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R & Coffee - Higher Order 3D Visualization - Ellipse

discussion posted 2 months ago by **GuilhermeKinzel**

For who wants to visualize more about Higher Order, I made a simple R code to generate 3D plots and its a opportunity give some R users, an introduction to *rgl* package - for who still doesn't know it.

And well, the question gives a beautiful plot. Its like a comet!

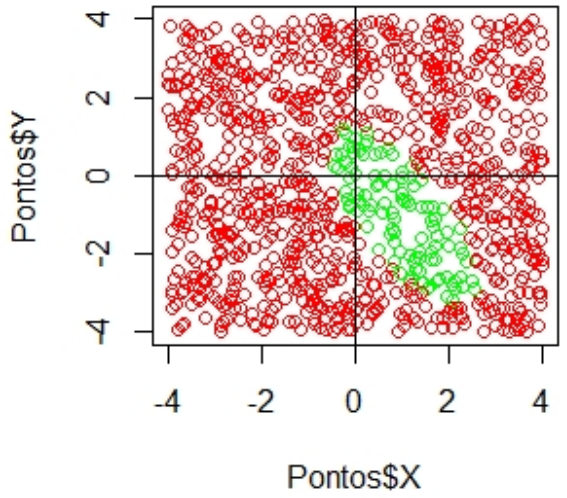
Remark: I think that the code **really** help to answer the question. I changed some parts to not shadow the question's ellipse, and removed some comments to not be so instrutive. Even so, if CTA's/Staff think that perceive too much, feel free to edit/remove it! (and my sorry on case)

```
## Higher Order 3D Visualization - Ellipse 1.0
## xMIT - 6.86x
## Lecture 6 - 2. Higher Order Feature Vectors
## Guilherme Kinzel - Student

require(rgl)

set.seed(1)
Pontos = data.frame(X = runif(1000, -4, 4), Y = runif(1000, -4, 4))
Pontos$BelongElipse = rep(NA, length.out=dim(Pontos)[1])

BelongsToEllipse = function(x, x0, a, y, y0, b, c)
{
  Num = (x-x0)^2/a+(y-y0)^2/b+c*x*y-1
  # print(Num)
  if(Num<0)return(TRUE)
  return(FALSE)
}

for (i in 1:dim(Pontos)[1])
{
  Pontos$BelongElipse[i] = BelongsToEllipse(x = Pontos[i,1], y = Pontos[i,2],
                                            x0 = 0.5, a = 1, y0 = 0, b = 2, c = 1)
}

plot(Pontos$X, Pontos$Y, col = ifelse(Pontos$BelongElipse==1,"green","red"))
abline(h=0)
abline(v=0)


library(rgl)

# Create some dummy data
dat <- replicate(2, 1:3)
plot3d(dat, type = 'n', xlim = c(-4, 4), ylim = c(-4, 4), zlim = c(-4, 4))
title3d(xlab="X",ylab="Y",zlab="Z")
```

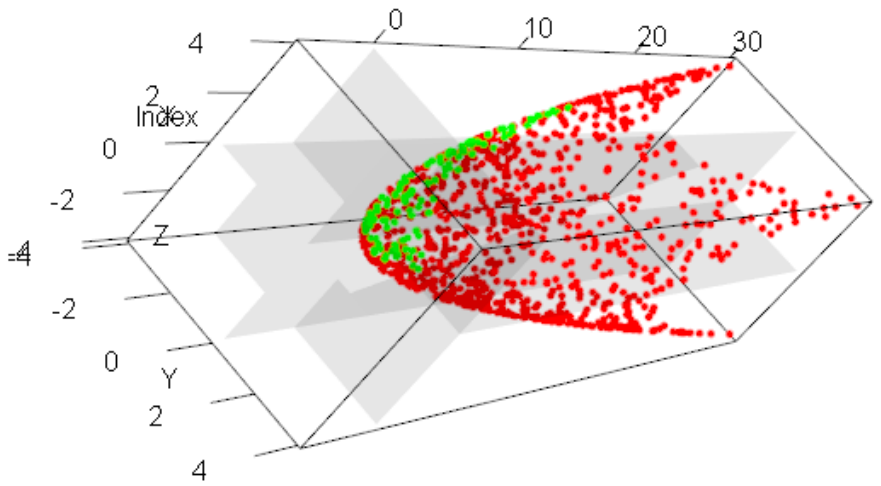
```
Data3D = Pontos
Data3D$Z = Data3D$X^2+Data3D$Y^2

planes3d(1, 0, 0, 0, col = 'black', alpha = 0.1)
planes3d(0, 1, 0, 0, col = 'black', alpha = 0.1)
planes3d(0, 0, 1, 0, col = 'black', alpha = 0.1)
points3d(Data3D$X, Data3D$Y, Data3D$Z, col =
ifelse(Pontos$BelongElipse==1,"green","red"),size=5)
```

