Animation in Statistics: Dynamic Graphics for Statistical Models and Practical Applications

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Contents

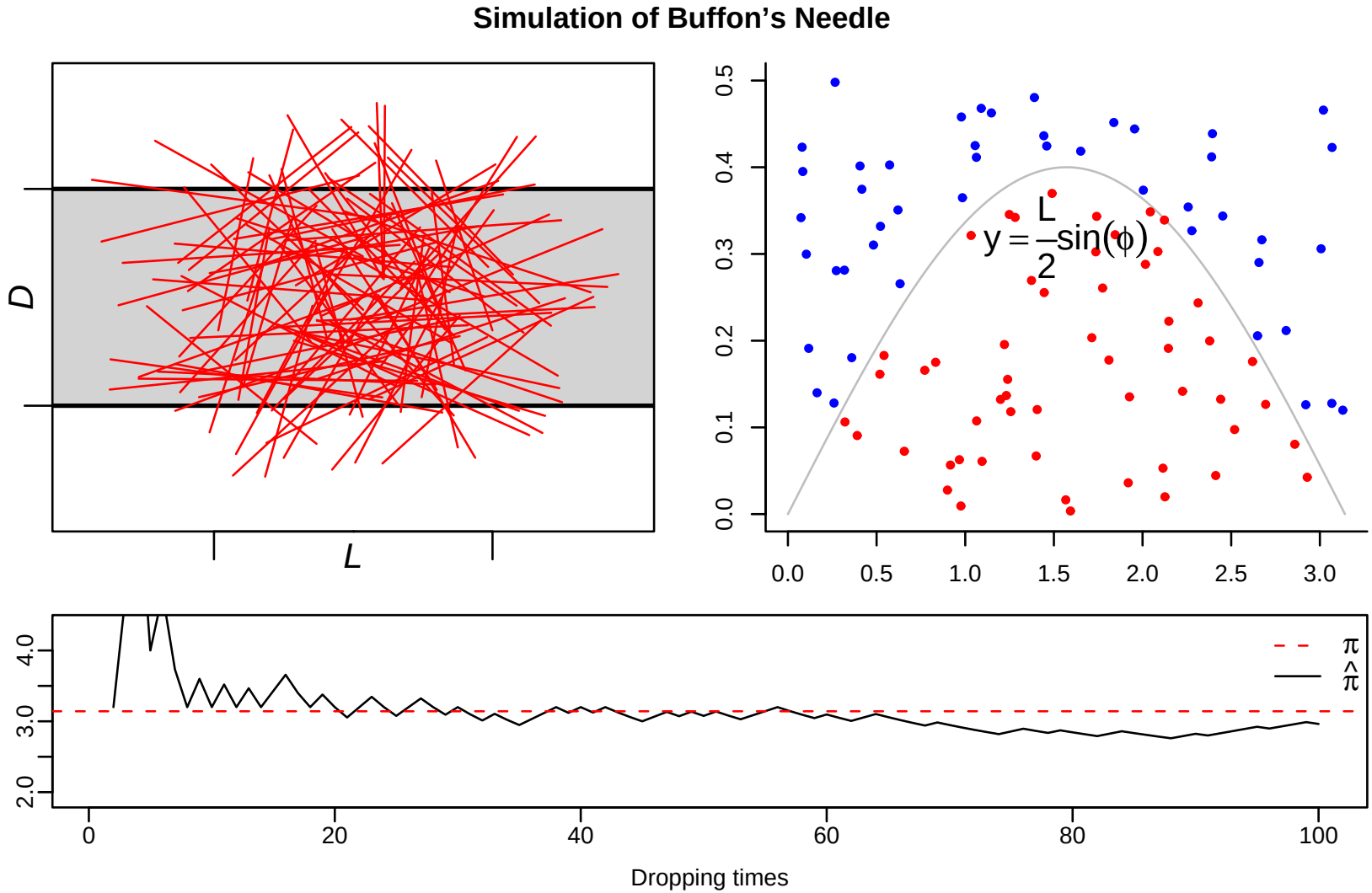
Interest is the Best Teacher

Nobody likes dull stuff...

