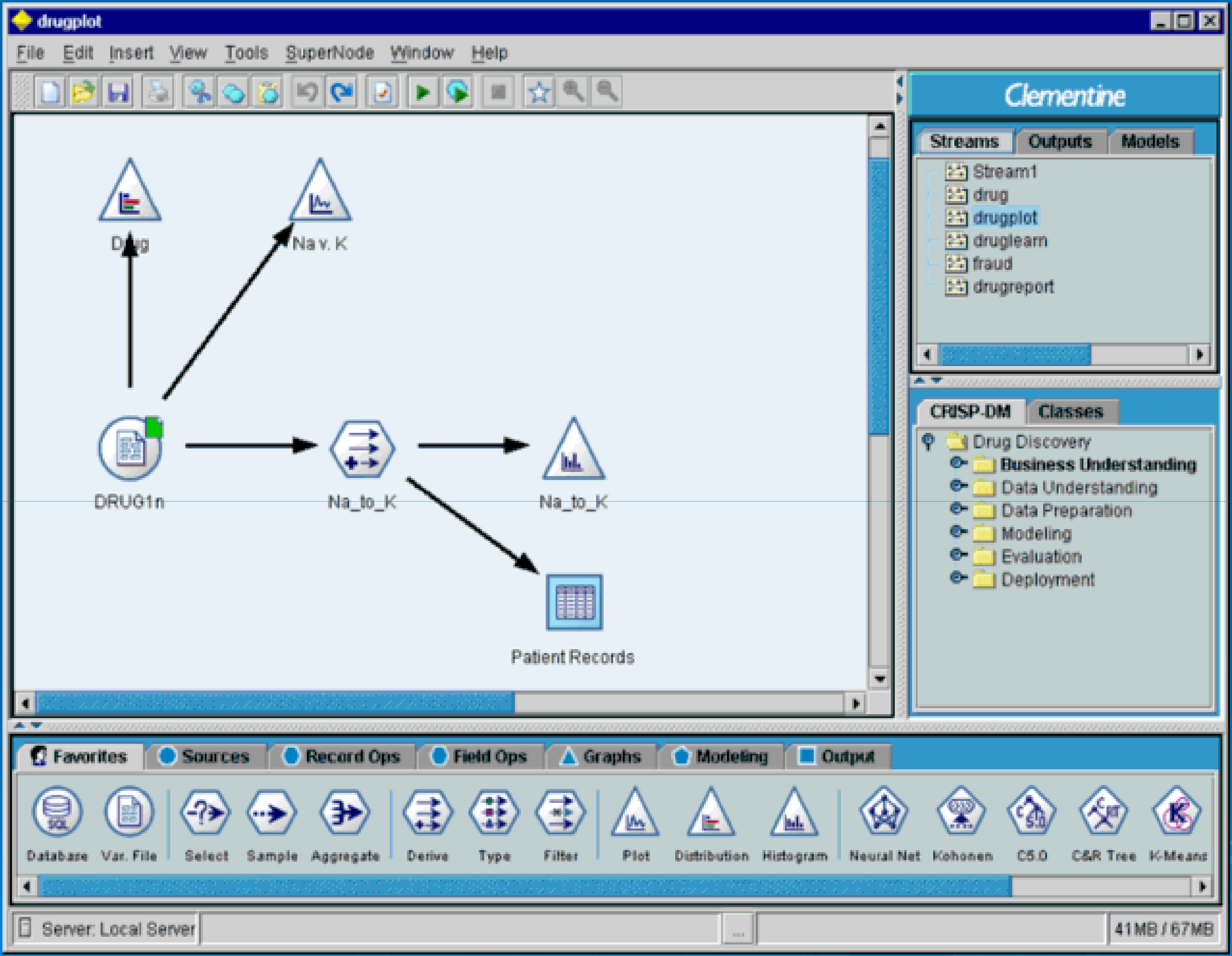
- To start Clementine:
  - From the Windows Start menu choose:
    - Programs
      Clementine


temp
Backup Now
Netscape SmartUpdate
New Office Document
Open Office Document
Restore Now
WinZip
Programs
Documents
Settings
Find
Help
Run...
Shut Down...
3M Mouse Utilities
Accessories
Startup
Winamp
Command Prompt
Internet Explorer
Outlook Express
Windows NT Explorer
3Com NIC Utilities
Administrative Tools (Common)
Adobe
Adobe Acrobat
Adobe Acrobat 4.0
Clementine 6.5
Clementine
Dragon NaturallySpeaking Preferred
Exceed
Executive Software
Fireworks
Internet Explorer
Java 2 Runtime Environment
Micrografx
Microsoft Office Tools
Microsoft Visual C++ 5.0
Clementine
Demos

- When you first start Clementine, the workspace opens in the default view.
- The tools here are used to help you create a visual representation of data mining operations.


drugplot
File
Edit
Insert
View
Tools
SuperNode
Window
Help
Drug
Na v. K
DRUG1n
Na_to_K
Na_to_K
Patient Records
Clementine
Streams
Outputs
Models
Stream1
drug
drugplot
druglearn
fraud
drugreport
CRISP-DM
Classes
Drug Discovery
Business Understanding
Data Understanding
Data Preparation
Modeling
Evaluation
Deployment
Favorites
Sources
Record Ops
Field Ops
Graphs
Modeling
Output
Database
Var. File
Select
Sample
Aggregate
Derive
Type
Filter
Plot
Distribution
Histogram
Neural Net
Kohonen
C5.0
C&R Tree
K-Means
Server: Local Server
41MB / 67MB

- First, the area in the middle is called the **stream canvas**. This is the main area you will use to work in Clementine.


drugplot
File Edit Insert View Tools SuperNode Window Help
Clementine
Streams Outputs Models
Stream1
drug
drugplot
druglearn
fraud
drugreport
CRISP-DM Classes
Drug Discovery
Business Understanding
Data Understanding
Data Preparation
Modeling
Evaluation
Deployment
Drug
Na v. K
DRUG1n
Na_to_K
Na_to_K
Patient Records
Favorites Sources Record Ops Field Ops Graphs Modeling Output
Database
Var. File
Select
Sample
Aggregate
Derive
Type
Filter
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Distribution
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K-Means
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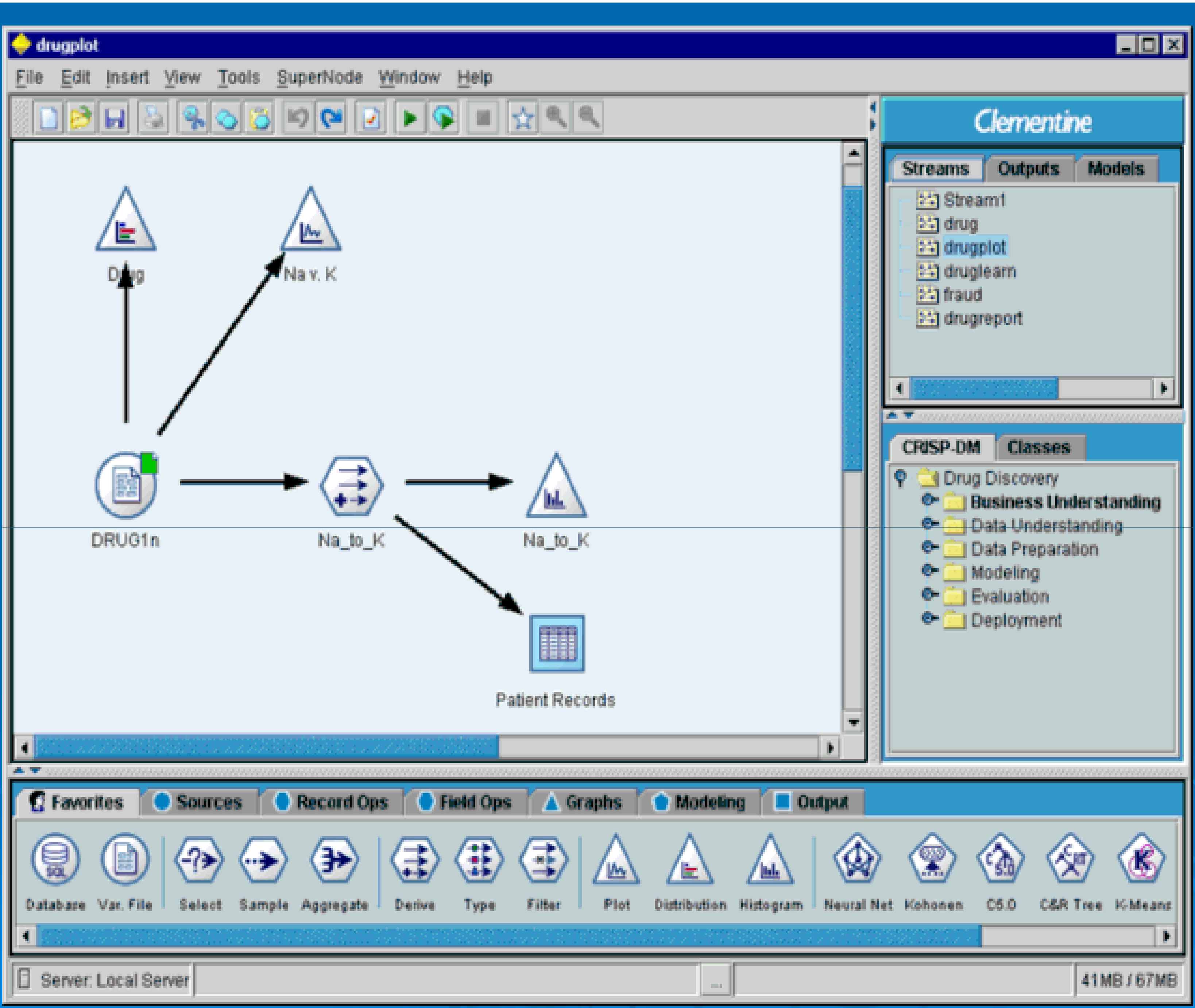
41MB / 67MB

- Most of the data and modeling tools in Clementine reside in **palettes**, the area below the stream canvas.


