

Computer Animations for Demonstrating Statistical Procedures: Methods and Implementations

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Statistical Graphics: Data and Information Visualization in Today's Multimedia Society
(Data Viz VI)

Outline

1 Motivation

- Sometimes Statistics Classes Are Like This...
- Sometimes Things Can Be Different...

2 Methods

- How to Generate Animations in R
- The `animation` Package
- Convert R Animations to Other Forms

3 Examples

4 Summary

Motivation

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Freeze! Listen to Me!

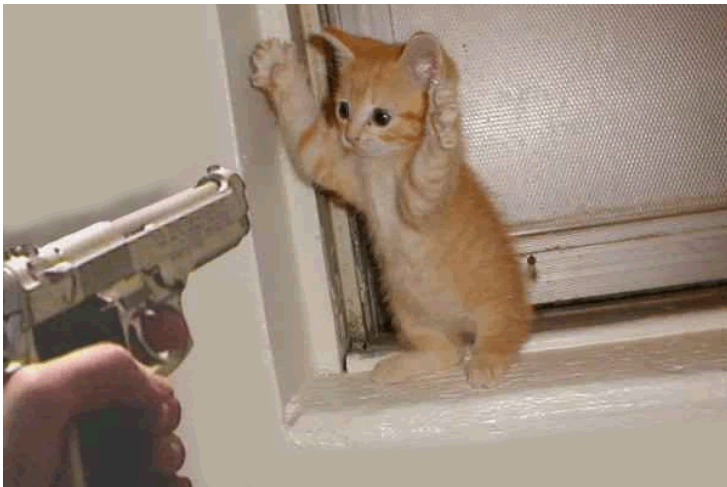


Figure 1: Hey, buddy, this is not funny!

Cooked in Examinations...



Figure 2: Are we like hot “dogs” when in examinations?

How Far Can Our Imagination Reach?



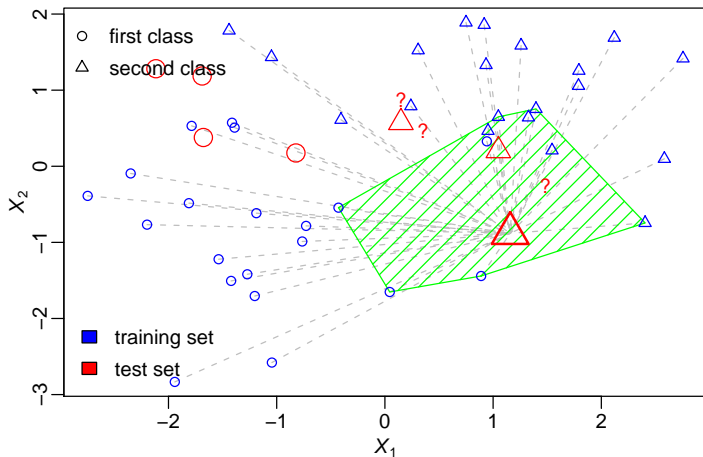
Figure 3: This is not Harry Potter!

Nobody's Sleeping There?



Figure 4: Me at a forum, talking about animations.

A Simple Illustration: Steps of the k NN Algorithm



`knn.ani()`

Where Do I Begin?

- Simulations that involve with random numbers: flip coins, drop (Buffon's) needles, LLN, CLT, etc.
- Sampling and Resampling (& sub-sampling): bootstrapping, jackknife, cross-validation, SRSWOR, etc.
- Computations that contains *intuitive* iterations: Newton's method, gradient descent, etc.
- Time series or any series that show changes along a certain variable.

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A Naive Method: Successive Plots in a Loop

```
cl = rainbow(360)
for (i in 1:360) {
  plot(1, ann = F, type = "n", axes = F)
  text(1, 1, "Animation", srt = i,
       col = cl[i], cex = 7 * i/360)
  Sys.sleep(0.01)
}
```

Animation

Figure 5: A rotation (rotation.swf)

