# sciBASIC#: Microsoft VisualBasic for Scientific Computing



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**[WARNING] This project is a work in progress and is not recommended for production use.**

> Probably some namespace and object name may changes frequently on each commit, and you are feel free to using the **Object Browser** in visual studio to adapted to the object not defined problem which was caused by these changes.....

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**Directory Structure**

**1. source projects**

- **/CLI_tools** : Some small utilities and example tools
- **/Data** : *sciBASIC#* data framework system for data science, includes data frame, data I/O and data object search framework.
- **/Data_science** : *sciBASIC#* Mathmatica system, data graphics plot system & Data Mining library
- **/Microsoft.VisualBasic.Architecture.Framework** : Microsoft VisualBasic General App Runtime core
- **/mime** : various mime-type doc parsers in VisualBasic
- **/gr** : **sciBASIC# Artists**: (graphic artist) VB.NET data graphics system
- **/win32_api** : Win32 API collection (**Obsolete**)
- **/www** : Web related utilities code

**2. docs for User**

- **/guides** : This framework code usage example and manual documents
- **/vb_codestyle** : sciBASIC# Coding style standard document

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**Scientific Computing Tools for VisualBasic.NET**

A visualbasic language feature runtime library for data science CLI architecture applications which is running on Windows/Linux/macOS Desktop/server platform or supercomputer platform. This framework project includes a lot of mathematics utility tools and the utility code extension functions for the data sciences programming in VisualBasic language, and extends the VisualBasic programming language syntax. Makes the VisualBasic programming style more modernized in the data science industry by using this runtime library framework.

> Abount VisualBasic code style guidelines:
> + https://github.com/xieguigang/sciBASIC/tree/master/vb_codestyle
>
> Guides for using this framework, you can found the document and content index at the README.md(This guidelines document is currently compiling for users):
> + https://github.com/xieguigang/sciBASIC/blob/master/guides/

**Install this framework via nuget package**

For .NET Framework 4.6:

- https://www.nuget.org/packages/sciBASIC#

```bash
# For install latest stable release version:

PM> Install-Package sciBASIC

# For install latest unstable beta version:

PM> Install-Package sciBASIC -Pre
```

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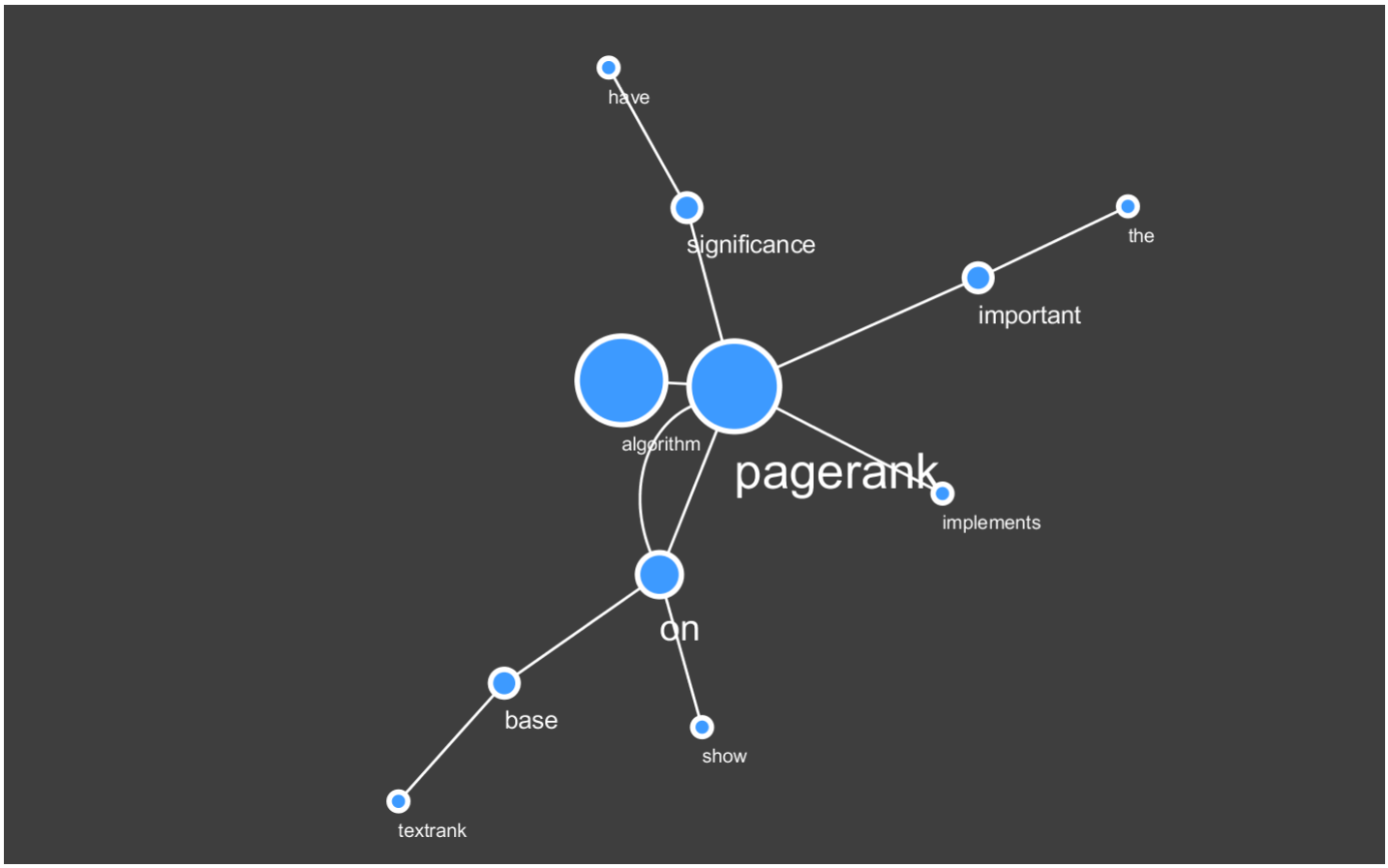
## Microsoft VisualBasic Trinity Natural Language Processor

**TextRank**

PageRank analysis on the text paragraph for find out the keyword, here is the pagerank result of the this example paragraph:

> "the important pagerank. show on pagerank. have significance pagerank. implements pagerank algorithm. textrank base on pagerank."