Buffon's Needle

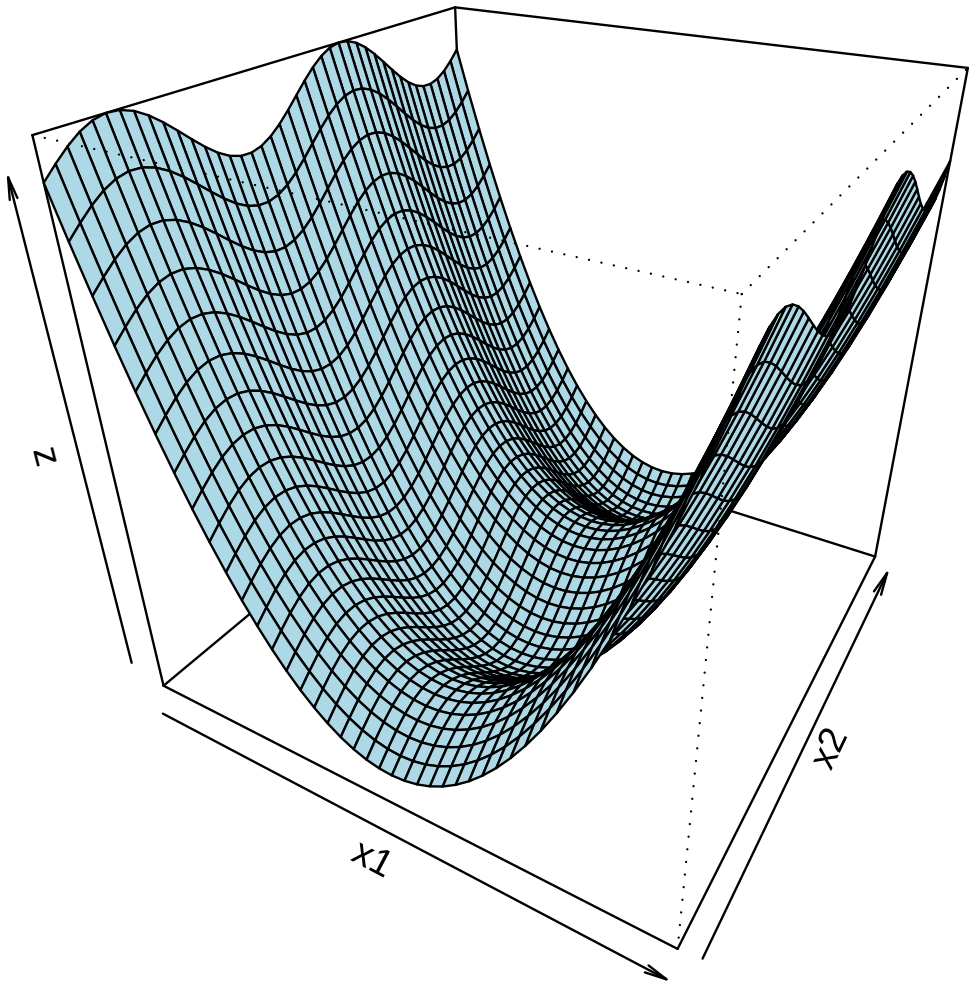
- Buffon's Needle is one of the oldest problems in the field of geometrical probability; It was first stated in 1777.
- It involves dropping a needle on a lined sheet of paper and determining the probability of the needle crossing one of the lines on the page.
- The remarkable result is that the probability is directly related to the value of π.
- From frequency to probability.

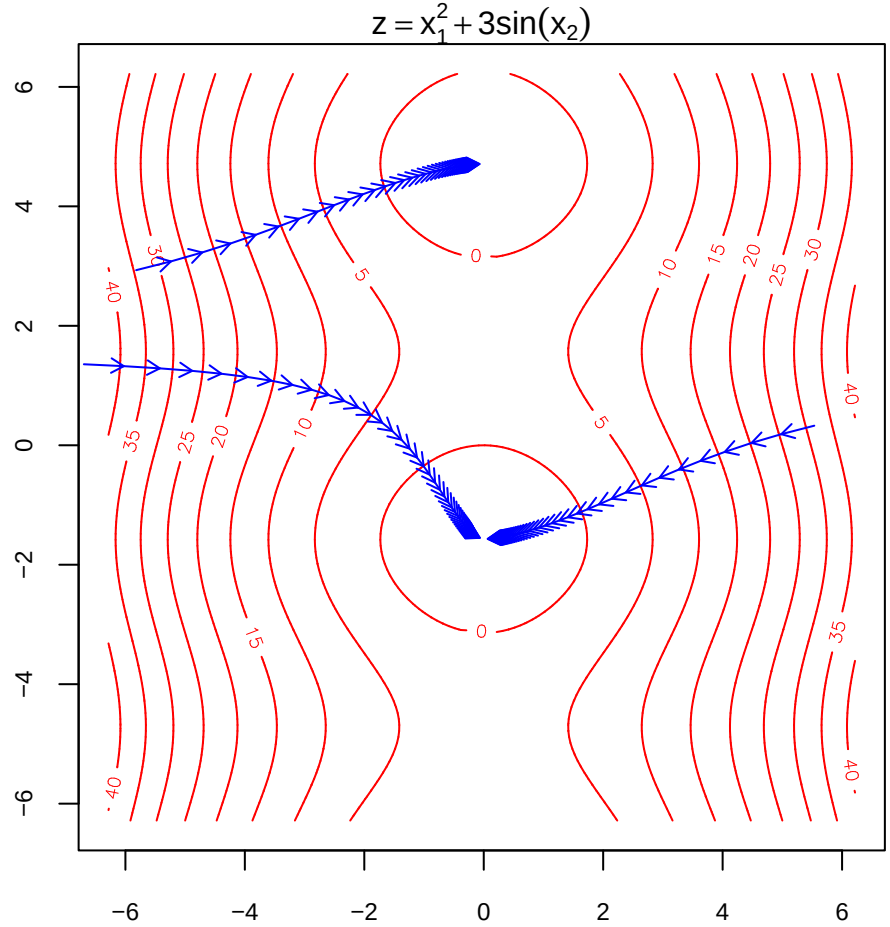
Interest is the Best Teacher (cont'd)