To Turn Ideas into Animations

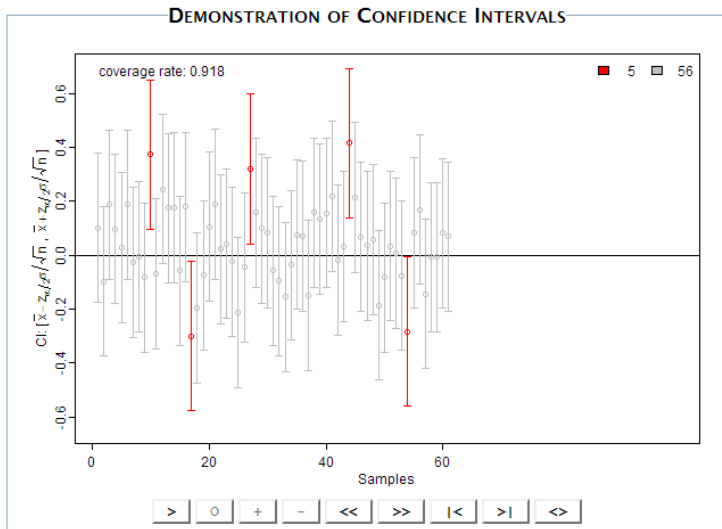
Infrastructure R base graphics (grid graphics in future?)

Implementation plot again and again... (and record the sequence of images)

Insane Ideas focus on the visual display of statistical theories to help people think in a *step-by-step* manner

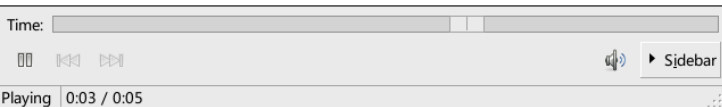
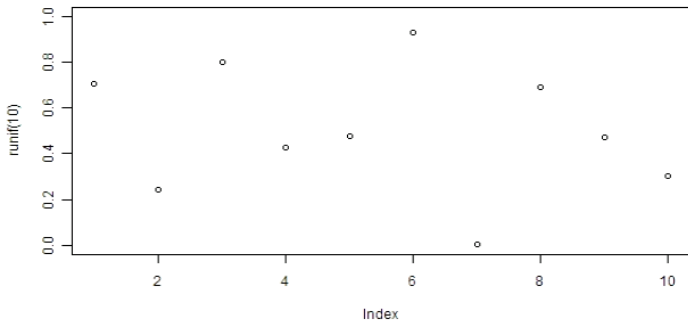
Internet AniWiki: Animations in Statistics
(<http://animation.yihui.name>)

Three Kinds of Animations: (1) HTML Pages

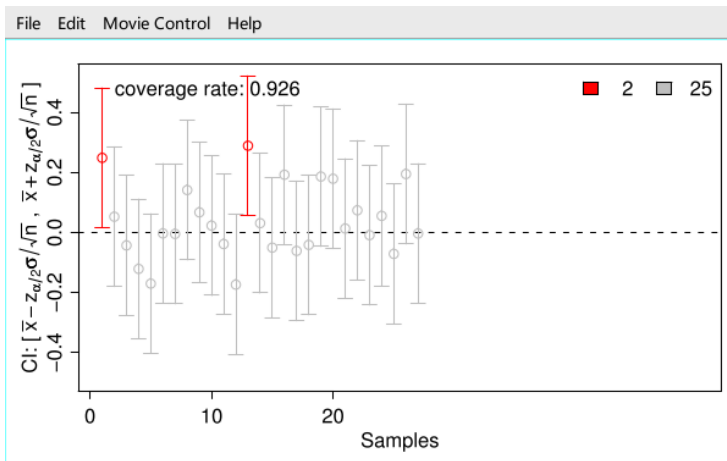


Three Kinds of Animations: (2) GIF/MPG by ImageMagic

Movie Edit View Go Sound Help



Three Kinds of Animations: (3) Flash by SWF Tools



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Demonstrations Covering About 20 Topics

Time to relax now! Let's watch some movies.

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Conclusions

- They told me: “very interesting, impressive”, but only *one* person told me “useful” so far; I’m so sorry about that :-(
- I think (insist?) animation is an effective measure to prevent students from sleeping, and this is an important step before teaching them knowledge :-D Besides, animations may help them understand statistical methods more quickly.
- “I hear and I forget, I see and I remember, I do and I understand.” – Xun Zi (an ancient Chinese Confucian philosopher)
- There are limitations: a lot of theories have nothing to do with animations (it’s not my fault); no GUI (necessary?); ...

Thanks

- Questions & Comments?