### Image fast binarization using VisualBasic image extension API

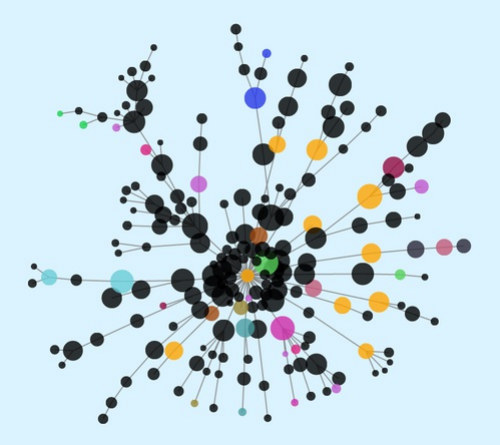
```
Sub Binarization(ByRef curBitmap As Bitmap, Optional style As BinarizationStyles = BinarizationStyles.Binary)
```

```vbnet
Imports Microsoft.VisualBasic.Imaging

Dim bitmap As Image = Image.FromFile("./etc/lena/f13e6388b975d9434ad9e1a41272d242_1_orig.jpg")

Call bitmap.Grayscale().SaveAs("./etc/lena/lena.grayscale.png", ImageFormats.Png)
Call bitmap.GetBinaryBitmap
.SaveAs("./etc/lena/lena.binary.png", ImageFormats.Png)
Call bitmap.GetBinaryBitmap(BinarizationStyles.SparseGray)
.SaveAs("./etc/lena/lena.gray.png", ImageFormats.Png)
```

| Normal | Binary | SparseGray | Grayscale |
|---|---|---|---|
|  |  |  |  |

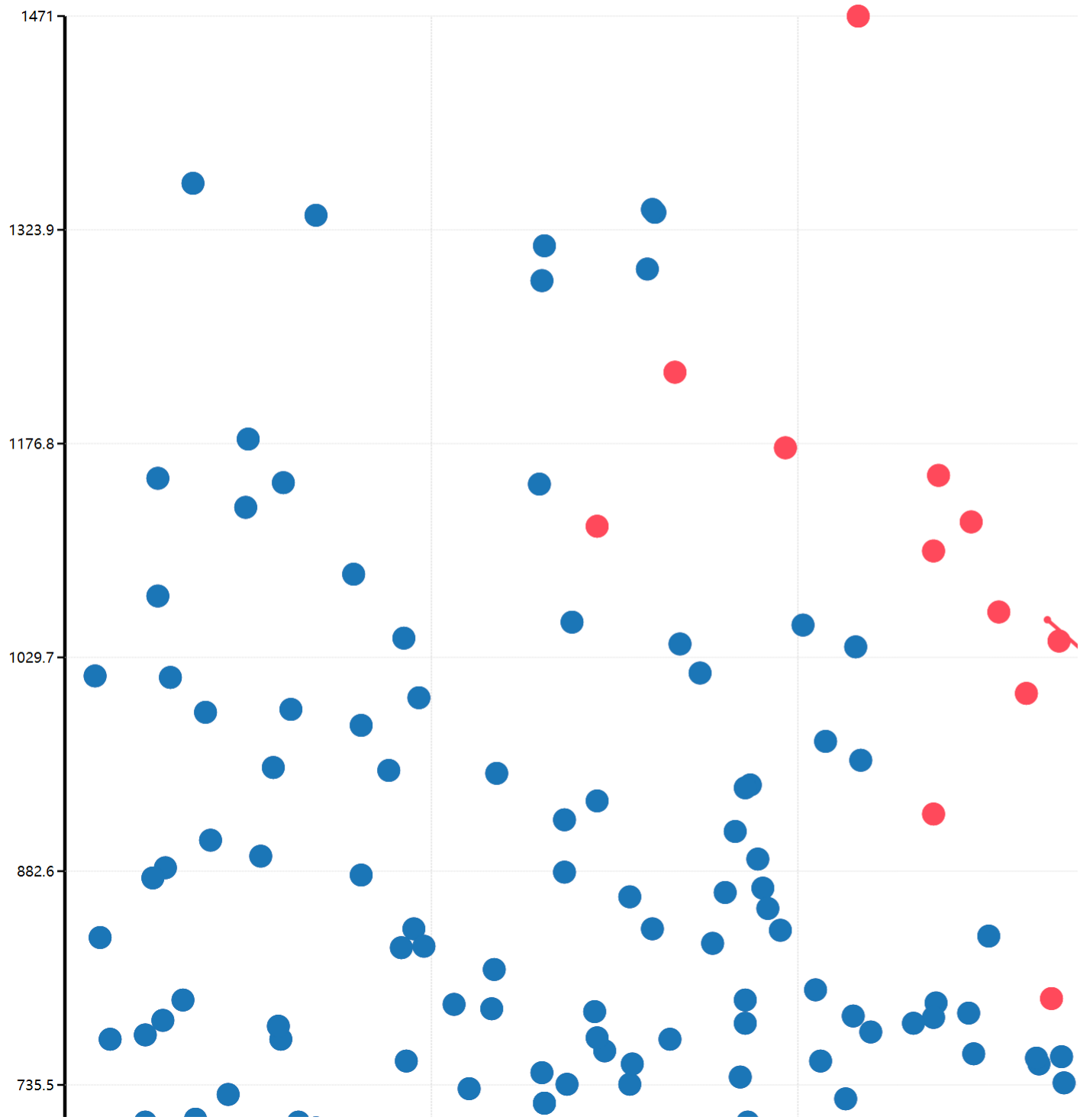
### Microsoft VisualBasic Mathematics & Data Graphics System

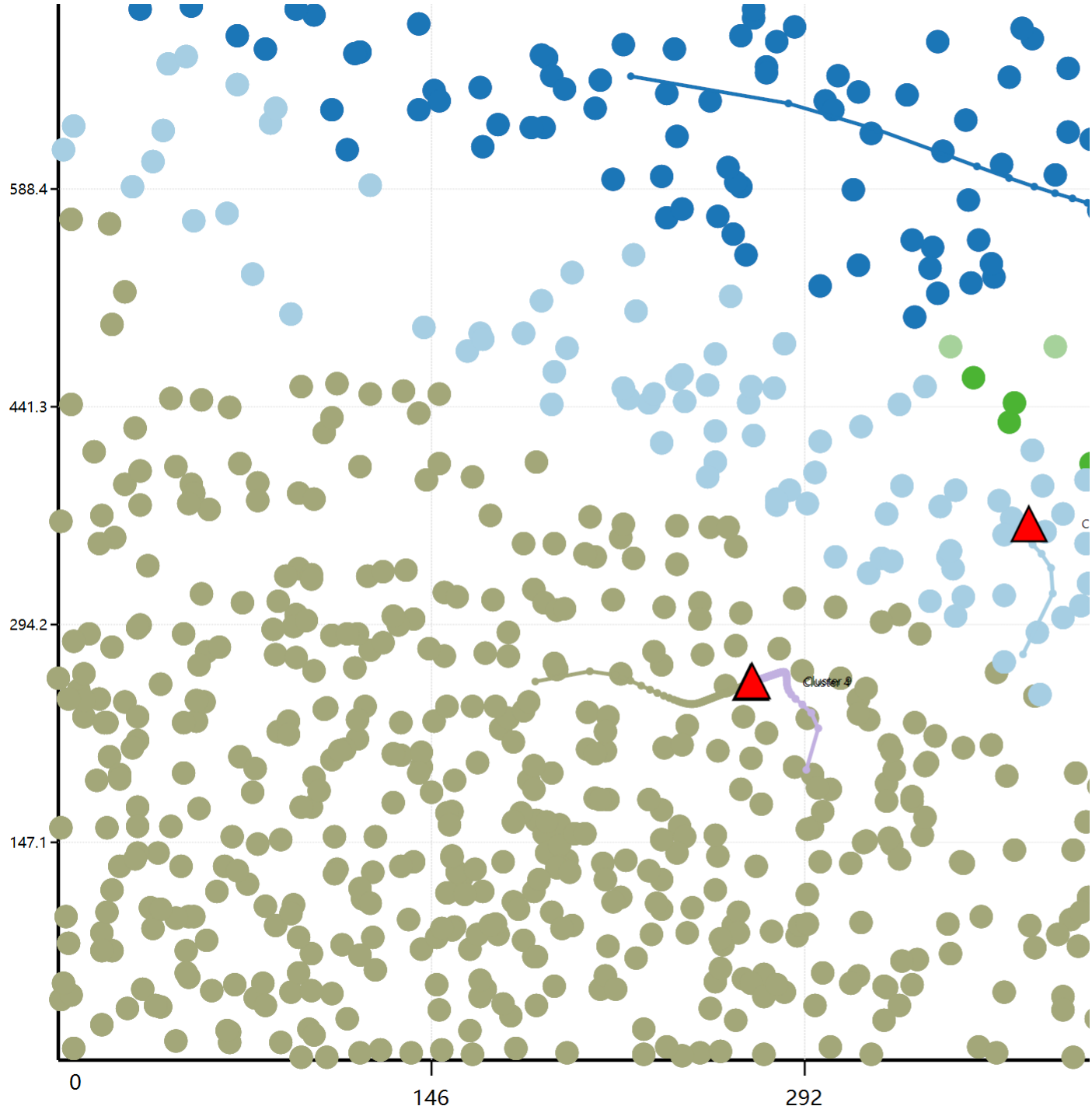
- Mathematics & Chart Ploting System
- Darwinism computing module
- Data Mining & Machine Learning
- sciBASIC# DataFrame System
- Network Visualization Interface