drugplot
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Tools
SuperNode
Window
Help
Clementine
Streams
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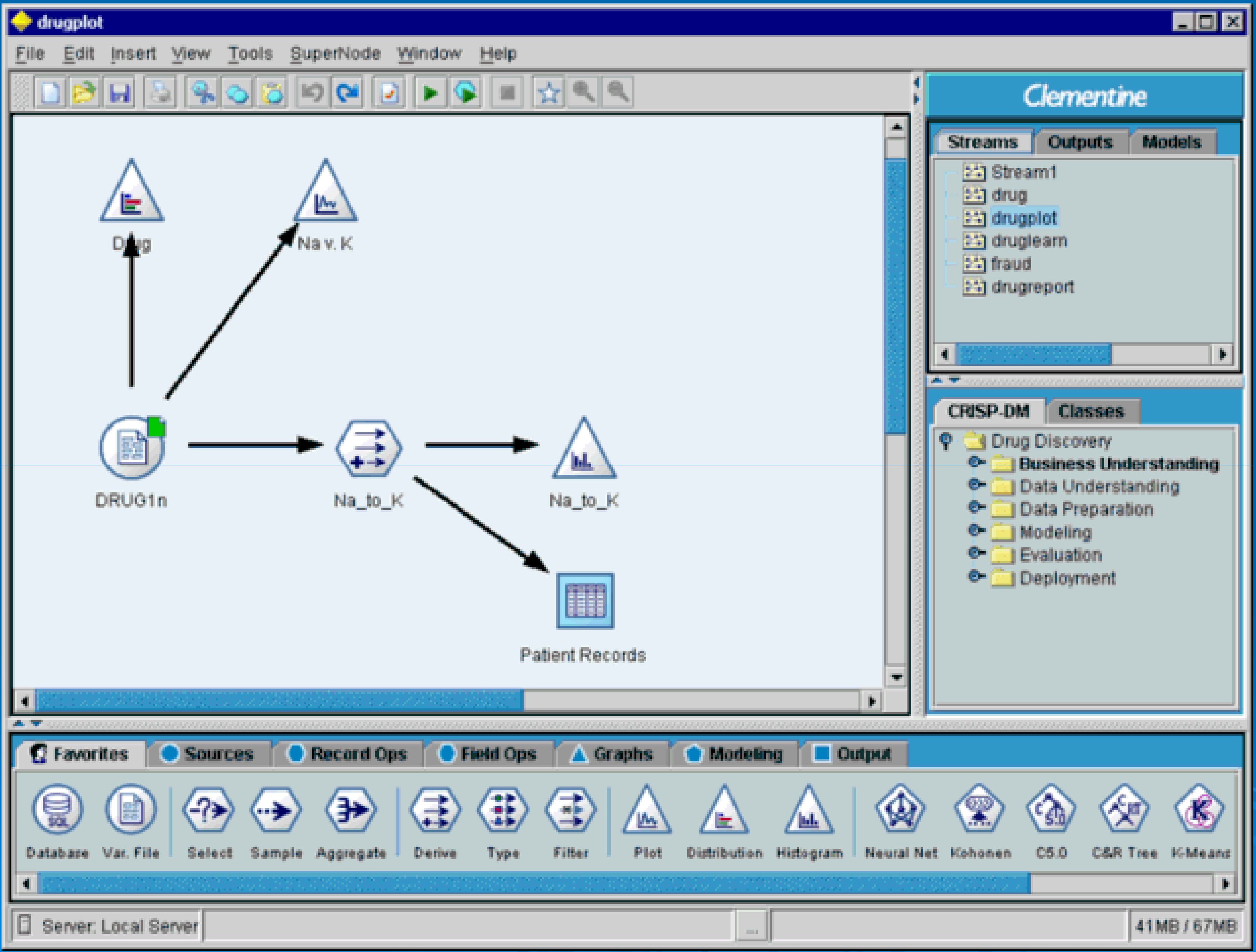
Server: Local Server
41MB / 67MB

- Each tab contains groups of nodes that are a graphical representation of data mining tasks, such as accessing and filtering data, creating graphs, and building models.
- To add nodes to the canvas, double-click icons from the node palettes or drag and drop them onto the canvas. You then connect them to create a **stream**, representing the flow of data.

- You will learn more about building streams later in this tutorial. You can jump ahead now using the Contents button below.

- On the top right side of the window are the output and object **managers**. These tabs are used to view and manage a variety of Clementine objects.


drugplot
File
Edit
Insert
View
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SuperNode
Window
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Graphs
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Output
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Var. File
Select
Sample
Aggregate
Derive
Type
Filter
Plot
Distribution
Histogram
Neural Net
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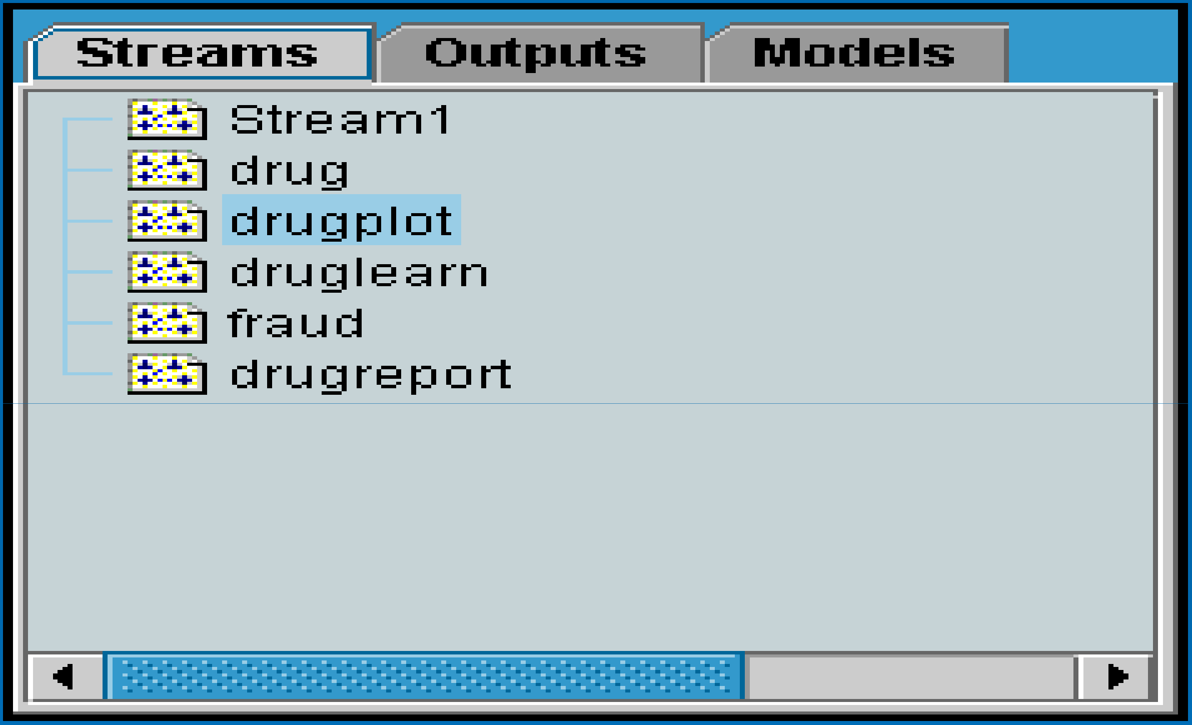
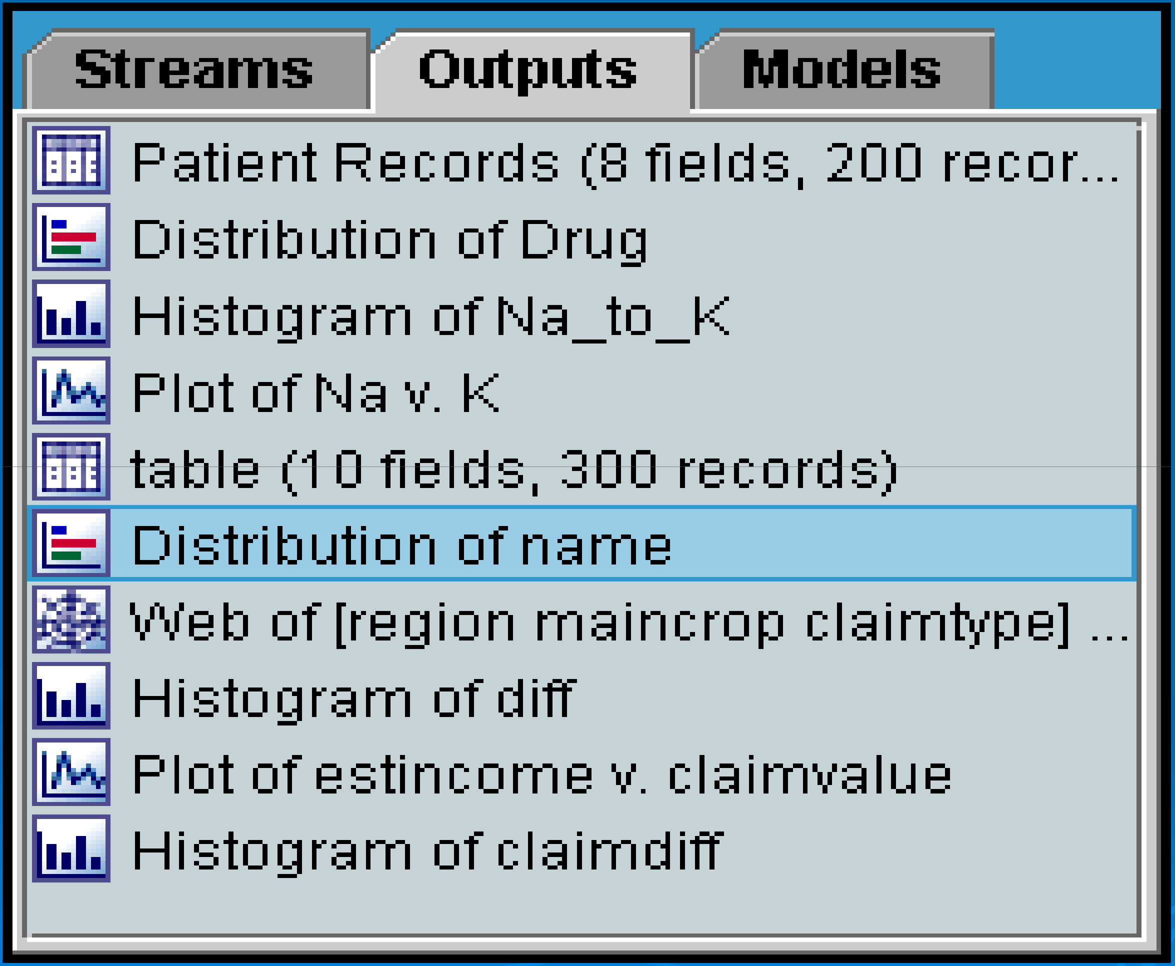
C5.0
C&R Tree
K-Means
Server: Local Server
41MB / 67MB

- The Streams tab contains all streams open in the current session. You can save and close streams as well as add them to a project.



Stream1
drug
drugplot
druglearn
fraud
drugreport

- The Outputs tab contains a variety of files produced by stream operations in Clementine. You can display, rename, and close the tables, graphs, and reports listed here



Patient Records (8 fields, 200 recor...

Distribution of Drug

Histogram of Na_to_K

Plot of Na v. K

table (10 fields, 300 records)