Two Pictures are Worth 2000 Words

You don't like those abstract theories, do you?





Produce Animations inside R

- The R package grDevices has offered a variety of graphics devices.
- We may just create animations in the Windows graphics devices (Windows) or X Window System graphics devices (Linux) or MacOS X Quartz devices (MacOS X).
- The most critical elements are loops and *Sys.sleep()*.
- It's convenient to produce single image files – there are several choices such as PNG, JPEG, BMP, PDF, PS, TEX/LATEX and WMF, etc.

Produce Animations outside R

- It's convenient to produce single image files using R – there are several choices such as PNG, JPEG, BMP, PDF, PS, TEX/LATEX and WMF, etc.
- We may use JavaScript to animate these image frames – quite naive way.
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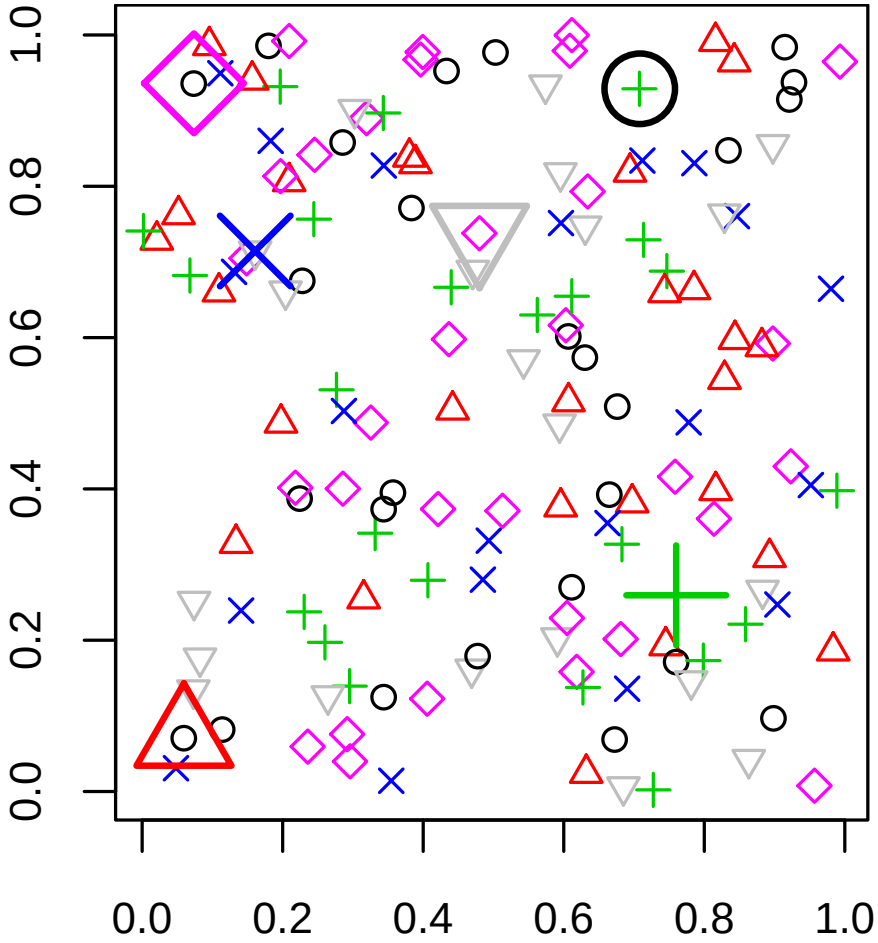
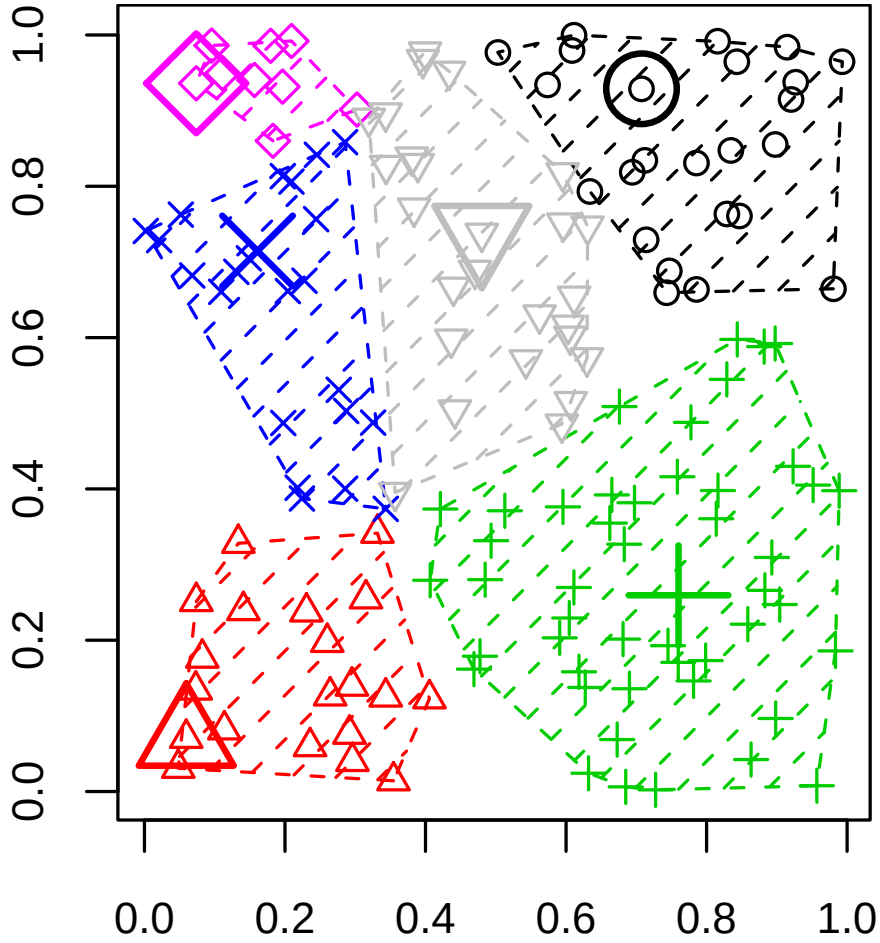
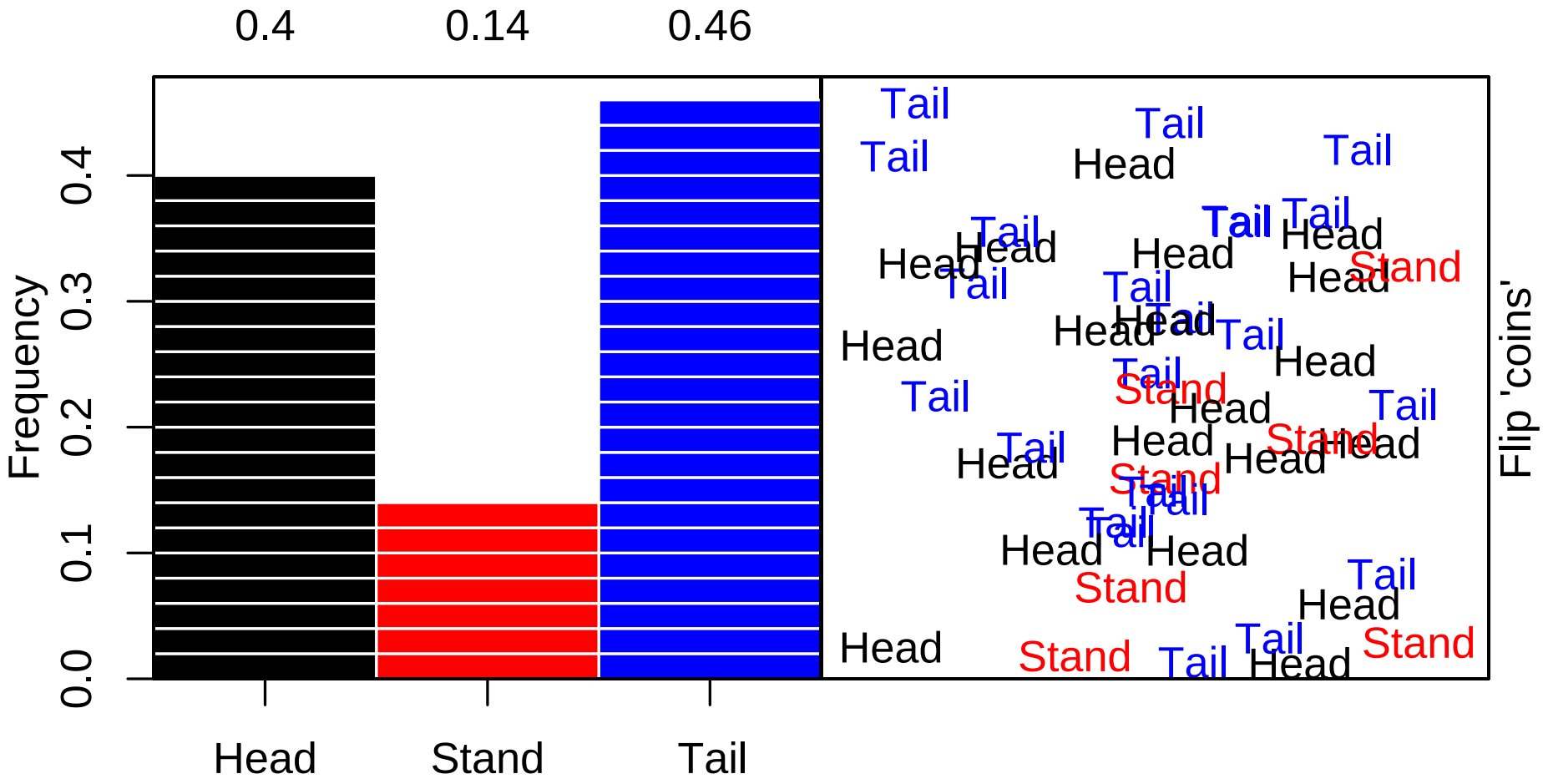
- Many examples in this talk have been implemented in the R package 'animation'; you may download it from CRAN.
- The package 'animation' has offered both ways of creating animations.
- See *buffon.needle()*, *flip.coin()*, *kmeans.ani()*, *boot.iid()*, *knn.ani()*, ...