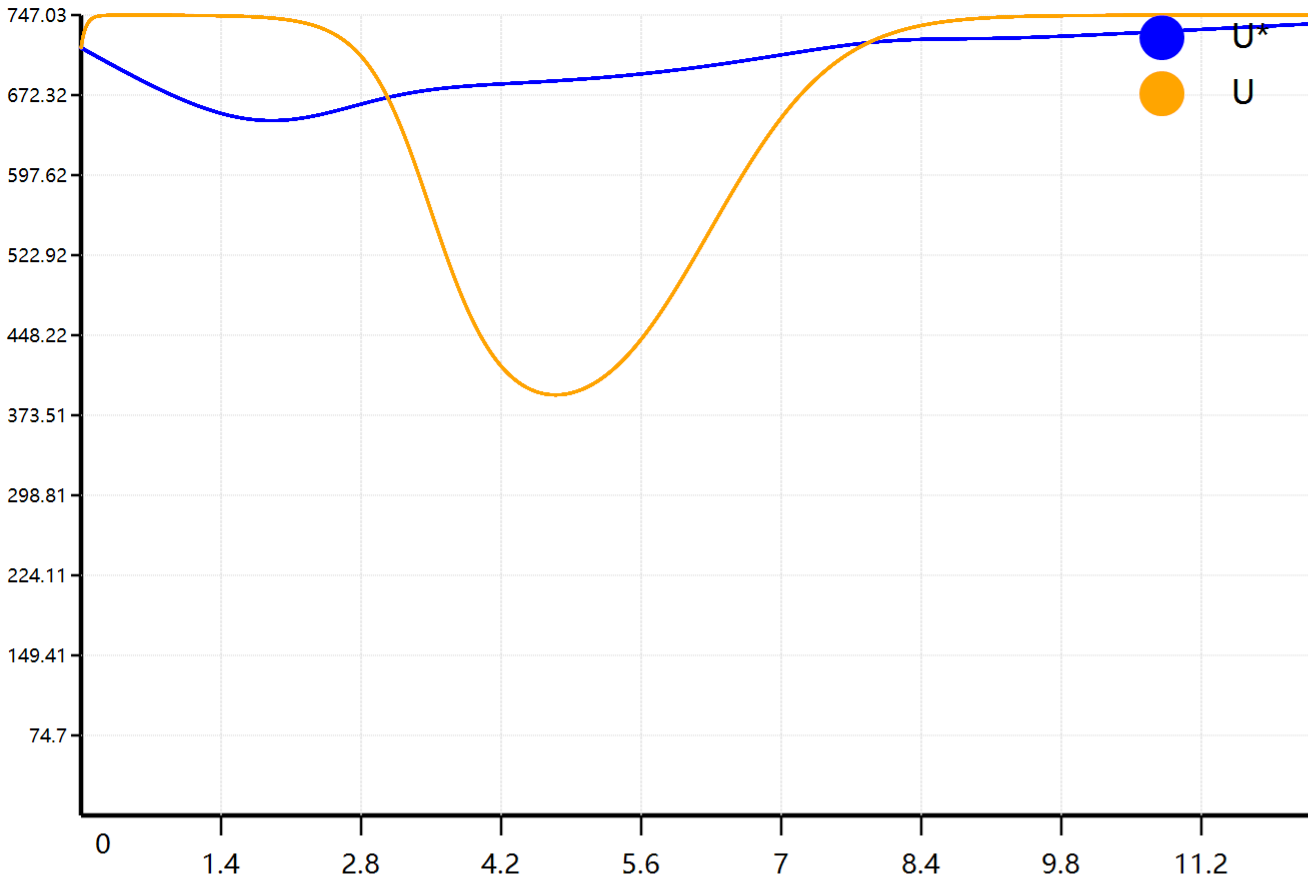


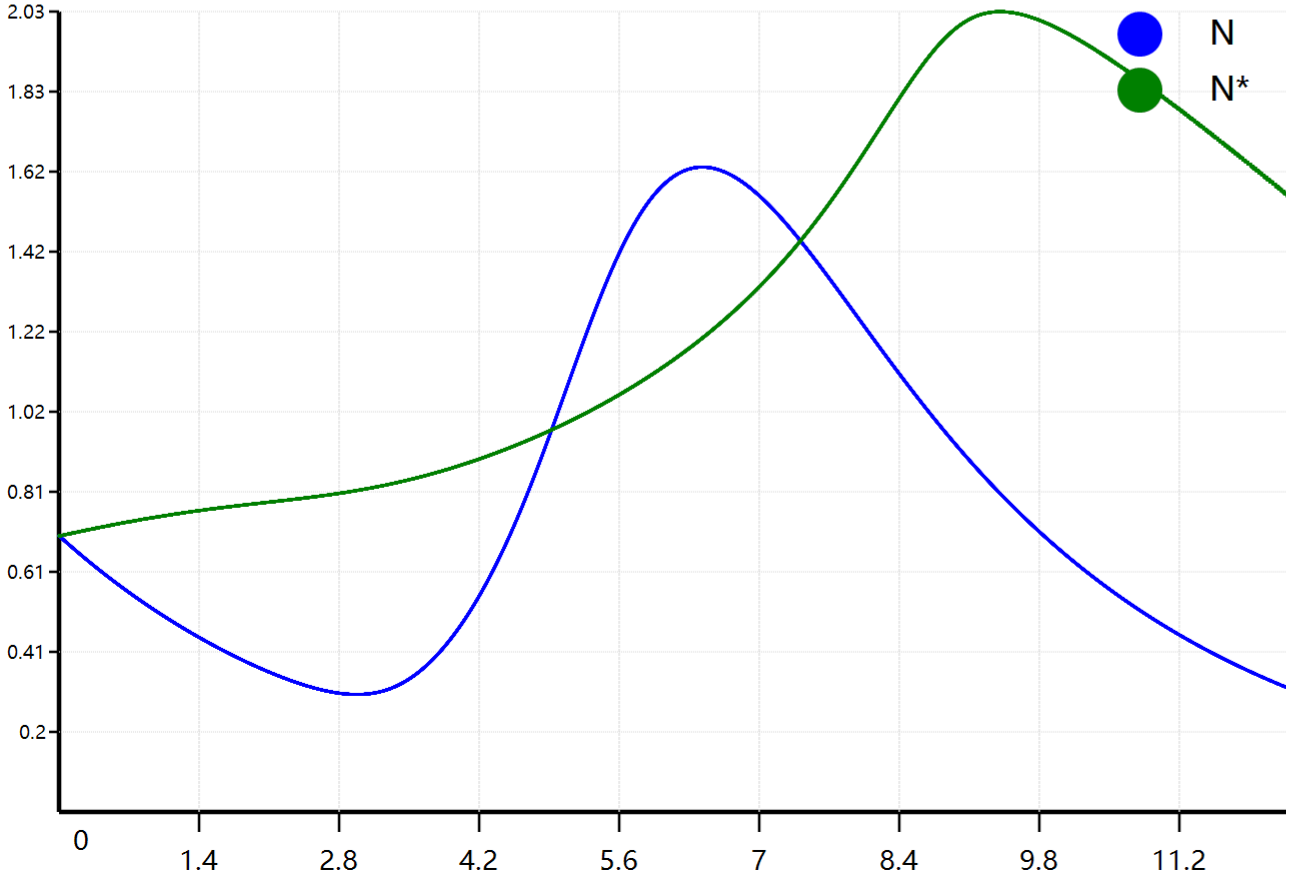
**sciBASIC# Chart Plots System**

```
vbnet
Imports Microsoft.VisualBasic.Data.ChartPlots
```