Distribution of name

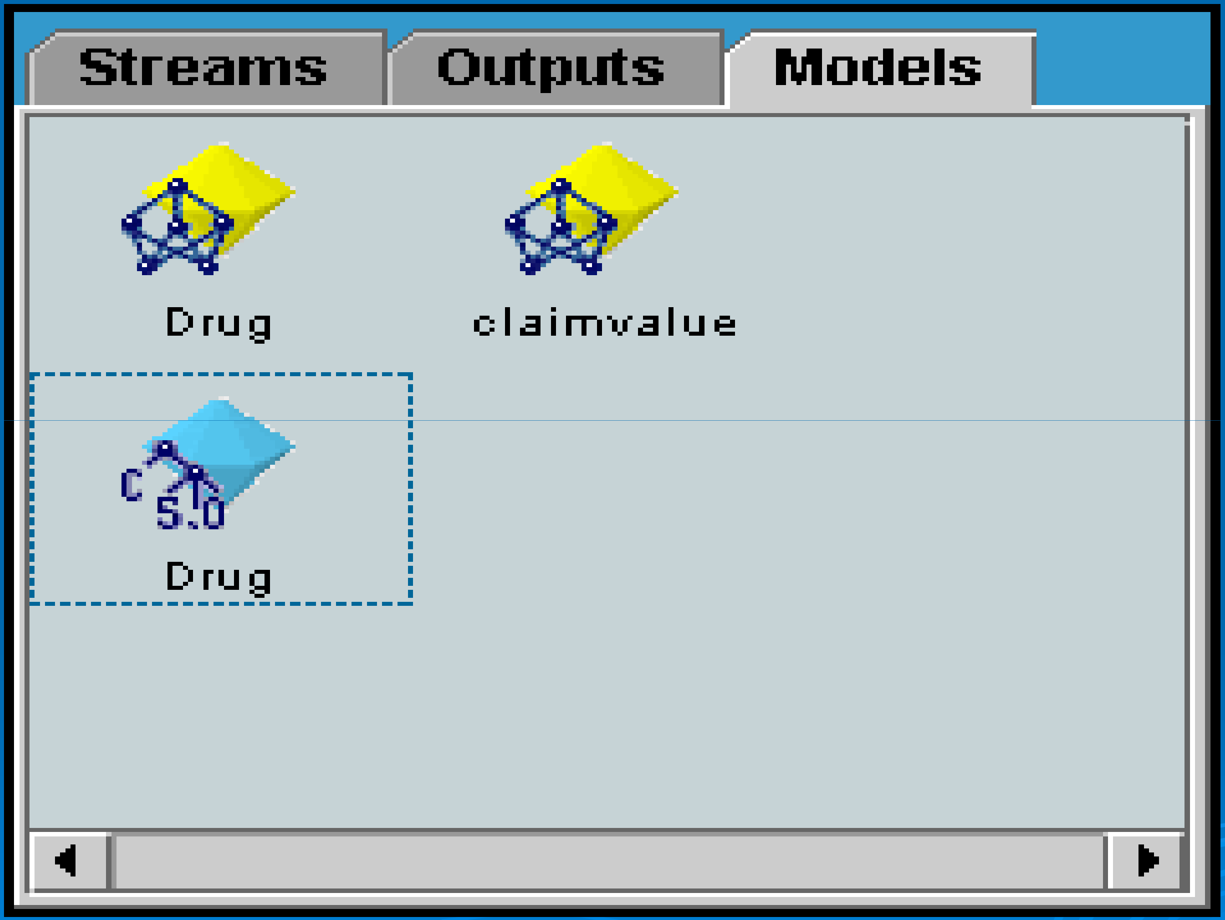
Web of [region maincrop claimtype] ...

Histogram of diff

Plot of estincome v. claimvalue

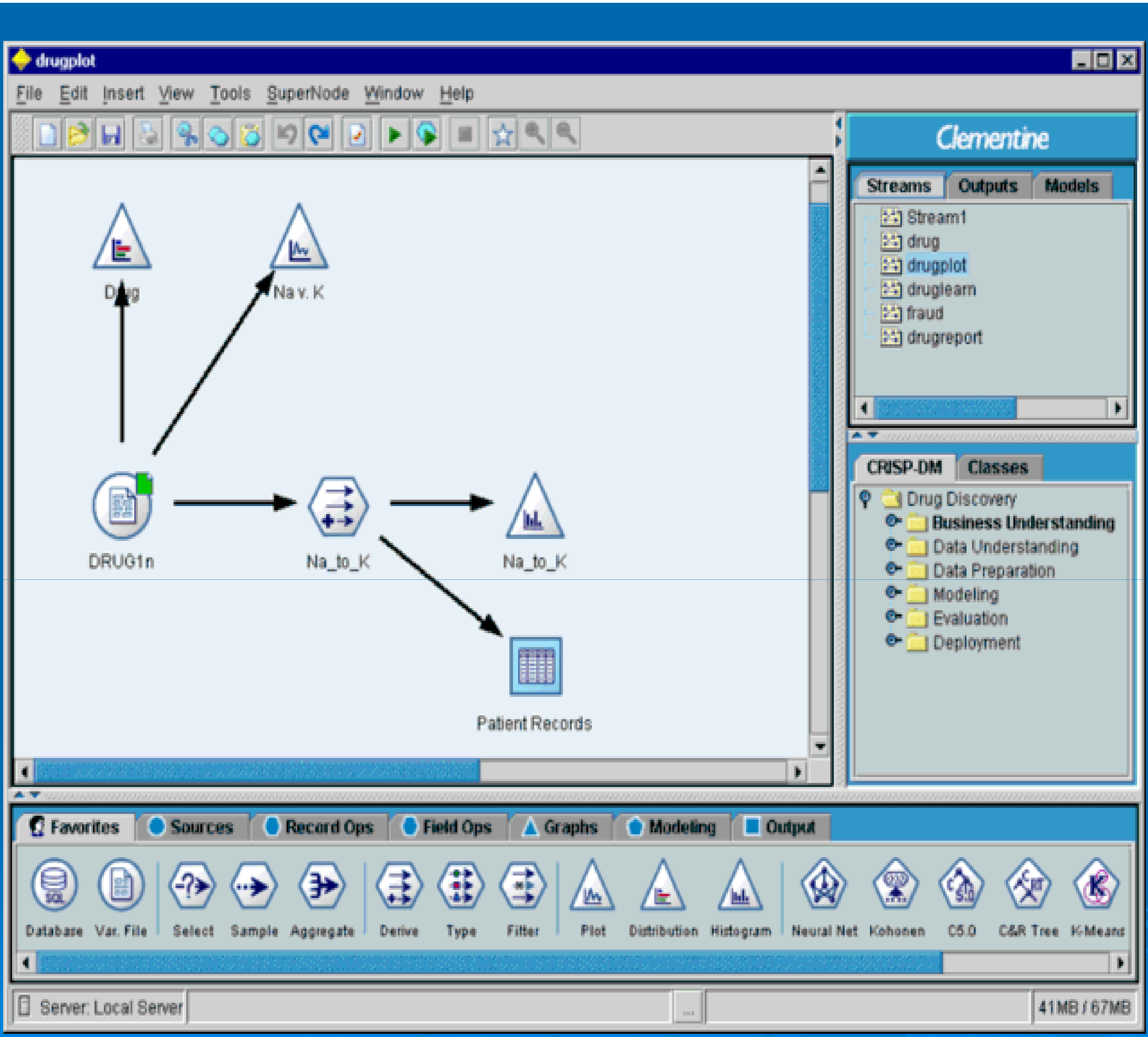
Histogram of claimdiff

- The Models tab is a powerful tool that contains all generated models (models that have been built in Clementine) for a session. Models can be examined closely, added to the stream, exported, or annotated.


Streams
Outputs
Models
Drug
claimvalue
C 5.0
Drug

- *Note*: The Models tab replaces the Generated Models tab from earlier versions of Clementine.

- On the bottom right side of the window is the **projects** tool, used to create and manage data mining projects.
- There are two ways to view projects you create in Clementine--Classes view and CRISP-DM view.


drugplot
File Edit Insert View Tools SuperNode Window Help
Drug
Na v. K
DRUG1n
Na_to_K
Na_to_K
Patient Records
Clementine
Streams
Outputs
Models
Stream1
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drugplot
druglearn
fraud
drugreport
CRISP-DM
Classes
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Business Understanding
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Evaluation
Deployment
Favorites
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Record Ops
Field Ops
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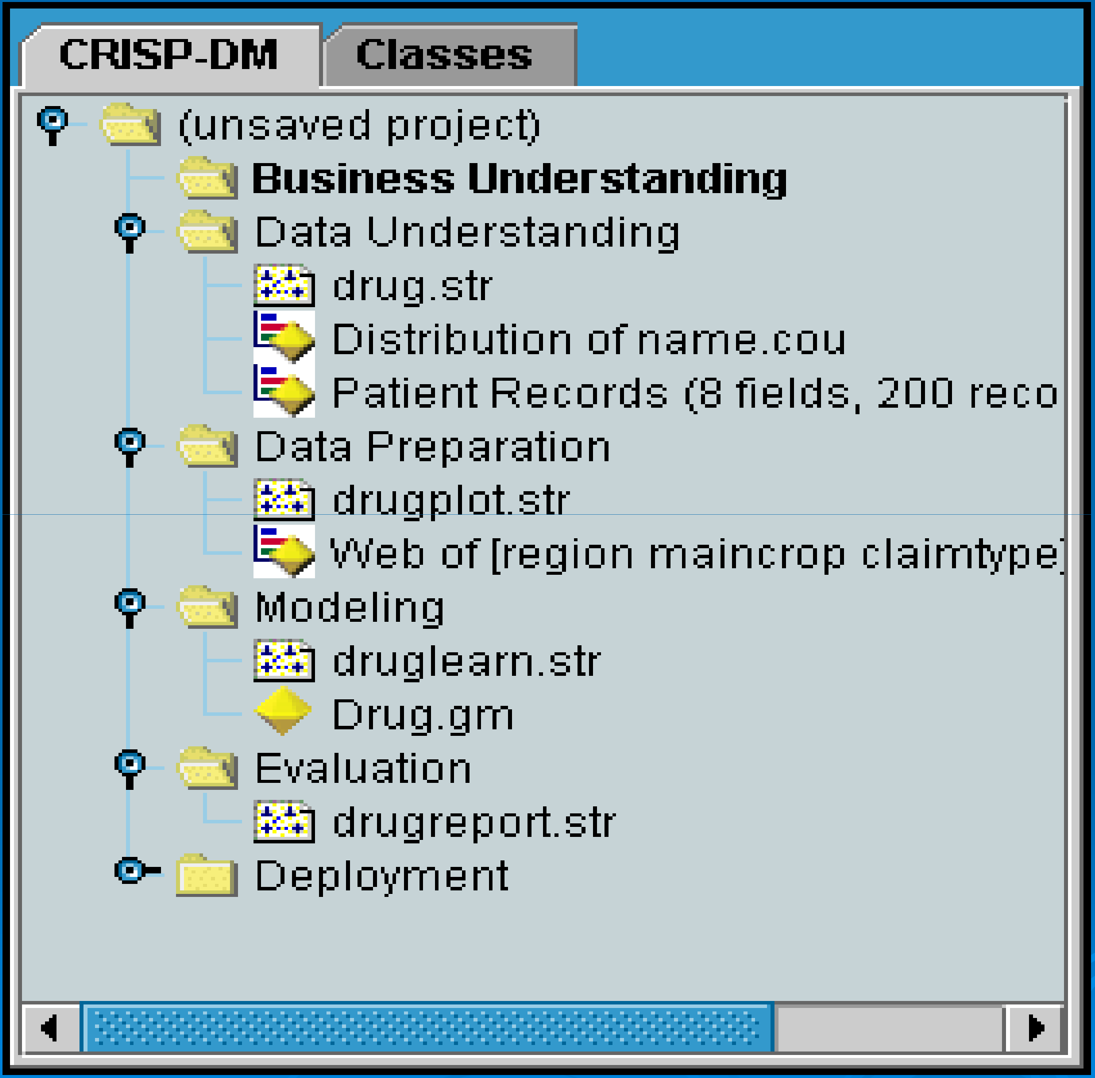
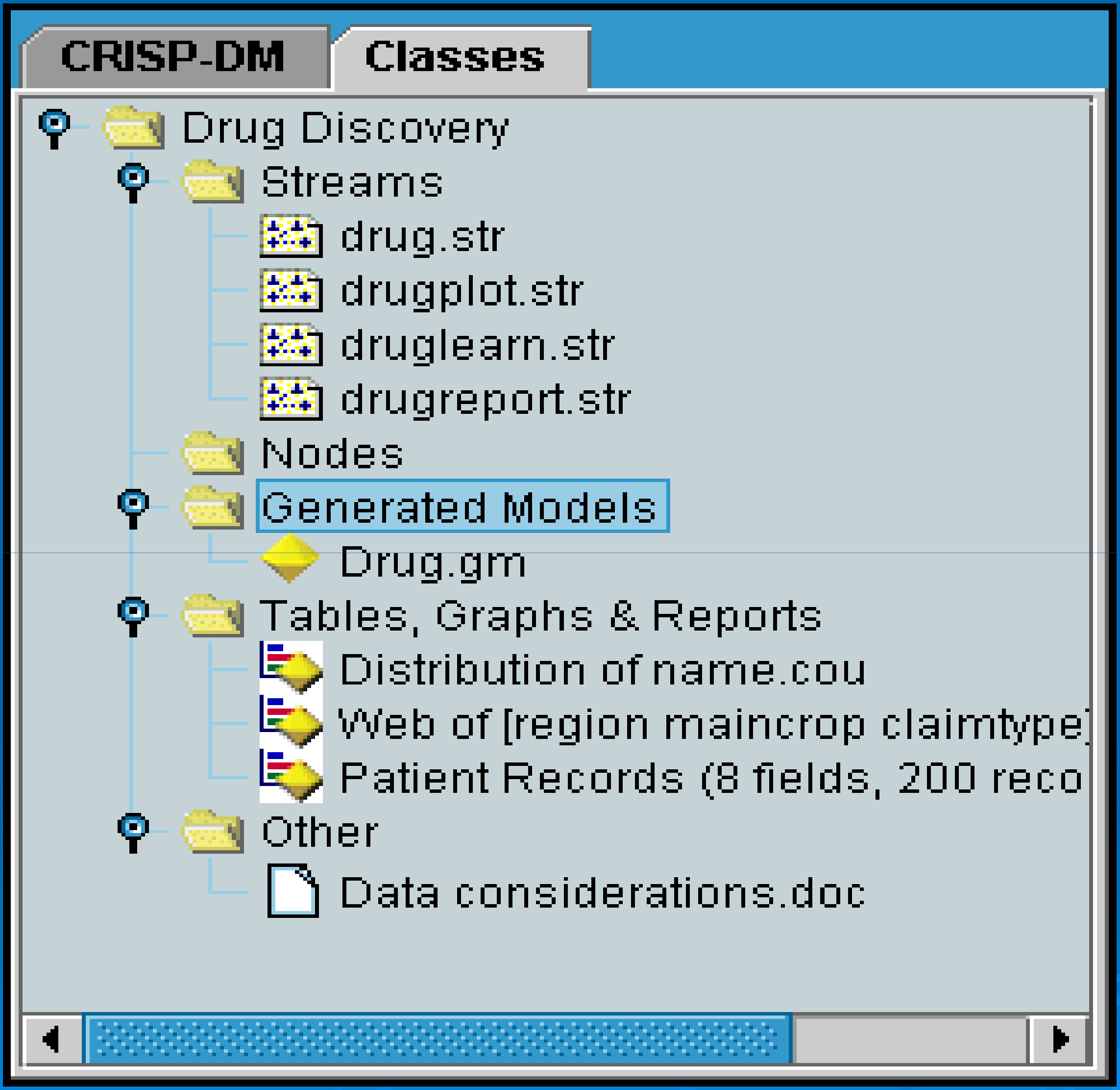
Kohonen
C5.0
C&R Tree
K-Means
Server: Local Server
41MB / 67MB