K-Means Cluster Algorithm

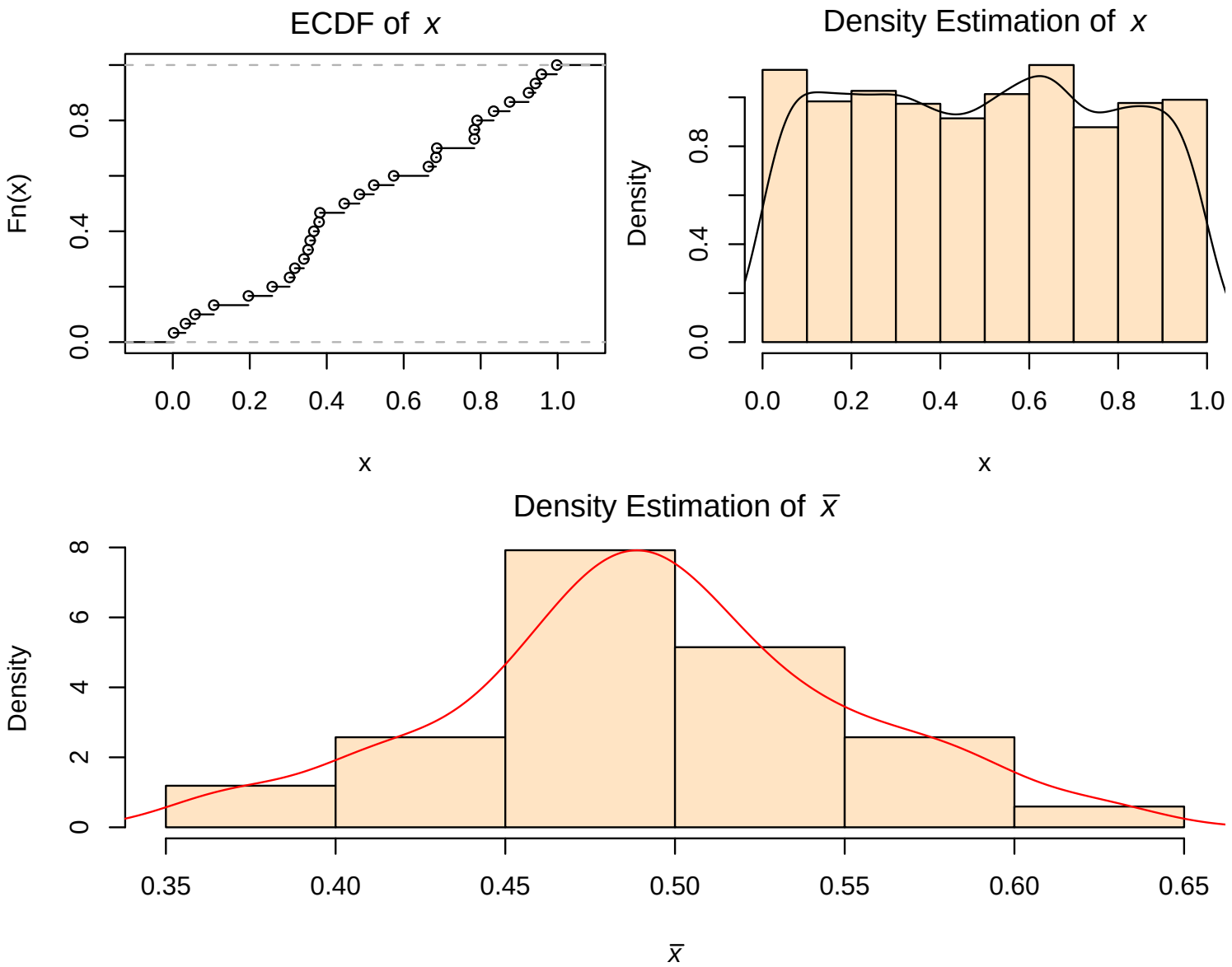