588.4
441.3
294.2
147.1
0
146
292
Cluster 9

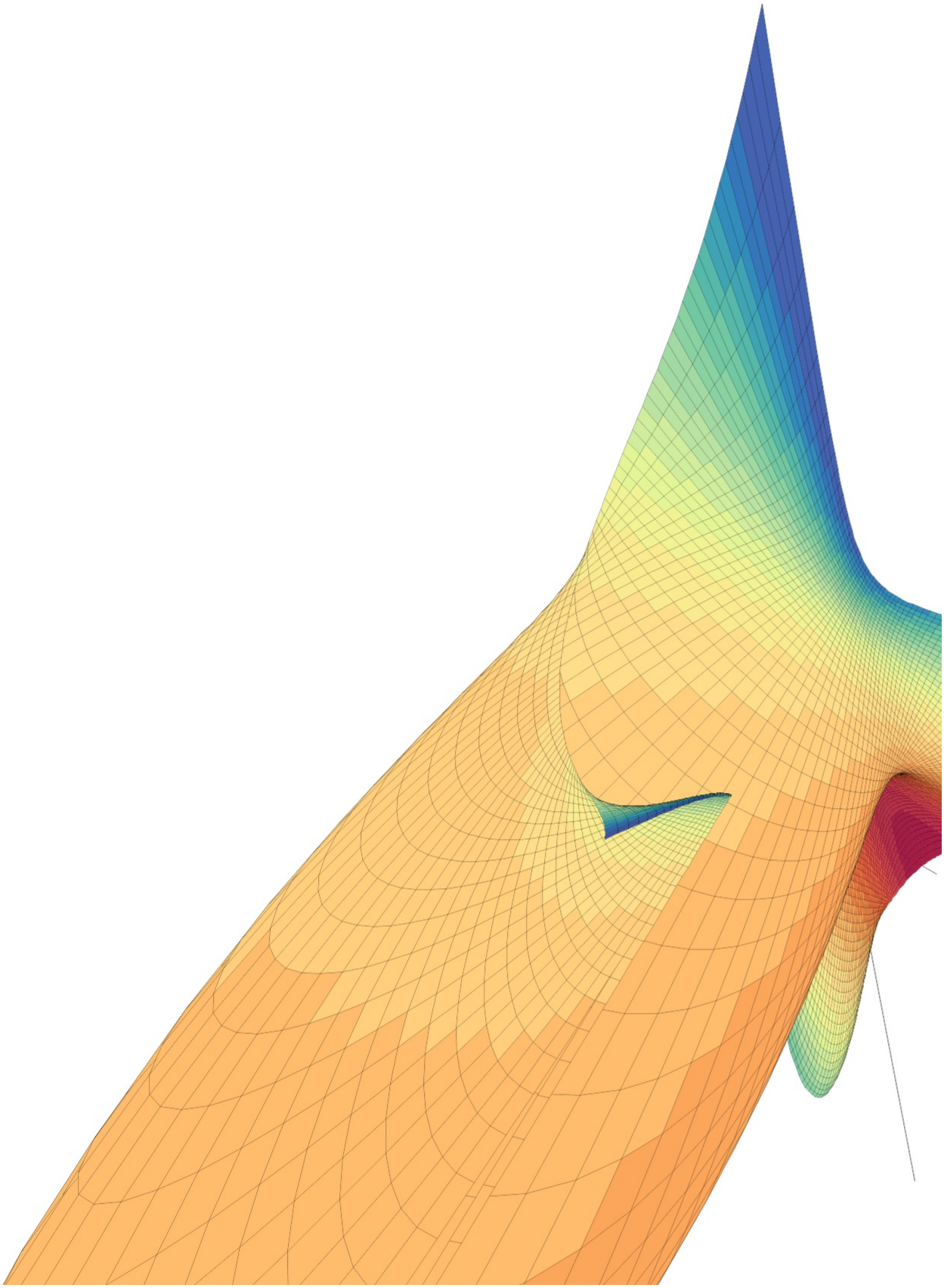


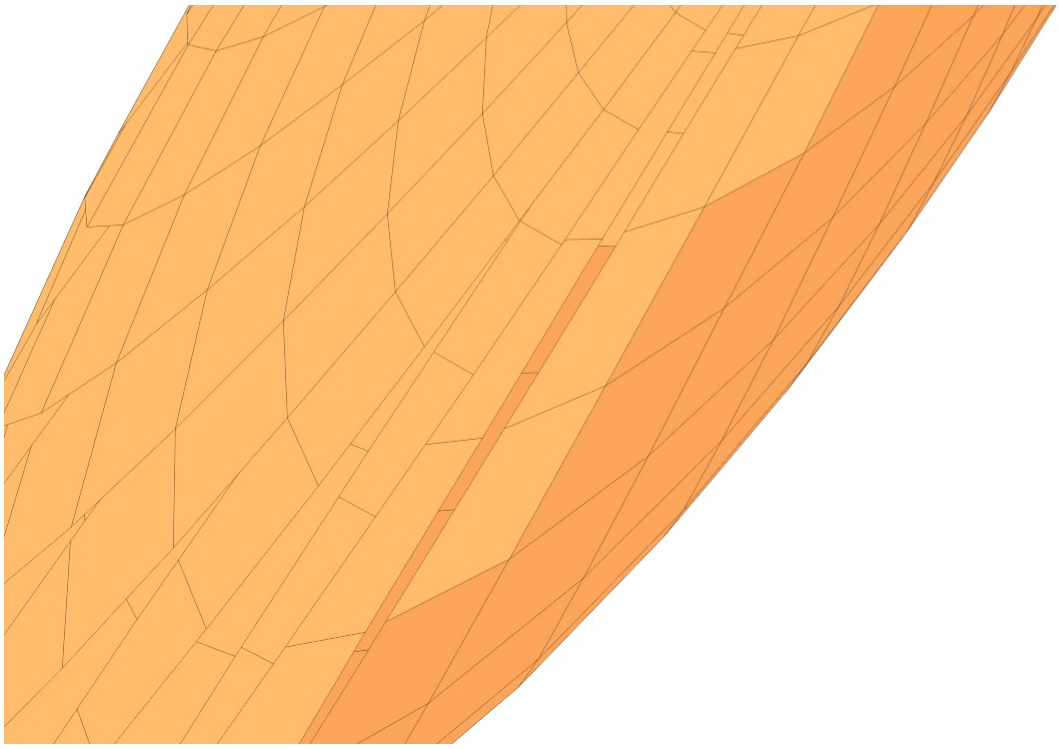




3D heatmap

```vbnet
```

```
Dim func As Func(Of Double, Double, (Z#, Color#)) =
_
Function(x, y) (3 * Math.Sin(x) * Math.Cos(y), Color:=x + y ^ 2)

Call Plot3D.ScatterHeatmap.Plot(
func, "-3,3", "-3,3",
New Camera With {
.screen = New Size(3600, 2500),
.ViewDistance = -3.3,
.angleZ = 30,
.angleX = 30,
.angleY = -30,
.offset = New Point(-100, -100)
}) _
.SaveAs("./3d-heatmap.png")
```