- The CRISP-DM tab provides a way to organize projects according to the Cross-Industry Standard Process for Data Mining, an industry-proven, nonproprietary methodology. For both experienced and first-time data miners, using the CRISP-DM tool will help you to better organize and communicate your efforts.



- (unsaved project)
  - **Business Understanding**
  - Data Understanding
    - drug.str
    - Distribution of name.cou
    - Patient Records (8 fields, 200 reco
  - Data Preparation
    - drugplot.str
    - Web of [region maincrop claimtype]
  - Modeling
    - druglearn.str
    - Drug.gm
  - Evaluation
    - drugreport.str
  - Deployment

- The Classes tab provides a way to organize your work in Clementine categorically--by the types of objects you create. This view is useful when taking inventory of data, streams, models, etc.



CRISP-DM | Classes

- Drug Discovery
  - Streams
    - drug.str
    - drugplot.str
    - druglearn.str
    - drugreport.str
  - Nodes
  - Generated Models
    - Drug.gm
  - Tables, Graphs & Reports
    - Distribution of name.cou
    - Web of [region maincrop claimtype]
    - Patient Records (8 fields, 200 reco
  - Other
    - Data considerations.doc

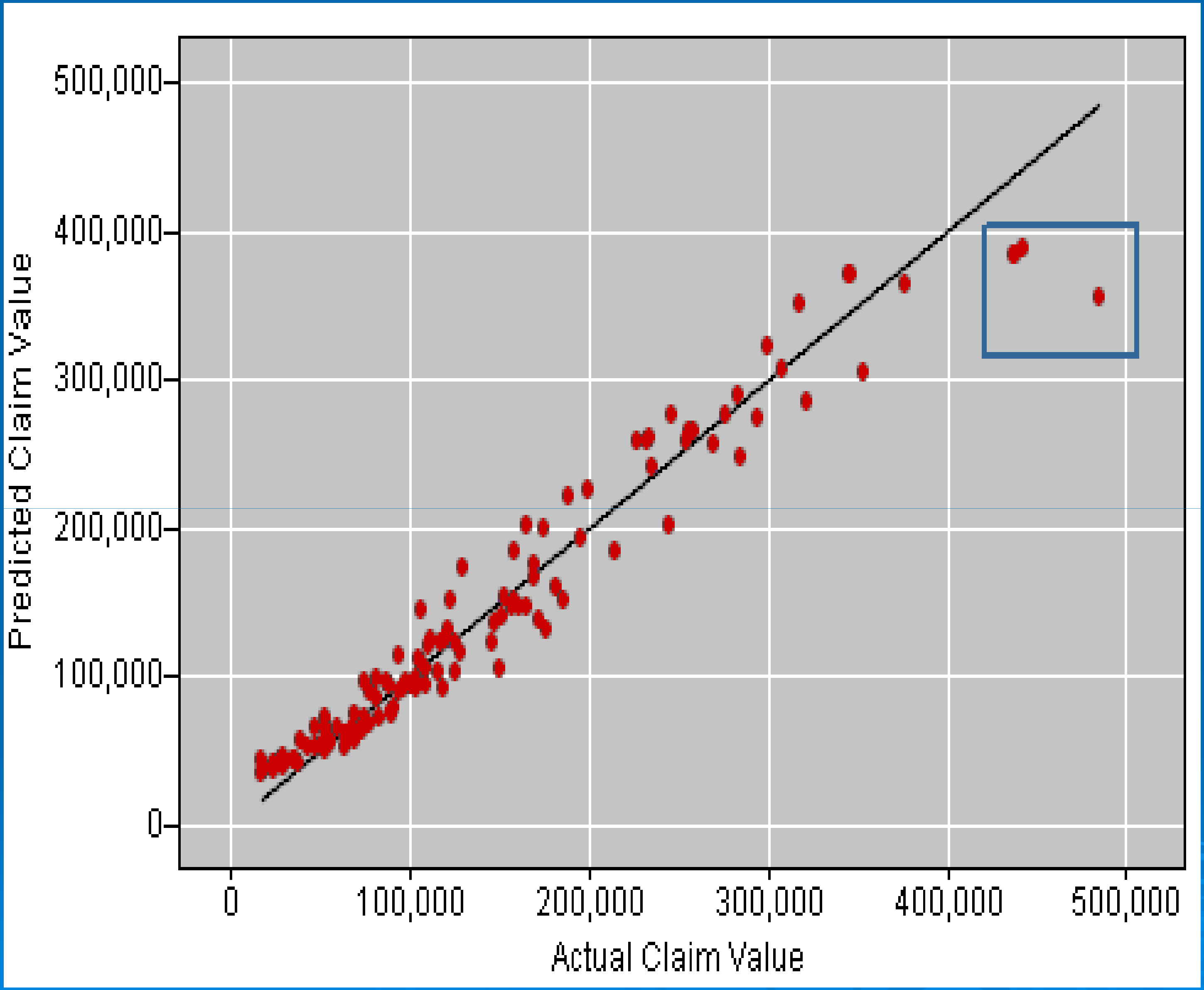
- As a data mining application, Clementine offers a strategic approach to finding useful relationships in large data sets. In contrast to more traditional statistical methods, you do not necessarily need to know what you are looking for when you start. You can explore your data, fitting different models and investigating different relationships, until you find useful information.

- This section provides:
  - An overview of the types of data-mining problems Clementine can help solve.
  - A hands-on demonstration of building streams, deriving fields, using graphs, and modeling in Clementine.

- A wide variety of organisations use Clementine to help them mine vast repositories of data. Following is a sample of the types of problems data mining can help solve.

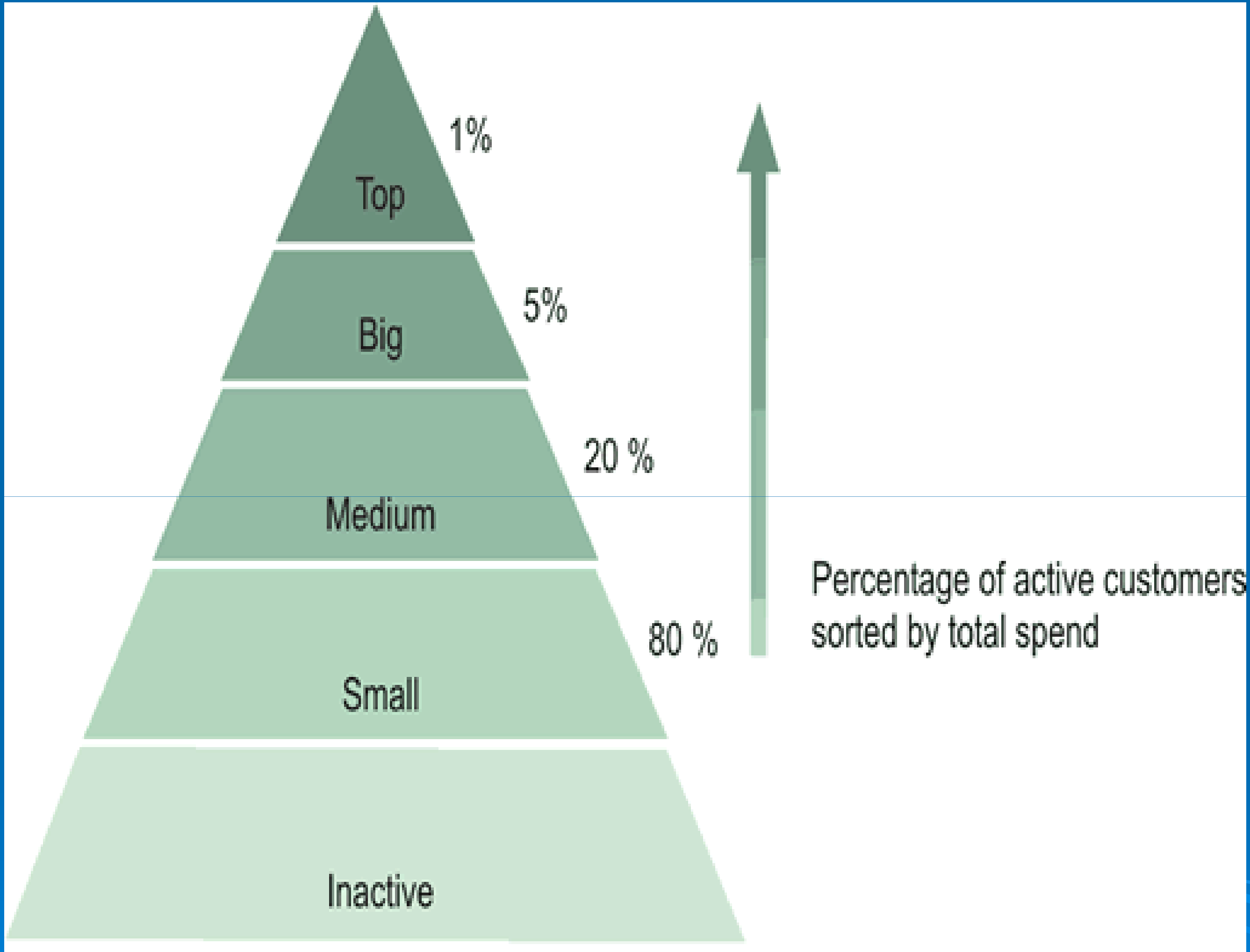
Public sector

- Governments around the world use data mining to explore massive data stores, improve citizen relationships, detect occurences of fraud such as money laundering and tax evasion, detect crime and terrorist patterns, and enhance the expanding realm of e-goverment