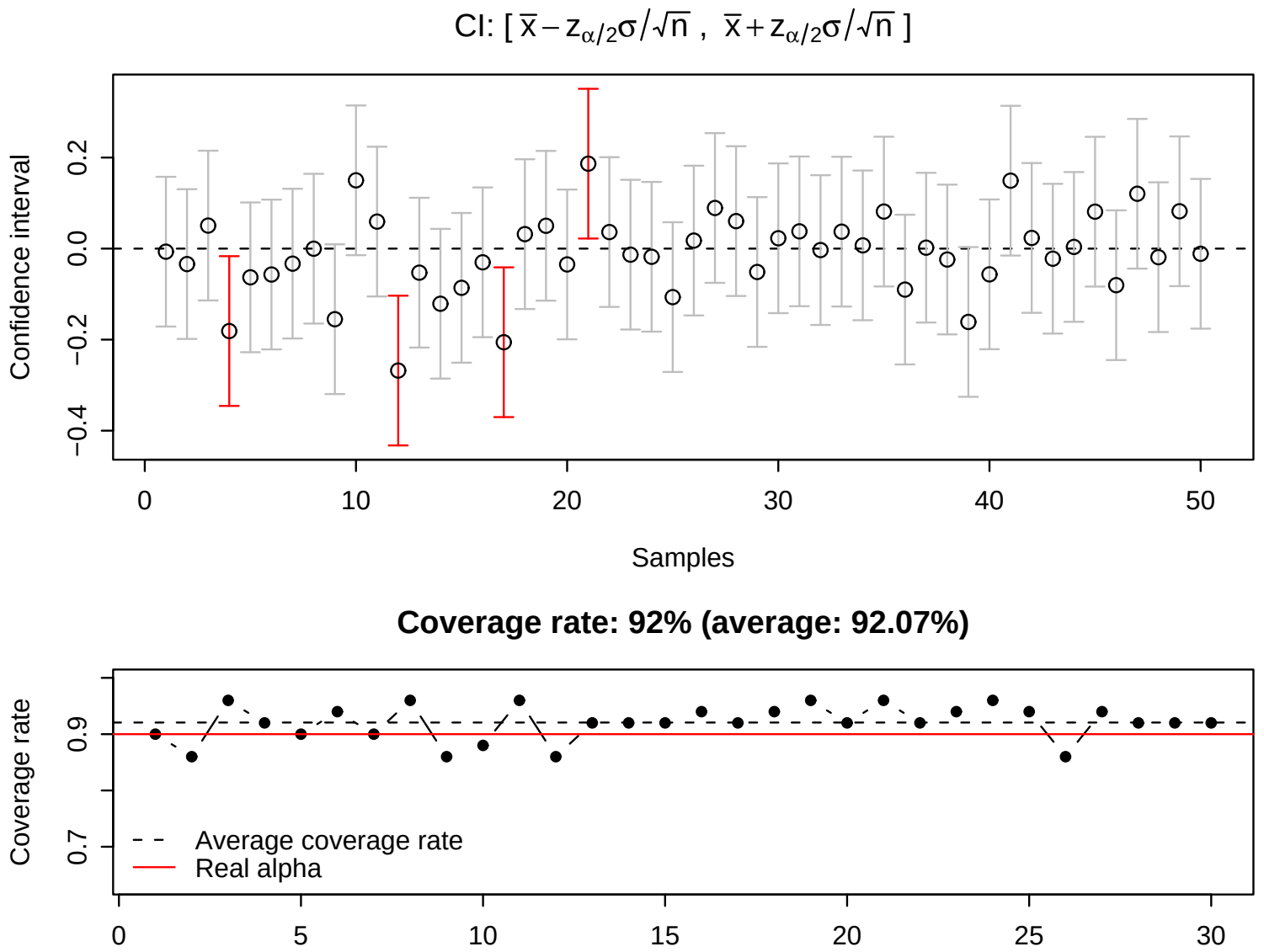
Flipping Coins



