

CS 6170: Computational Topology, Spring 2019

Lecture 10

Topological Data Analysis for Data Scientists

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TDA pipeline: computational tools I

- JavaPlex
- TDA-R
- Dionysus
- GUDHI
- DIPHA
- PHAT
- ...
- https://people.maths.ox.ac.uk/otter/PH_programs
- Here: macOS Mojave 10.14.2

- <https://cran.r-project.org/web/packages/TDA/>
- Install R and R-studio (XQuartz optional)
 - <https://medium.com/@GalarnykMichael/install-r-and-rstudio-on-mac-e911606ce4f4>
 - <http://cran.cnr.berkeley.edu/>
 - <https://www.rstudio.com/products/rstudio/download/>
 - <https://www.xquartz.org/>
- Tutorials
 - <https://geometrica.saclay.inria.fr/team/Steve.Oudot/courses/TUM/TP/index.html#persistence-diagrams-for-rips-filtration>
 - https://www.win.tue.nl/SoCG2015/wp-content/uploads/tutorials/150623_presentation_2.pdf
- Demo
- Fasy et al. (2015)

TDA-R: Demo

```
install.packages("TDA", dependencies=TRUE)
```

```
library(TDA)
```

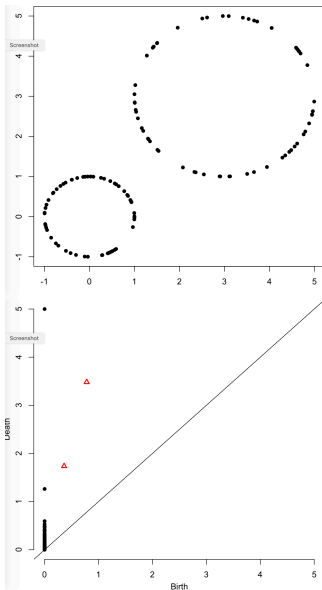
```
Circle1 <- circleUnif(60)  
Circle2 <- circleUnif(60, r = 2) + 3  
Circles <- rbind(Circle1, Circle2)  
plot(Circles, pch = 16, xlab = "", ylab = "")
```

```
maxdimension <- 1 # components and loops  
maxscale <- 5 # limit of the filtration
```

```
Diag <- ripsDiag(X = Circles,  
                 maxdimension,  
                 maxscale,  
                 library = "GUDHI",  
                 printProgress = FALSE)  
print(Diag[["diagram"]])
```

```
print(summary.diagram(Diag[["diagram"]]))
```

```
plot(Diag[["diagram"]])
```



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 - <https://www.xquartz.org/>
- Follow tutorial at:
<https://geometrica.saclay.inria.fr/team/Steve.Oudot/courses/TUM/TP/index.html#persistence-diagrams-for-rips-filtration>
- Demo

Fasy, B. T., Kim, J., Lecci, F., and Maria, C. (2015). Introduction to the r package tda. *arXiv:1411.1830*.