Predicted Claim Value
500,000
400,000
300,000
200,000
100,000
0
0
100,000
200,000
300,000
400,000
500,000
Actual Claim Value

CRM

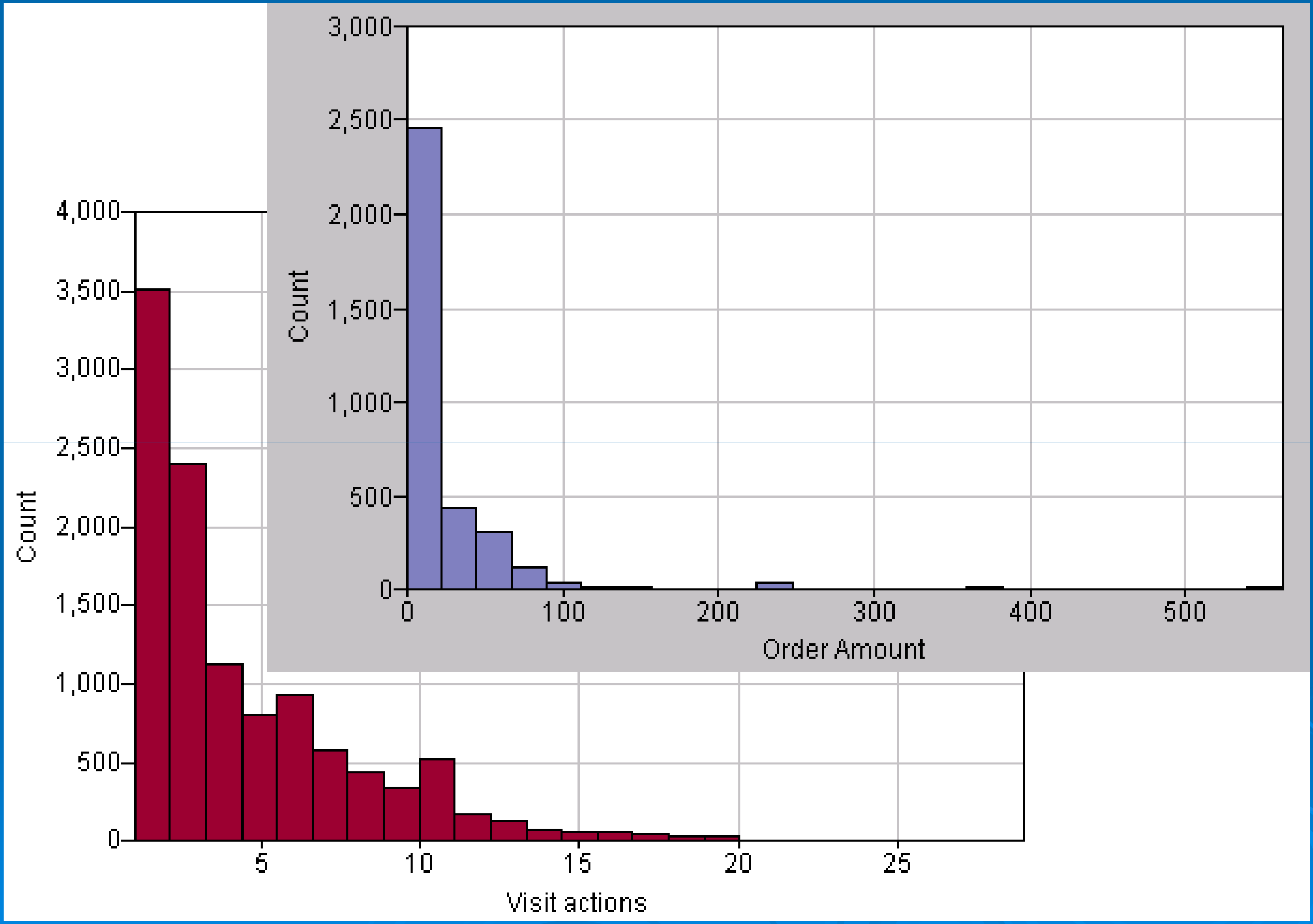
- Customer relationship management can be improved thanks to smart classification of customer types and accurate predictions of churn. Clementine has successfully helped businesses attract and retain the most valuable customers in a variety of industries.



Customer Value Pyramid

Web mining

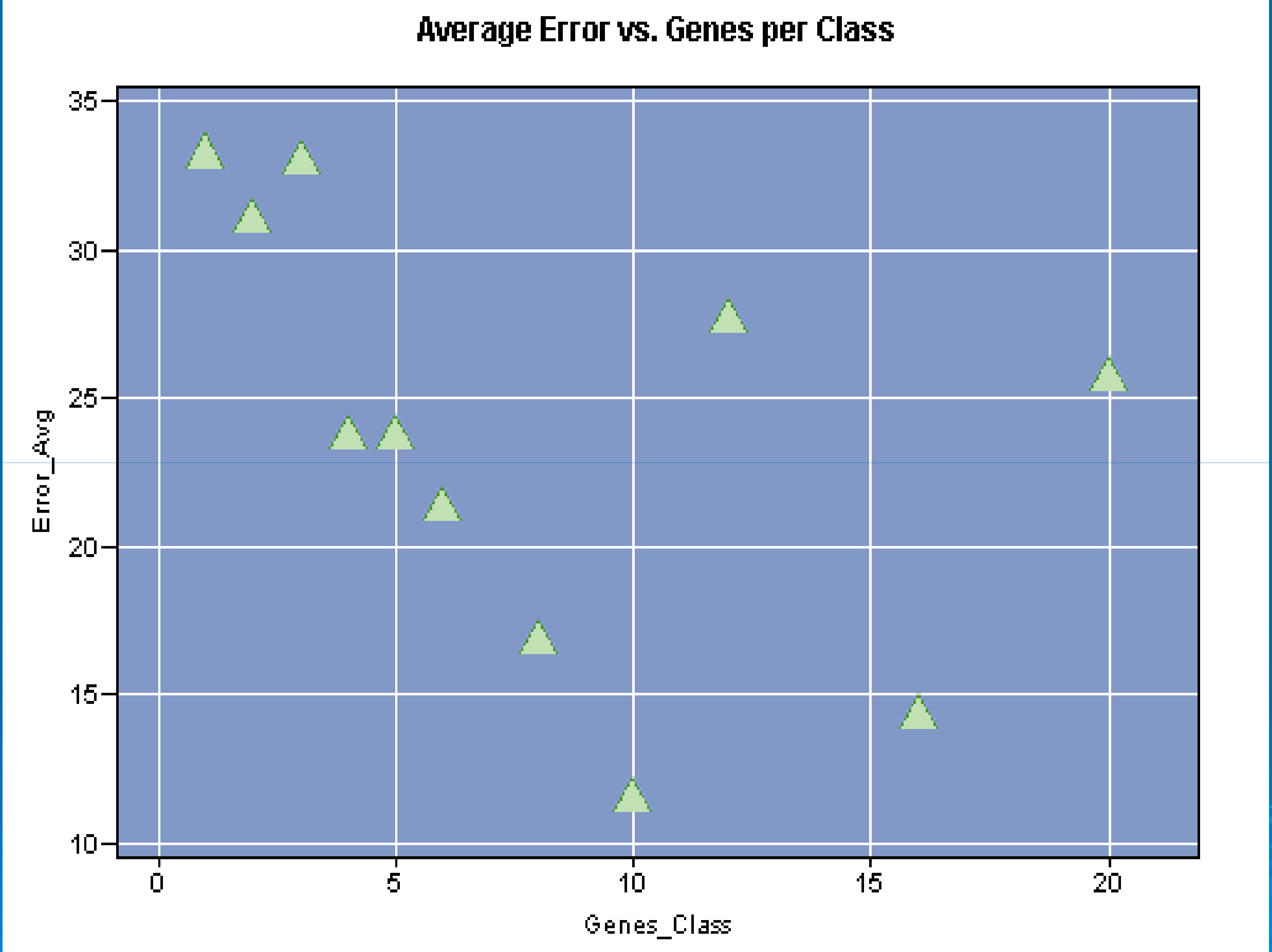
- With powerful sequencing and prediction algorithms, Clementine contains the necessary tools to discover exactly what guests do at a Web site and deliver exactly the products or information they desire. From data preparation to modeling, the entire data-mining process can be managed inside of Clementine.



Count
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
5
10
15
20
25
Visit actions
Count
3,000
2,500
2,000
1,500
1,000
500
0
0
100
200
300
400
500
Order Amount

Drug discovery and bioinformatics

- Data mining aids both pharmaceutical and genomics research by analyzing the vast data stores resulting from increased lab automation. Clementine's clustering and classification models help generate leads from compound libraries while sequence detection aids the discovery of patterns.


Average Error vs. Genes per Class
Error_Avg
35
30
25
20
15
10
0
5
10
15
20
Genes_Class

- Clementine provides templates for many of these data-mining applications. Clementine Application Templates, also known as CATs, are available for the following types of activities:
  - Web-mining
  - Fraud detection
  - Analytical CRM
  - Telcommunications analytical CRM
  - Microarray analysis
  - Crime detection and prevention