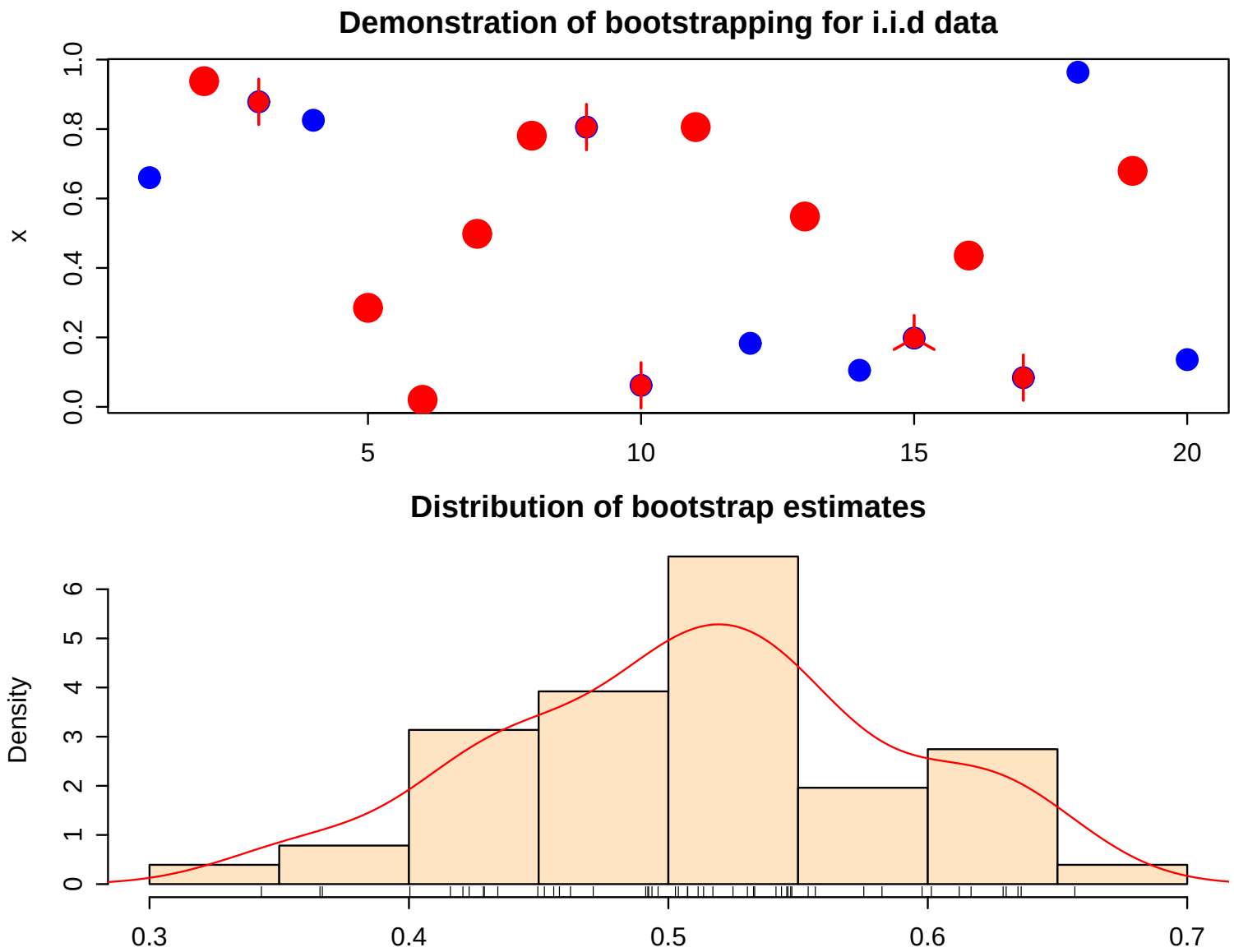
Probability Theory: Central Limit Theorem