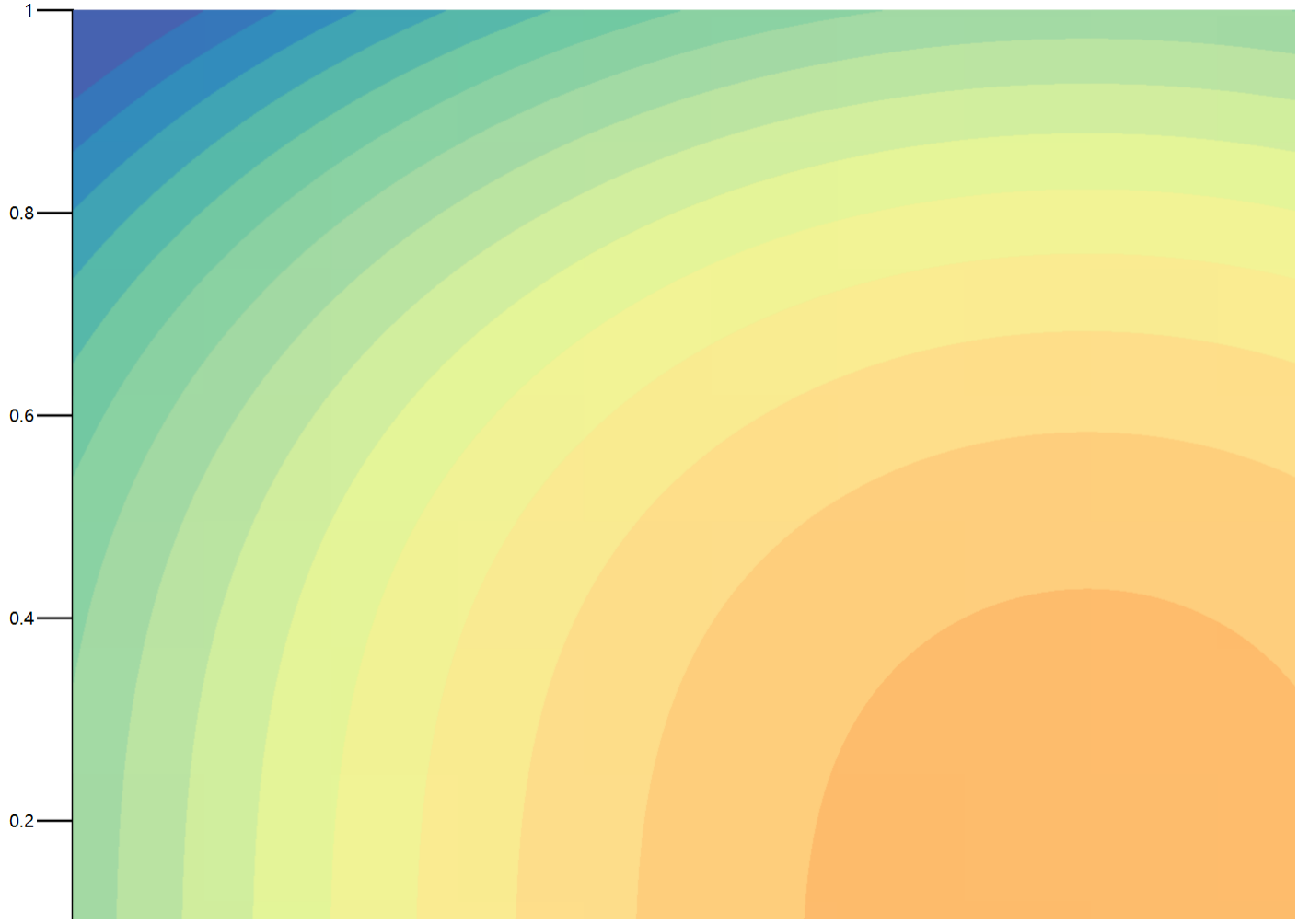


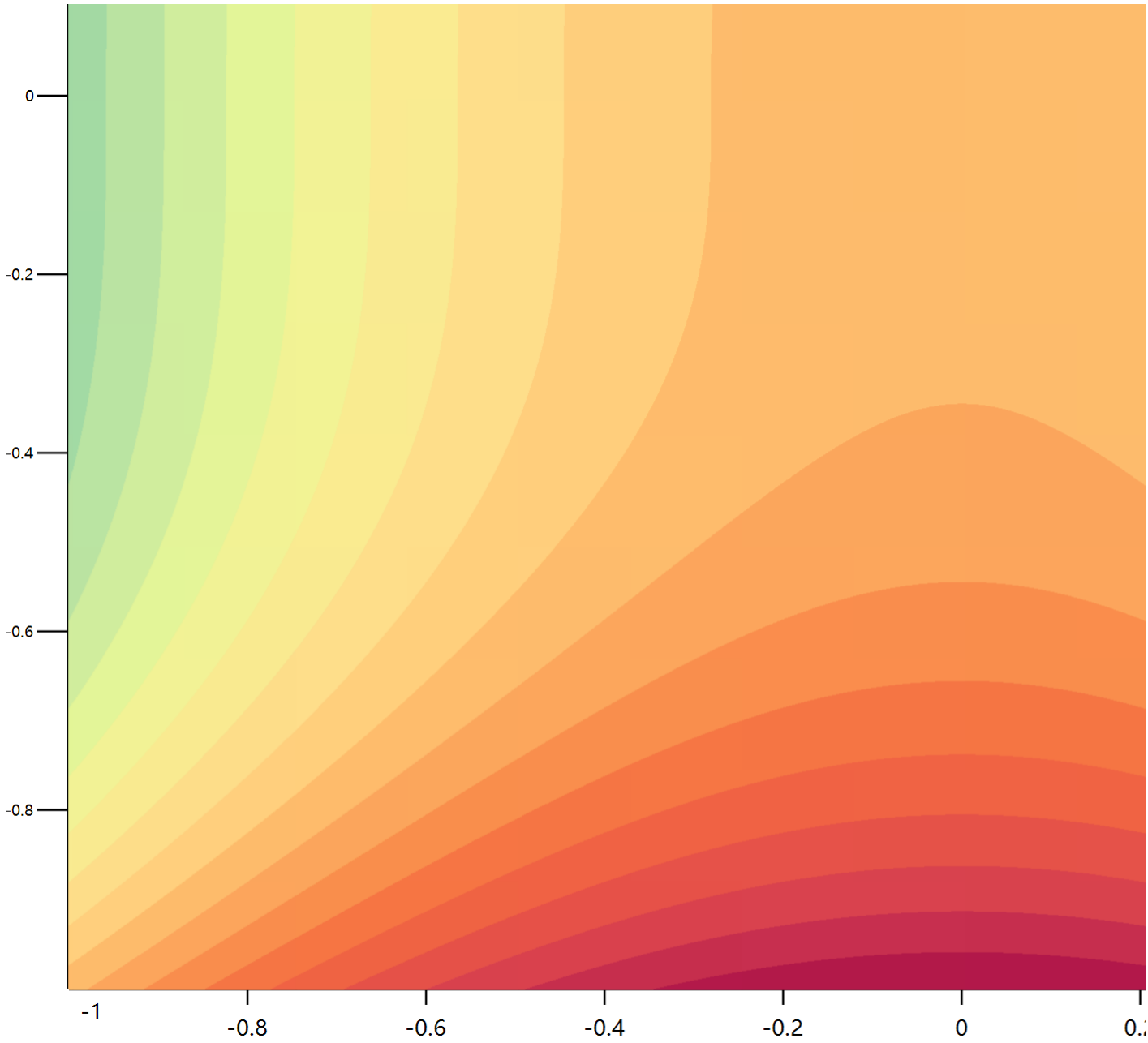


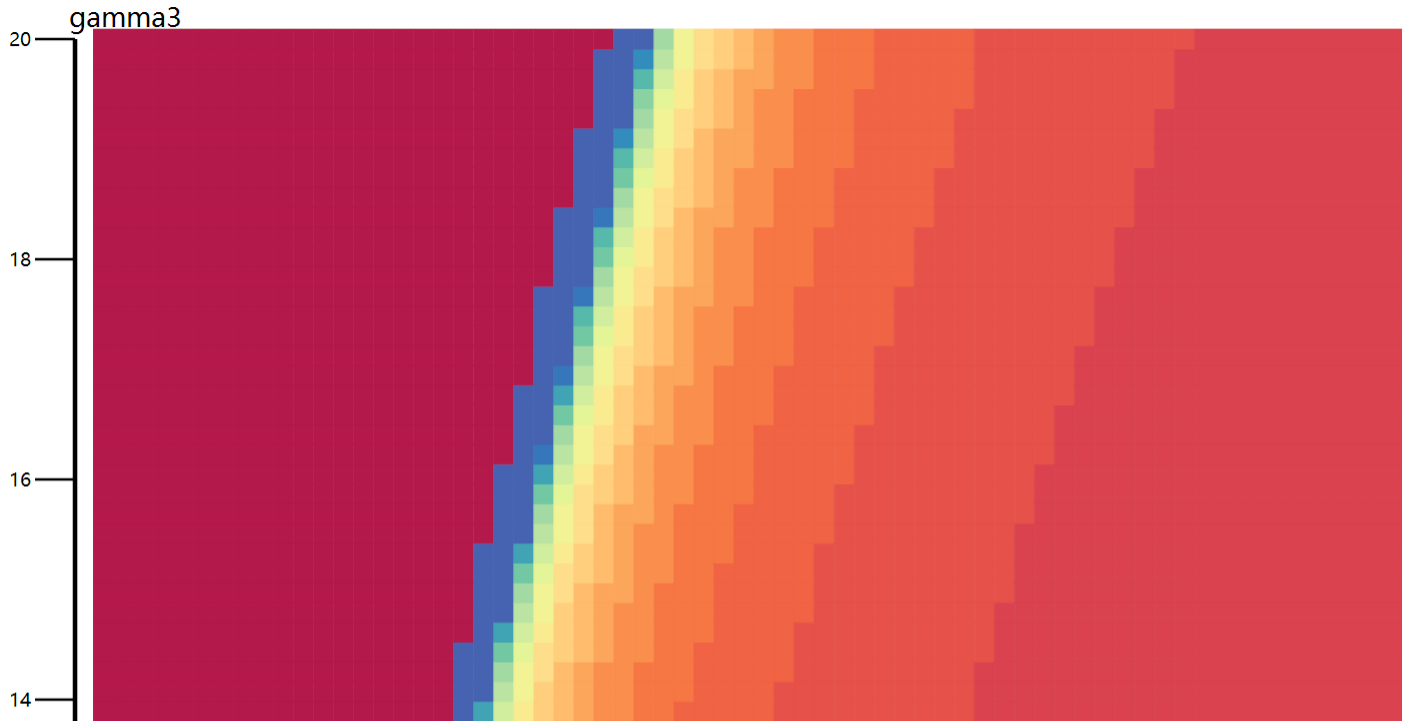
#### Scatter Heatmap

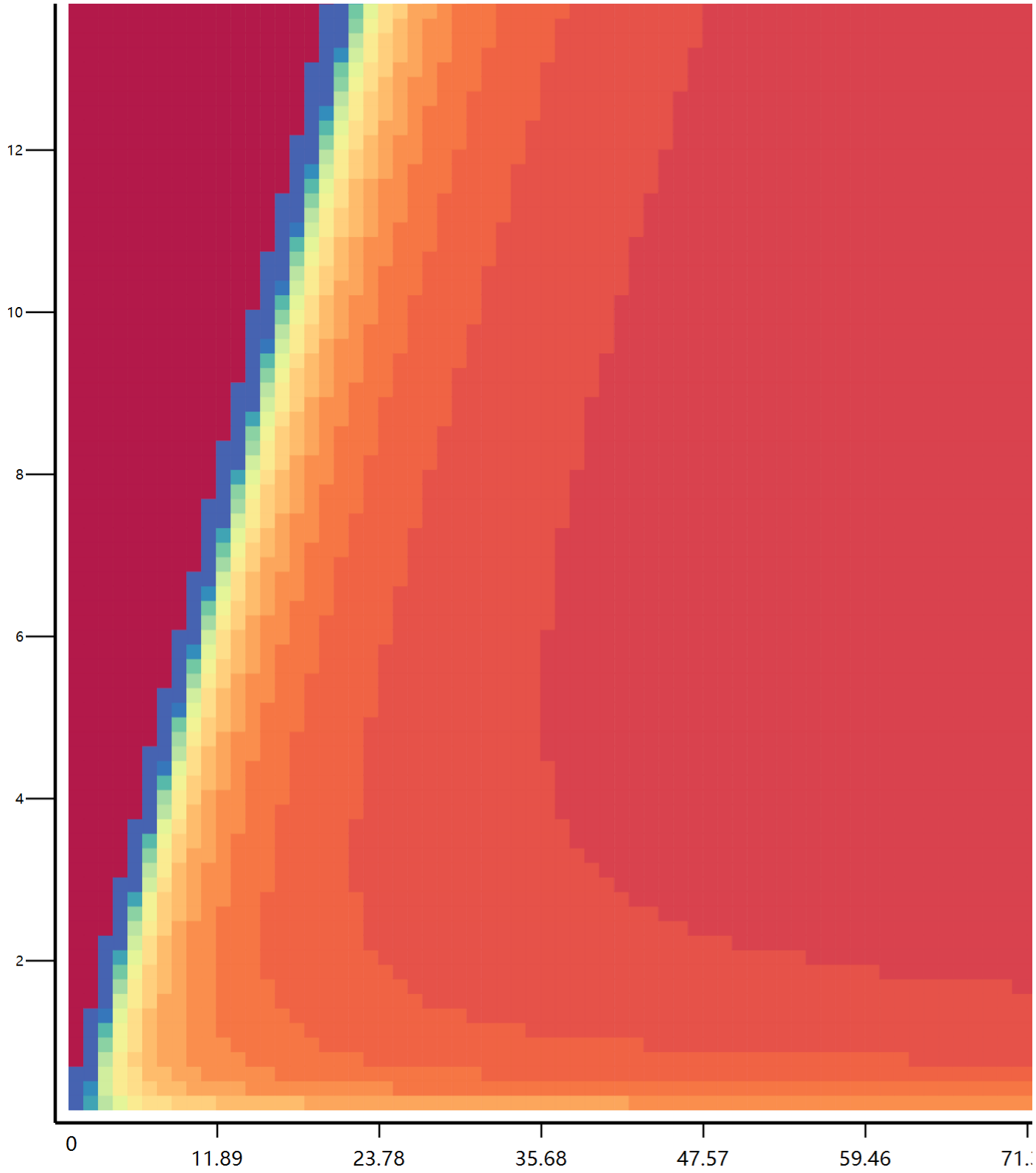
You can using a lambda expression as the plot data source:

```vbnet
Dim f As Func(Of Double, Double, Double) =
Function(x, y) x ^ 2 + y ^ 3

Call ScatterHeatmap _
.Plot(f, "(-1,1)", "(-1,1)", legendTitle:="z = x ^ 2 + y ^ 3") _
.SaveAs("./scatter-heatmap.png")
```