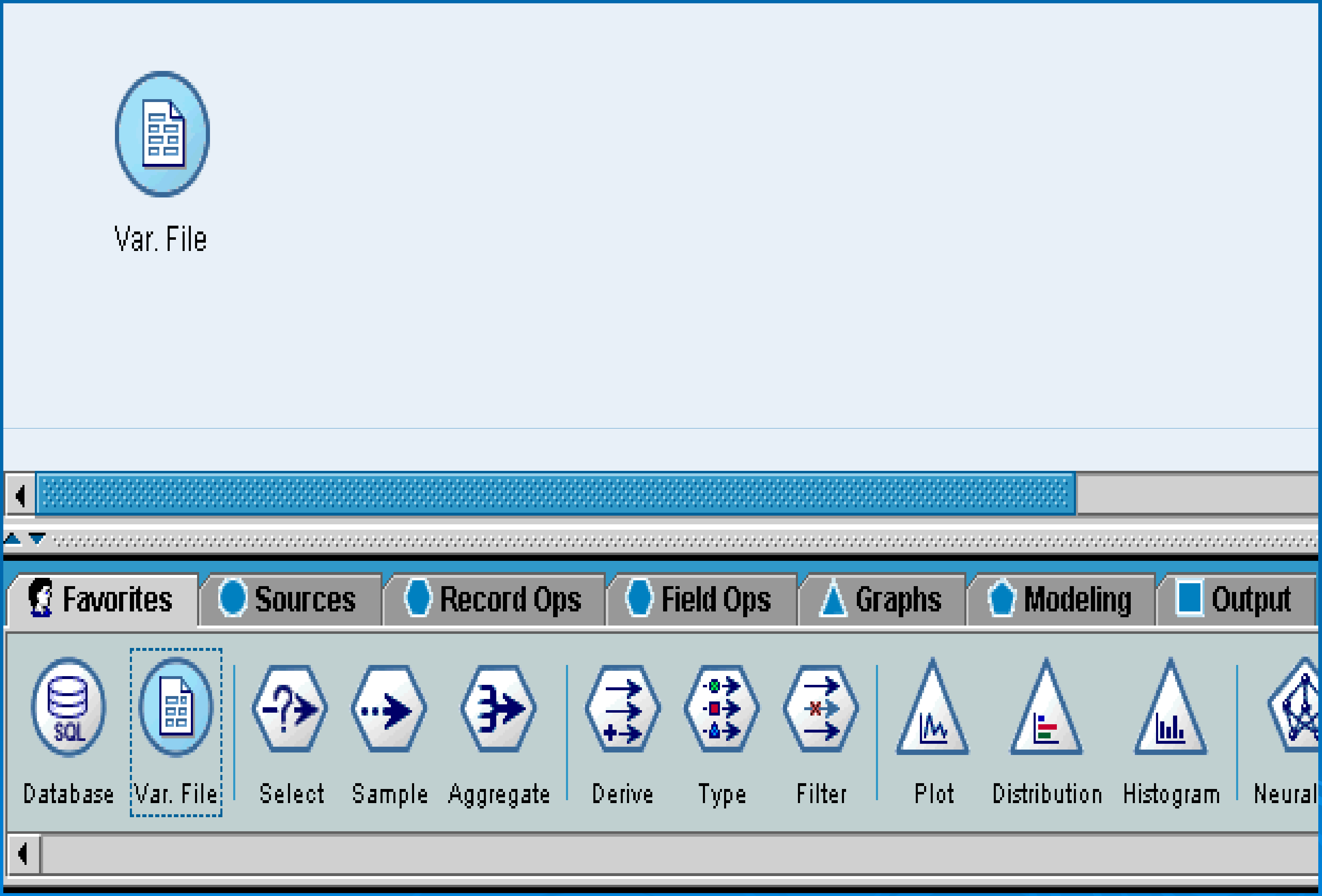
- Let's get started learning how Clementine can help you conduct your own data mining project.
- This section of the guide will show you how to build and execute simple streams using sample drug demonstration files that are included with Clementine. You will learn how to work with data in the various phases of data mining, including:
  - **Visualization**, which helps you gain an overall picture of your data. You can create plots and charts to explore relationships among the fields in your data set and generate hypotheses to explore during modeling.
  - **Manipulation**, which lets you clean and prepare the data for modeling. You can sort or aggregate data, filter out fields, discard or replace missing values, and derive new fields.
  - **Modeling**, which gives you the broadest range of insight into the relationships among data fields. Models perform a variety of tasks such as predict outcomes, detect sequences, and group similarities. These help your organization grow, streamline processes, detect fraud, and retain the most valuable customers.

- For this section, imagine that you are a medical researcher compiling data for a study.
- You have collected data about a set of patients, all of whom suffered from the same illness. During their course of treatment, each patient responded to one of five medications.
- Part of your job is to use data mining to find out which drug might be appropriate for a future patient with the same illness.

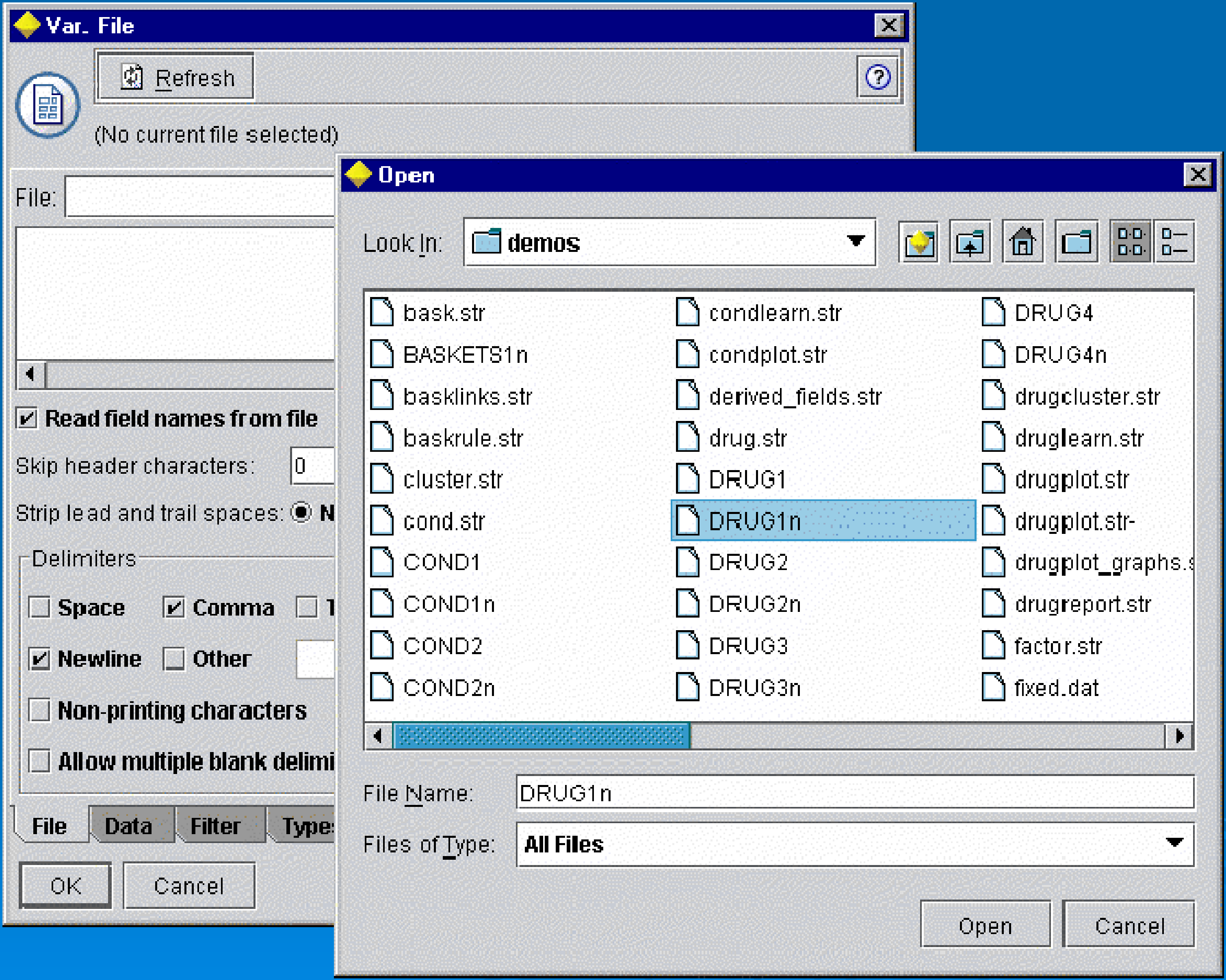
- The data fields used in this demo are:

- Age (Number)
- Sex M or F
- BP Blood pressure: HIGH, NORMAL, or LOW
- Cholesterol Blood cholesterol: NORMAL or HIGH
- Na Blood sodium concentration
- K Blood potassium concentration
- Drug Prescription drug to which a patient responded

- The first step is to load the data file using a **Variable File node**. You can add a Variable File node from the palettes--either click the **Sources** tab to find the node or use the **Favorites** tab, which includes this node by default. Next, double-click the newly placed node to open its dialog box.


Var. File
Favorites
Sources
Record Ops
Field Ops
Graphs
Modeling
Output
Database
Var. File
Select
Sample
Aggregate
Derive
Type
Filter
Plot
Distribution
Histogram
Neural

- Click the button just to the right of the File box marked with ellipses (...). This opens a dialog box for browsing to the directory in which Clementine is installed on your computer (or server). Open the *demos* directory and select the file called *DRUG1n*.



(No current file selected)

File:

☑ Read field names from file

Skip header characters: 0

Strip lead and trail spaces: ● N

Delimiters

□ Space ☑ Comma □ T

☑ Newline □ Other

□ Non-printing characters

□ Allow multiple blank delimi

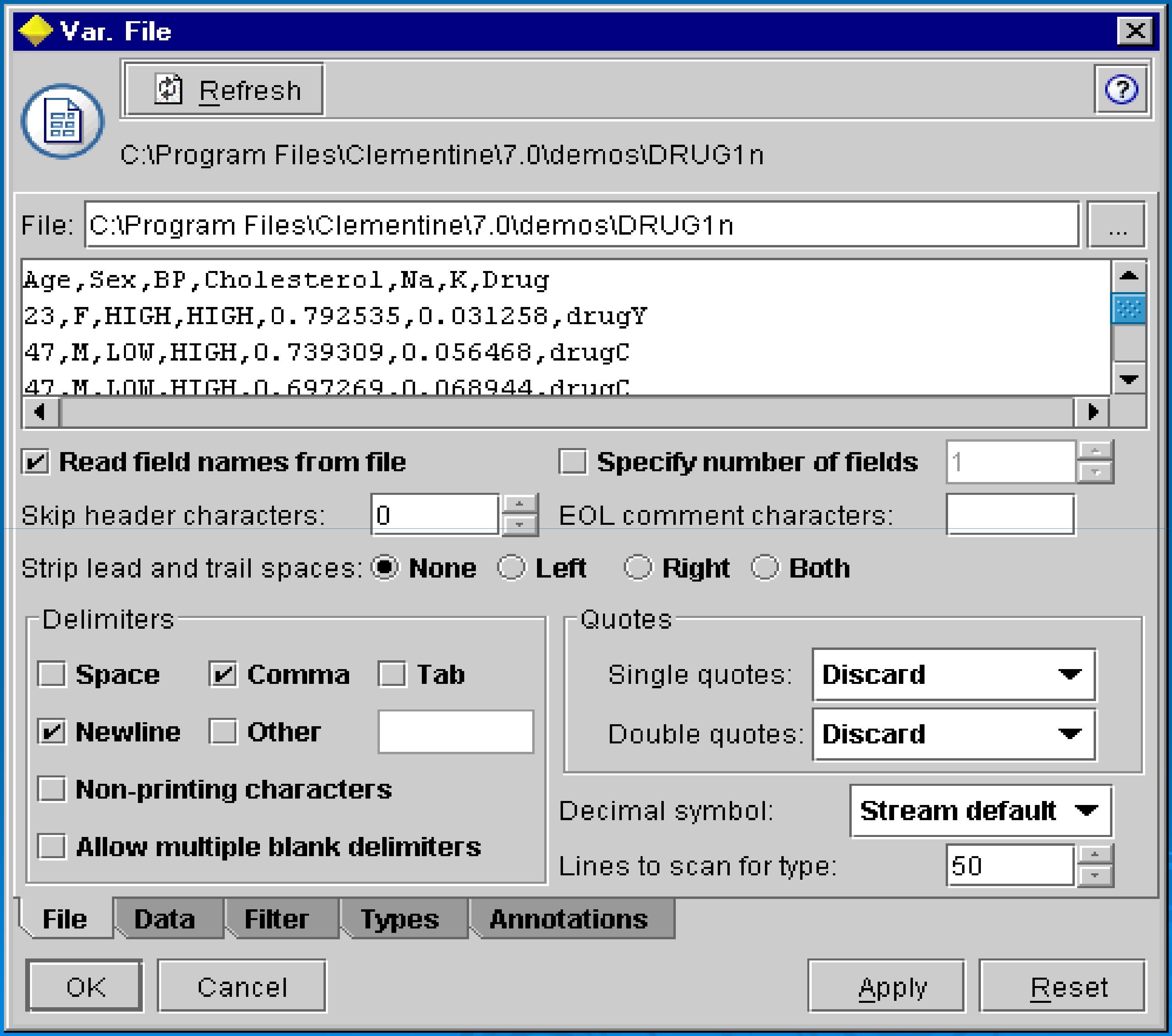
Look In: demos

bask.str
BASKETS1n
basklinks.str
baskrule.str
cluster.str
cond.str
COND1
COND1n
COND2
COND2n
condlearn.str
condplot.str
derived_fields.str
drug.str
DRUG1
DRUG1n
DRUG2
DRUG2n
DRUG3
DRUG3n
DRUG4
DRUG4n
drugcluster.str
druglearn.str
drugplot.str
drugplot.str-
drugplot_graphs.s
drugreport.str
factor.str
fixed.dat

File Name: DRUG1n

Files of Type: All Files

- Select **Read field names from file** and notice the fields and values that have just been loaded into the dialog box. Before clicking **OK** to close the dialog box, take a moment to look at the data using the other tabs on the Source node.



