Efficient  tools for geometrical statistics

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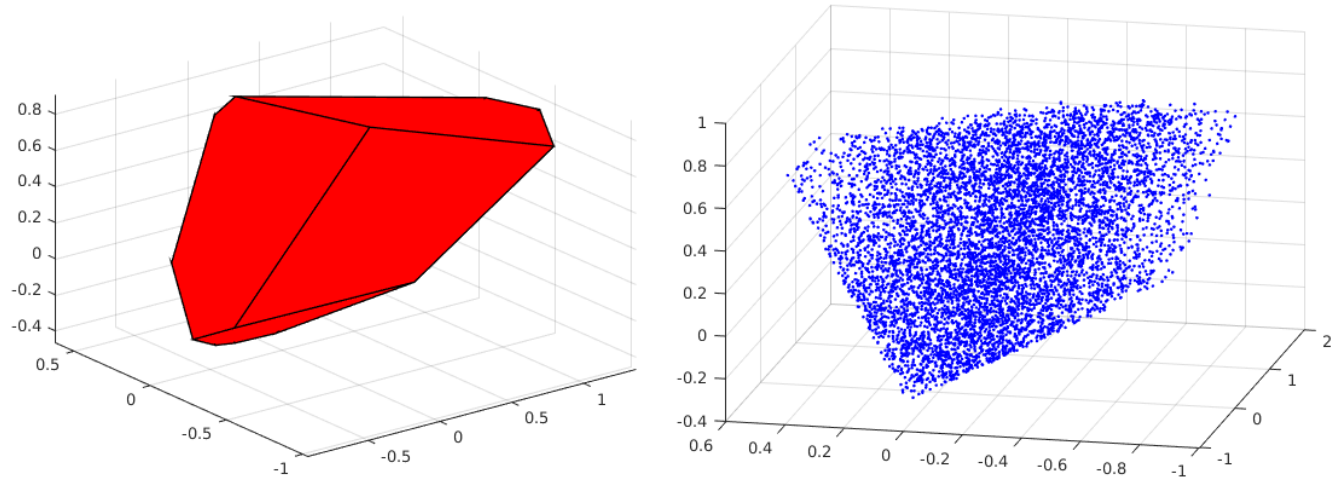
Project profile

- Keywords: Monte-Carlo, random walks, convex polytopes



- Student: Apostolos Chalkis, MSc, Uni of Athens, Greece
- Mentors: V.Fisikopoulos (Greece), Z.Zafeirakopoulos (Turkey)
- Software: `https://github.com/vissarion/volume_approximation/tree/R_volesti`
- Blog: `https://tolischal.github.io/GSoC2018`

Outcome - Community impact

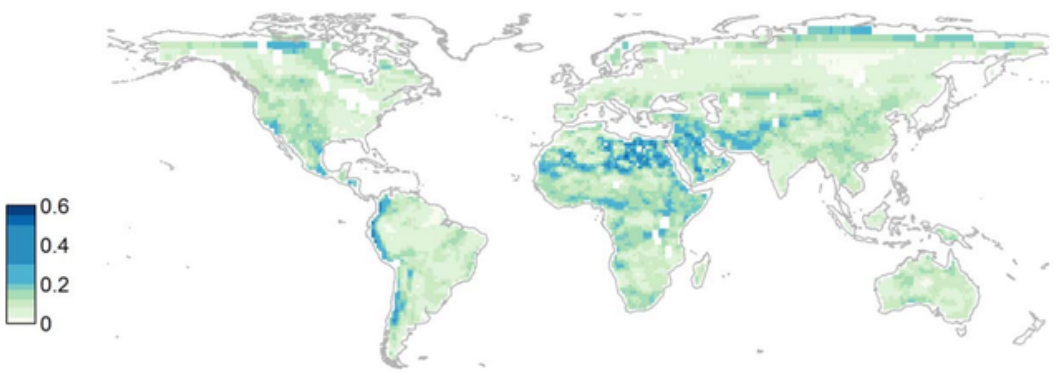
- R interface for C++
- new features: algorithms, types of polytopes
- High-dimensional volume computation (few hundreds), current in R (<15 dims)
- Example:

```
library(volesti)
P = GenCube(20,"H")
system.time(approxVol<-volume(P))
exactVol <- 2^20
print((exactVol - approxVol) / exactVol)
```

Ouput: 4% relative error in 1.67 secs

Applications

- Bio-geography: temporal analysis of biodiversity dynamics for bird species



- Economics. Portfolios performance:
  1^{st} September 1999 (during the dot-com bubble - left),
  1^{st} September 2000 (beginning of the bubble burst - right)