Ellipse Generated from two uniforms.

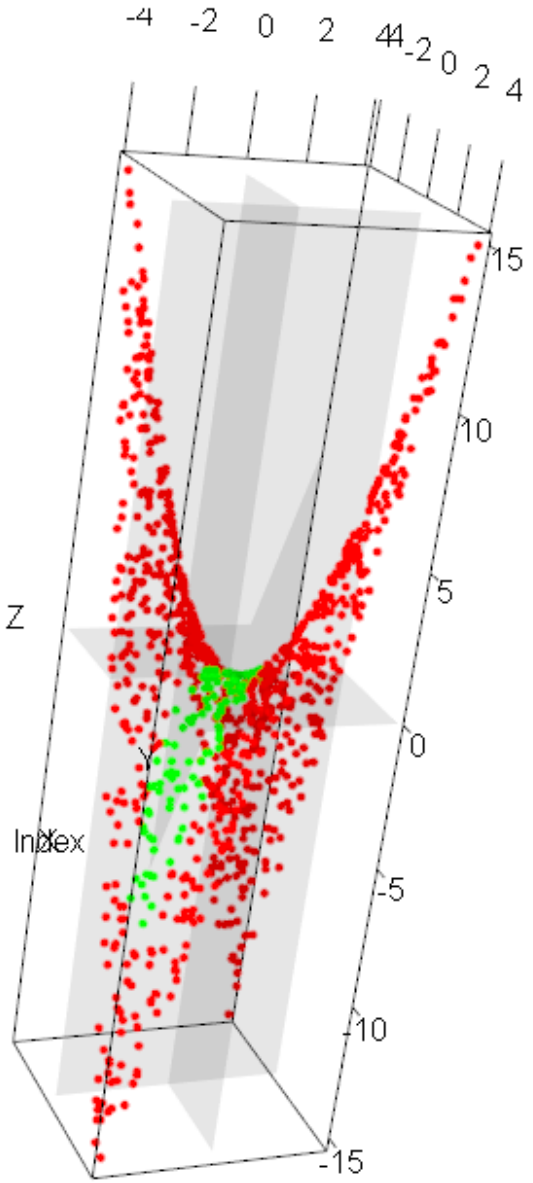
- Green: belongs to ellipse;
- Red: don't belong.



Using $\Phi^{(1)}(x)$ - I will not specify which one.



Using $\Phi^{(2)}\left(x\right)$ - I will not specify which one.



Related to: Unit 2 Nonlinear Classification, Linear regression, Collaborative Filtering (2 weeks):Lecture 6. Nonlinear Classification / 2. Higher Order Feature Vectors

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6 responses

JayNiX
2 months ago

That was really nice of you. I got the answer mathematically right but i was having a hard time trying to figure out what it actually meant, i wasn't imagining it accurately. Thank you!

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butterandfly
2 months ago

Cool~~

Add a comment

groepler
2 months ago

Really nice. I feel like R doesn't get enough "shrift" on the ML stuff. Learning python is great, but R is also quite wondeful for handling n-dimensional arrays. Thank you for doing and sharing!

Add a comment

ScottBernstein
2 months ago

Very nice! Thank you! :-)

Add a comment

goodyst
2 months ago

R-some thanks

Add a comment

gpr90662b
2 months ago

Does figure 2 qualify as a solution? If so how one draws a separating plane? Does not look like one can be drawn without including large number of red dots?

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