C:\Program Files\Clementine\7.0\demos\DRUG1n

File: C:\Program Files\Clementine\7.0\demos\DRUG1n

```
Age,Sex,BP,Cholesterol,Na,K,Drug
23,F,HIGH,HIGH,0.792535,0.031258,drugY
47,M,LOW,HIGH,0.739309,0.056468,drugC
47,M,LOW,HIGH,0.697269,0.068944,drugC
```

☑ Read field names from file □ Specify number of fields 1

Skip header characters: 0 EOL comment characters:

Strip lead and trail spaces: ● None ○ Left ○ Right ○ Both

Delimiters

□ Space ☑ Comma □ Tab

☑ Newline □ Other

□ Non-printing characters

□ Allow multiple blank delimiters

Quotes

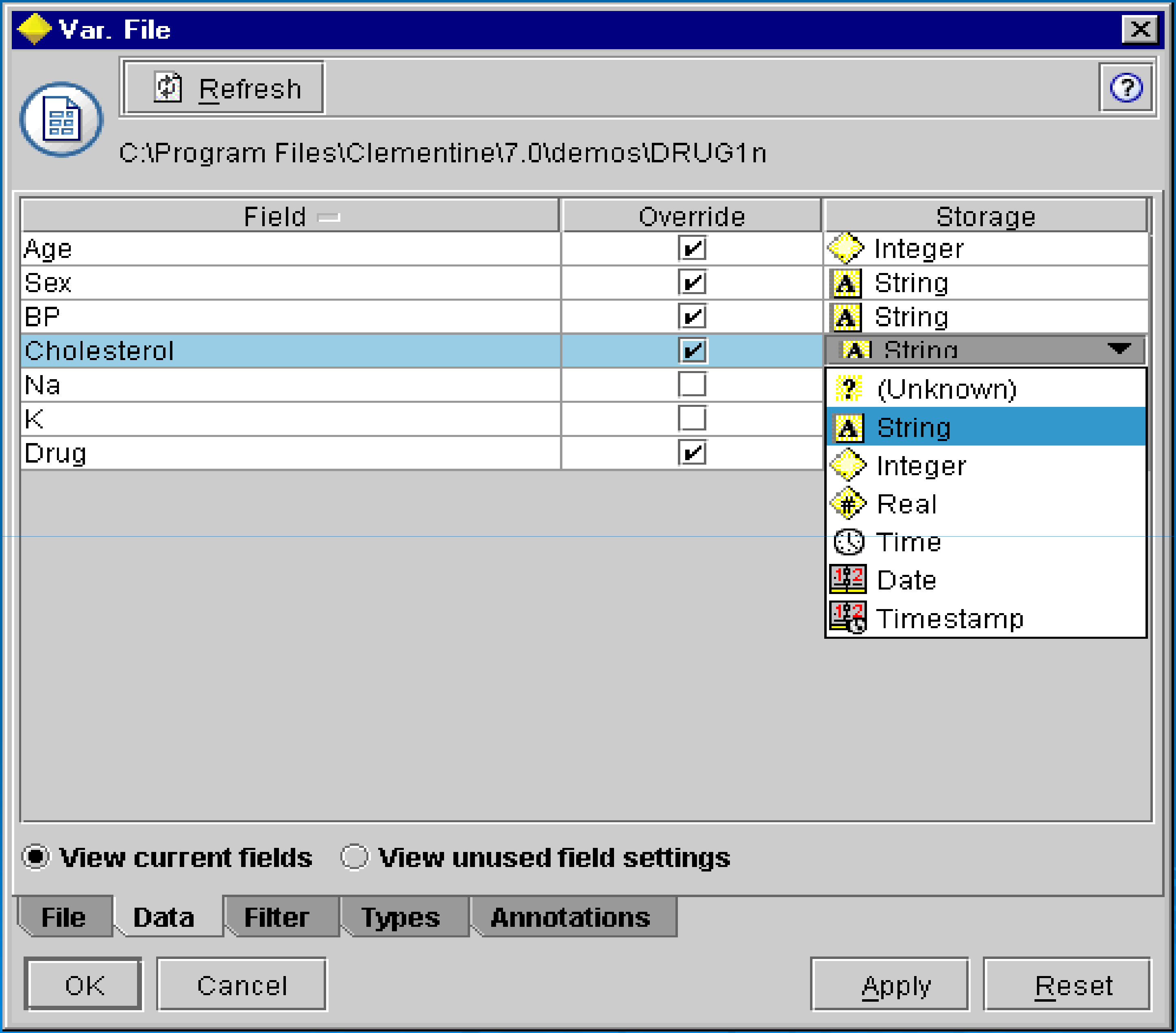
Single quotes: Discard

Double quotes: Discard

Decimal symbol: Stream default

Lines to scan for type: 50

- Click the **Data** tab to override and change **storage** for a field. Note that storage is different than **type**, or usage of the data field.

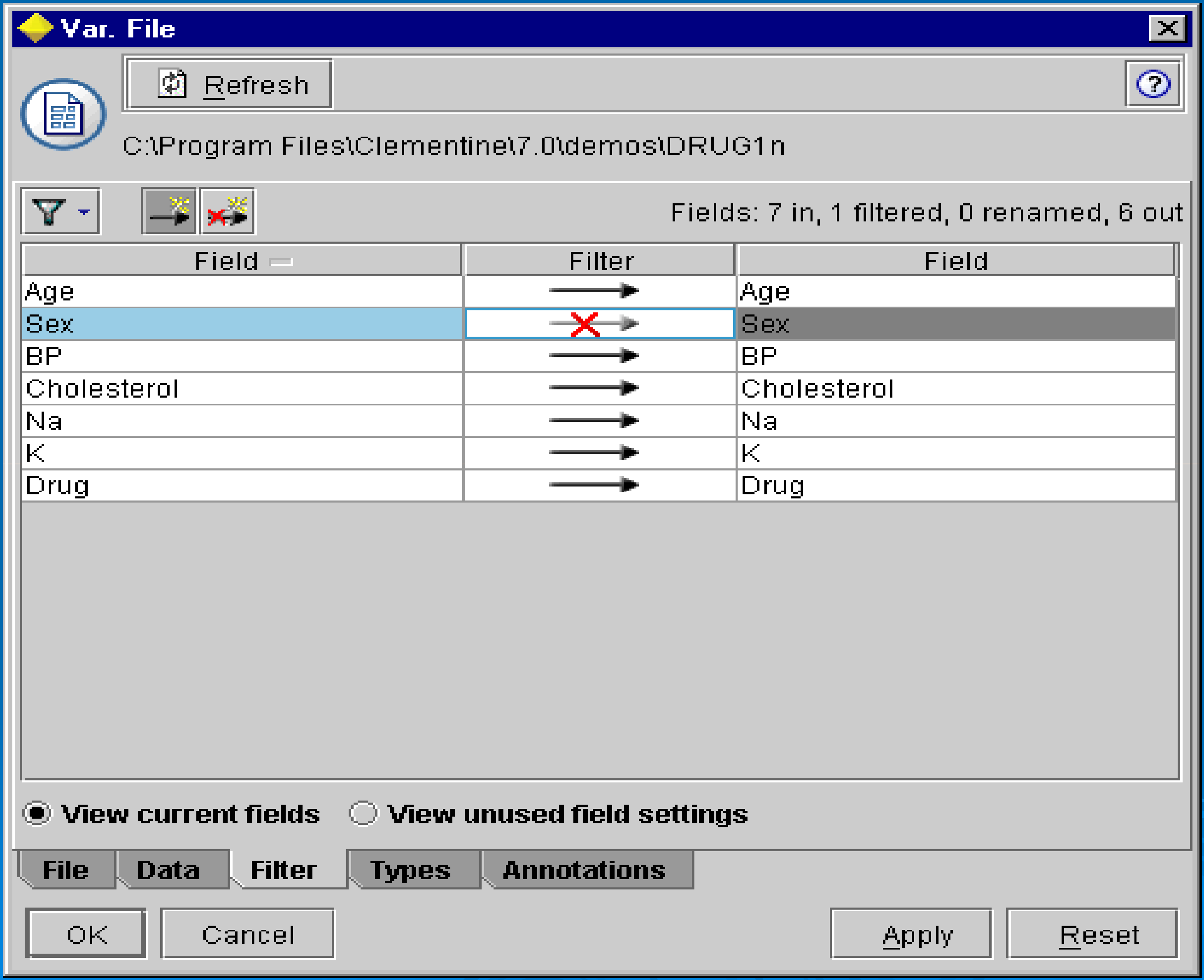


C:\Program Files\Clementine\7.0\demos\DRUG1n

Field	Override	Storage
Age	☑	Integer
Sex	☑	String
BP	☑	String
Cholesterol	☑	String
Na	☐	
K	☐	
Drug	☑	

● View current fields ○ View unused field settings

- The **Filter** tab can be used to remove any fields from the data that is brought into Clementine. Clicking on a field's arrow will mark it with a red X and filter it out. For this tutorial, though, we want to keep all fields.