0
-0.2
-0.4
-0.6
-0.8
-1
-0.8
-0.6
-0.4
-0.2
0

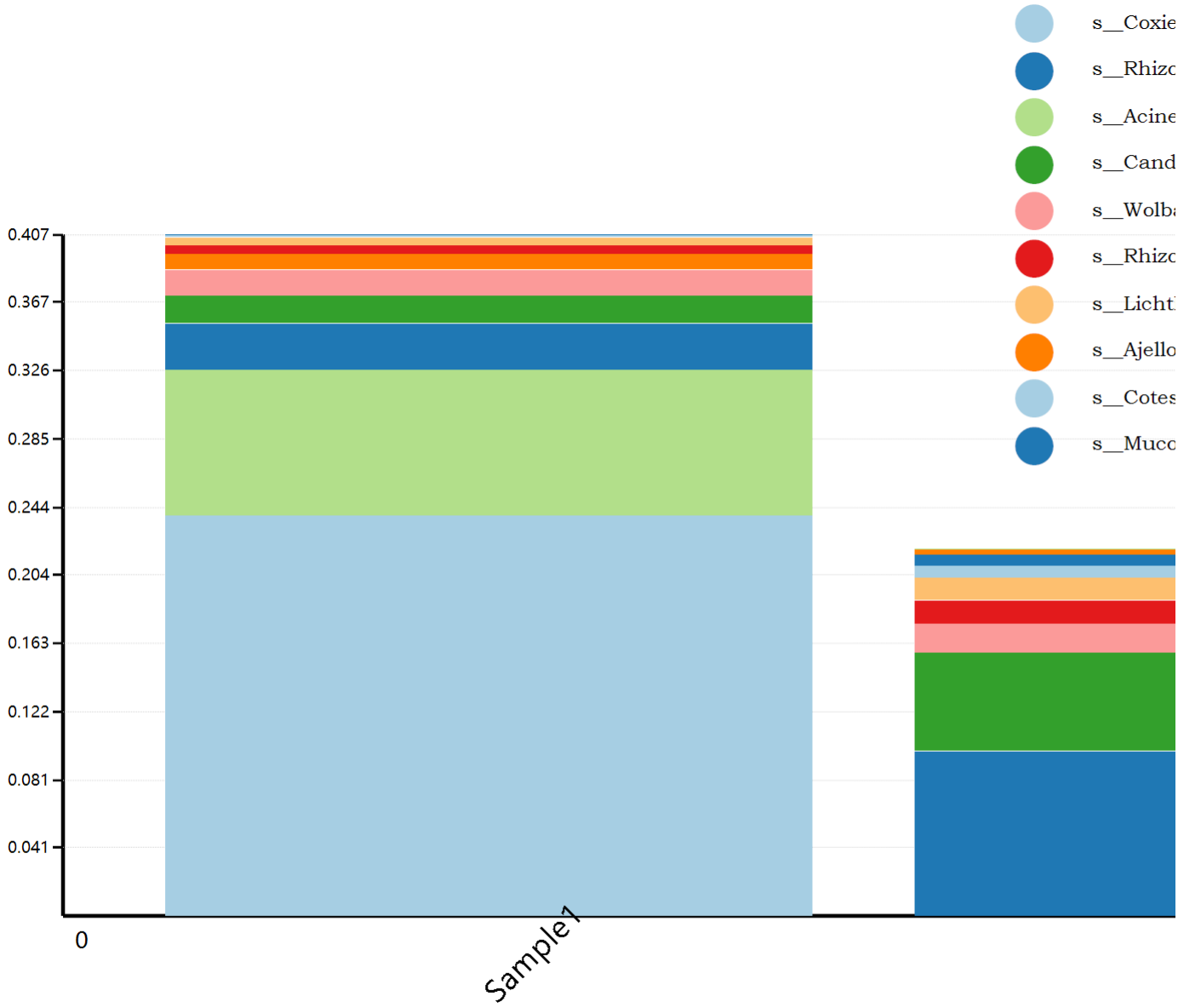

gamma3
20
18
16
14




#### Stacked Barplot

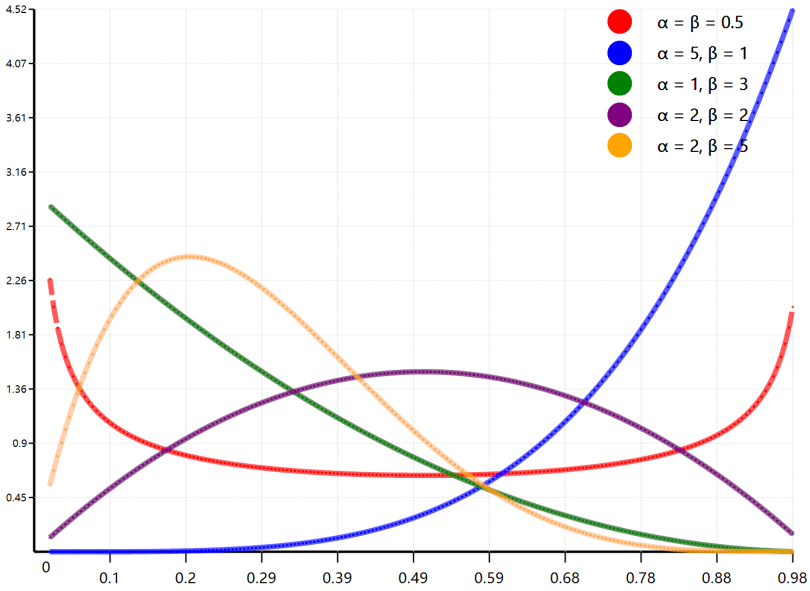
The stacked barplot is a best choice for visualize the sample composition and compares to other samples data:

```vbnet
Imports Microsoft.VisualBasic.Data.ChartPlots

' Plots metagenome taxonomy profiles annotation result using barplot
Dim taxonomy As BarDataGroup = csv.LoadBarData(
"./FigurePlot-Reference-Unigenes.absolute.level1.csv",
"Paired:c8") ' Using color brewer color profiles

Call BarPlot.Plot(
taxonomy,
New Size(2000, 1400),
stacked:=True,
legendFont:=New Font(FontFace.BookmanOldStyle, 18)) _
.SaveAs("./FigurePlot-Reference-Unigenes.absolute.level1.png")
```