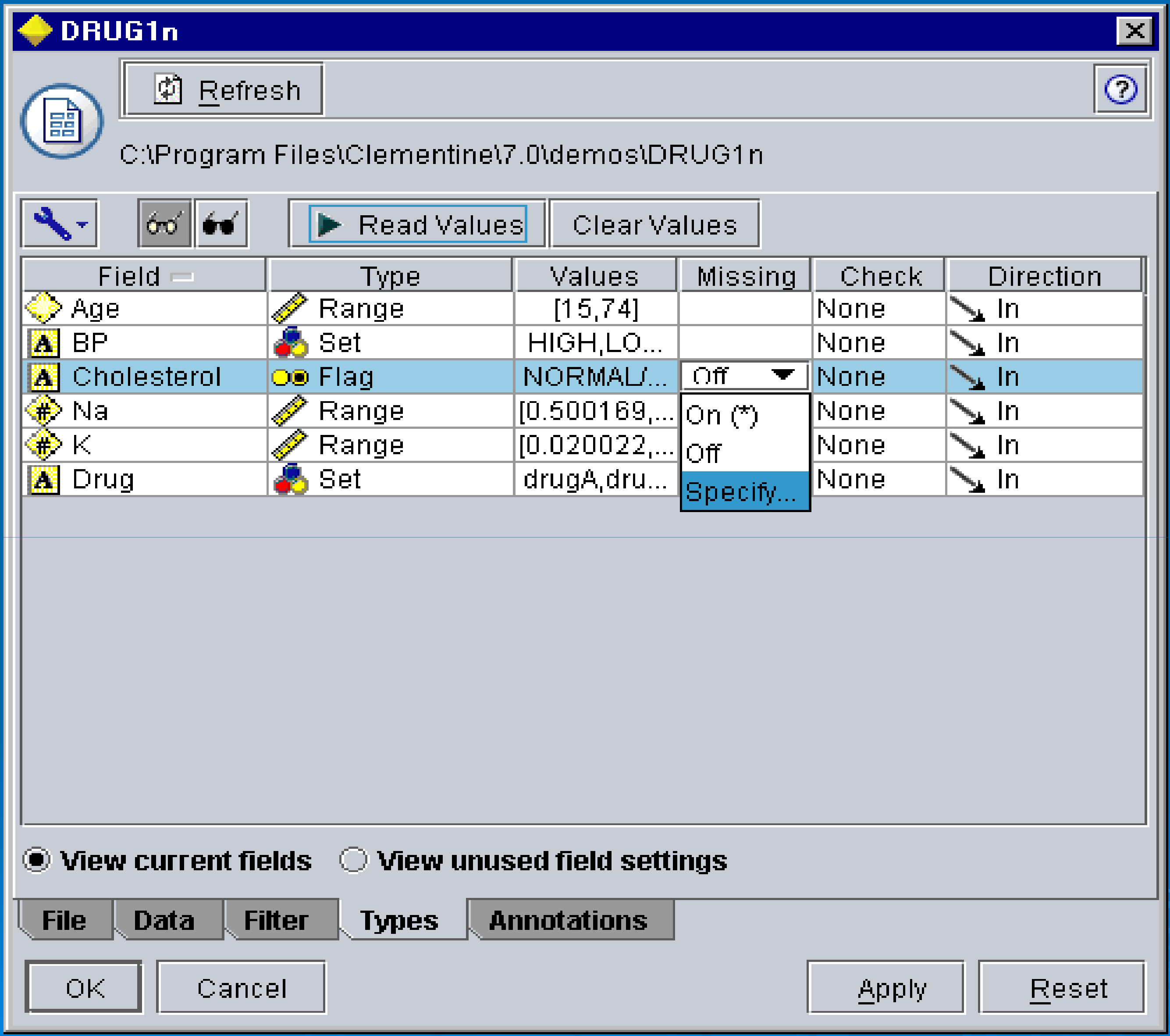
C:\Program Files\Clementine\7.0\demos\DRUG1n

Fields: 7 in, 1 filtered, 0 renamed, 6 out

Field	Filter	Field
Age	→	Age
Sex	✗	Sex
BP	→	BP
Cholesterol	→	Cholesterol
Na	→	Na
K	→	K
Drug	→	Drug

● View current fields ○ View unused field settings

- The **Types** tab helps you learn more about the type of fields in your data. You can also choose **Read Values** to view the actual values for each field based on the selections that you make from the *Values* column. This process is known as **instantiation**.

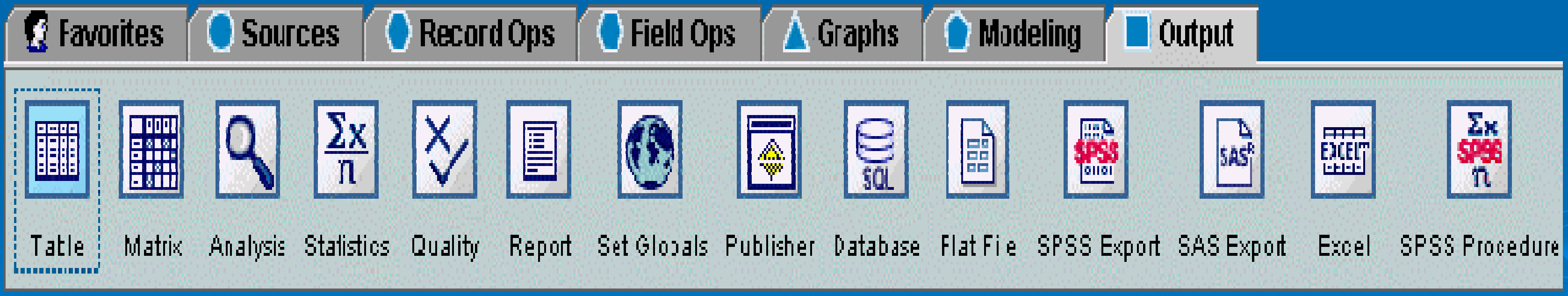


C:\Program Files\Clementine\7.0\demos\DRUG1n

Field	Type	Values	Missing	Check	Direction
Age	Range	[15,74]		None	In
BP	Set	HIGH,LO...		None	In
Cholesterol	Flag	NORMAL/...	Off	None	In
Na	Range	[0.500169,...		None	In
K	Range	[0.020022,...		None	In
Drug	Set	drugA,dru...		None	In

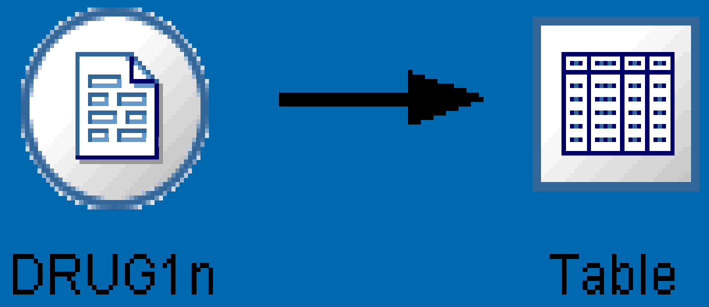
● View current fields ○ View unused field settings

- Now that you have loaded the data file, you may want to glance at the values for some of the records.
- One way to do this is by building a stream that includes a Table node. To place a Table node in the stream, either double-click the icon in the palette or drag and drop it on to the canvas.


Favorites
Sources
Record Ops
Field Ops
Graphs
Modeling
Output
Table
Matrix
Analysis
Statistics
Quality
Report
Set Globals
Publisher
Database
Flat File
SPSS Export
SAS Export
Excel
SPSS Procedure

- *Note*: Double-clicking a node from the palette will automatically connect it to the selected node in the stream canvas. However, you can not connect to terminal nodes like tables and graphs.

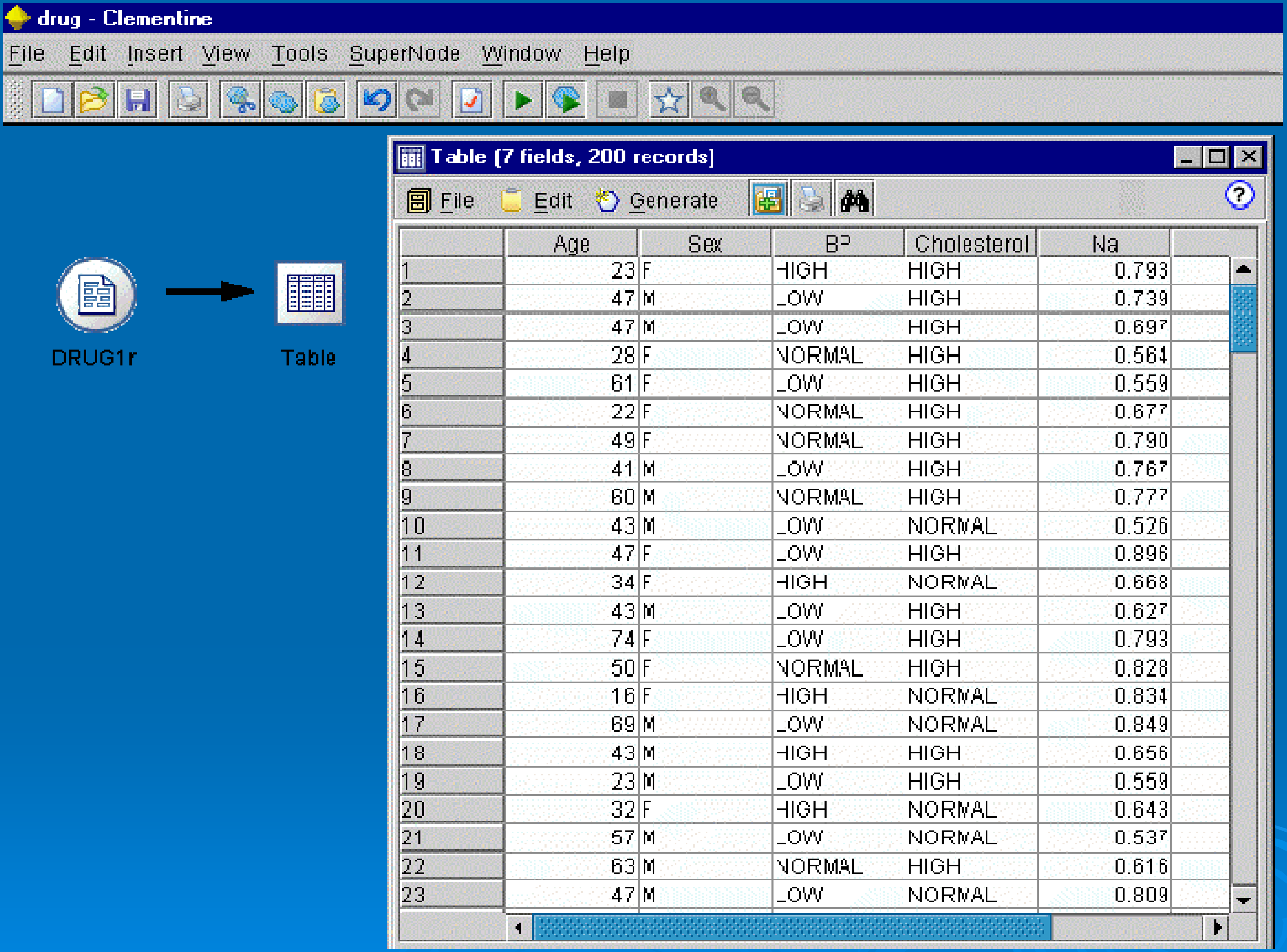
- Next, if the nodes are not already connected, you can use your middle mouse button to connect the Source node to the Table node. To simulate a middle mouse button, click the Alt key while using the mouse.



DRUG1n

Table

- Now that you have built a stream, you must execute it in order to view its output. Click the green arrow button on the toolbar to execute the stream and view an output table showing all of the records in the data file.


drug - Clementine
File Edit Insert View Tools SuperNode Window Help
DRUG1r
Table
Table (7 fields, 200 records)
File Edit Generate

	Age	Sex	BP	Cholesterol	Na
1	23	F	HIGH	HIGH	0.793
2	47	M	LOW	HIGH	0.739
3	47	M	LOW	HIGH	0.697
4	28	F	NORMAL	HIGH	0.564
5	61	F	LOW	HIGH	0.559
6	22	F	NORMAL	HIGH	0.677
7	49	F	NORMAL	HIGH	0.790
8	41	M	LOW	HIGH	0.767
9	60	M	NORMAL	HIGH	0.777
10	43	M	LOW	NORMAL	0.526
11	47	F	LOW	HIGH	0.896
12	34	F	HIGH	NORMAL	0.668
13	43	M	LOW	HIGH	0.627
14	74	F	LOW	HIGH	0.793
15	50	F	NORMAL	HIGH	0.828
16	16	F	HIGH	NORMAL	0.834
17	69	M	LOW	NORMAL	0.849
18	43	M	HIGH	HIGH	0.656
19	23	M	LOW	HIGH	0.559
20	32	F	HIGH	NORMAL	0.643
21	57	M	LOW	NORMAL	0.537
22	63	M	NORMAL	HIGH	0.616
23	47	M	LOW	NORMAL	0.809