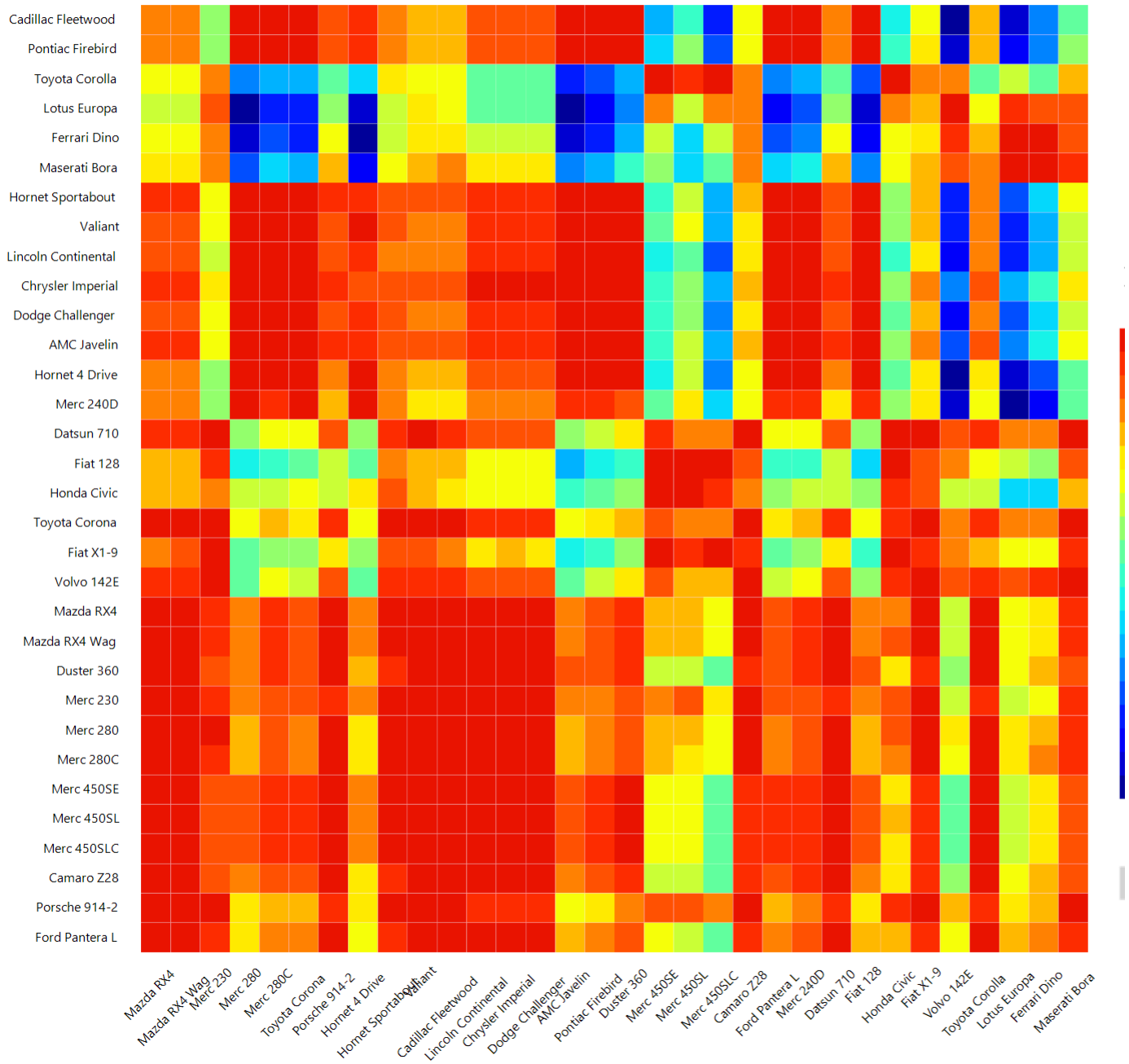

**beta-PDF**

```vbnet
Public Function beta(x#, alpha#, _beta#) As Double
Return Pow(x, alpha - 1) * Pow((1 - x), _beta - 1) *
Exp(lgamma(alpha + _beta) - lgamma(alpha) - lgamma(_beta))
End Function

Public Function lgamma(x As Double) As Double
Dim logterm As Double = Math.Log(x * (1.0F + x) * (2.0F + x))
Dim xp3 As Double = 3.0F + x

Return -2.081061F - x + 0.0833333F / xp3 -
    logterm + (2.5F + x) * Math.Log(xp3)

End Function
```




https://en.wikipedia.org/wiki/Beta_distribution

**Heatmap**




```vbnet
Dim data = DataSet.LoadDataSet("./Quick_correlation_matrix_heatmap/mtcars.csv")

Call data.CorrelatesNormalized() _
.Plot(mapName:="Jet", ' Using internal color theme 'Jet'
mapLevels:=20,
legendFont:=New Font(FontFace.BookmanOldStyle, 32)) _
.SaveAs("./images/heatmap.png")
```

**Microsoft.VisualBasic.Mathematical.Plots.Heatmap::Plot(IEnumerable(Of NamedValue(Of Dictionary(Of String, Double))), Color(), Integer, String, Boolean, Size, Size, String, String, String) As Bitmap**

Heatmap data source from R dataset mtcars and calculates the Pearson correlations:

```
R
data(mtcars)
write.csv(mtcars, "./Data_science/Mathematical/Quick_correlation_matrix_heatmap/mtcars.csv")
```

---

## New VisualBasic Language Syntax in this runtime

First of all, imports the language feature namespace of VisualBasic

```vbnet
```

# Region "Microsoft VisualBasic.NET language"

' sciBASIC# general application runtime
' Microsoft.VisualBasic.Architecture.Framework_v3.0_22.0.76.201__8da45dcd8060cc9a.dll

# End Region

Imports Microsoft.VisualBasic.Language
```

#### 1. Inline value assign

Old:

```vbnet
Dim s As String = ""

Do While Not s Is Nothing
s = blablabla

' Do other staff
Loop
```

New:

```vbnet
Dim s As New Value(Of String)

Do While Not (s = blablabla) Is Nothing
' Do other staff
Loop
```

#### 2. List(Of ) Add

Old:

```vbnet
Dim l As New List(Of String)

Call l.Add("123")
Call l.AddRange(From x In 100.Sequence Select CStr(x))
```

New:

```vbnet
Dim l As New List(Of String)

l += "123"
l += From x As Integer
In 100.Sequence
Select CStr(x)
```

#### VB int Type

```vbnet
Dim min As int = 1
Dim max As int = 200
Dim x As Integer = 199

Console.WriteLine(min <= x < max) ' True
x += 10 ' 209
Console.WriteLine(min <= x < max) ' False
x = -1
Console.WriteLine(min <= x < max) ' False
```

---
```