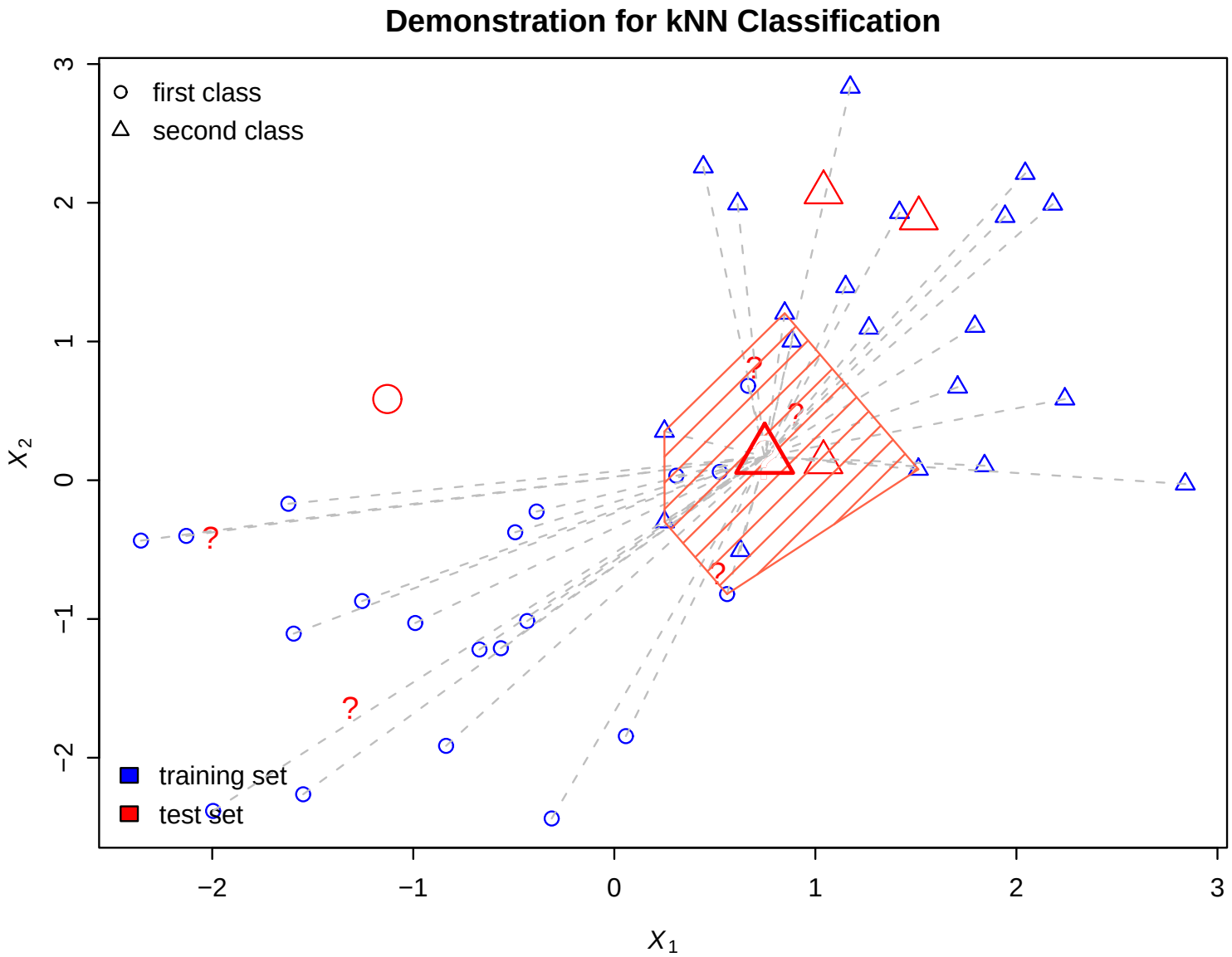
Mathematical Statistics: Confidence Interval



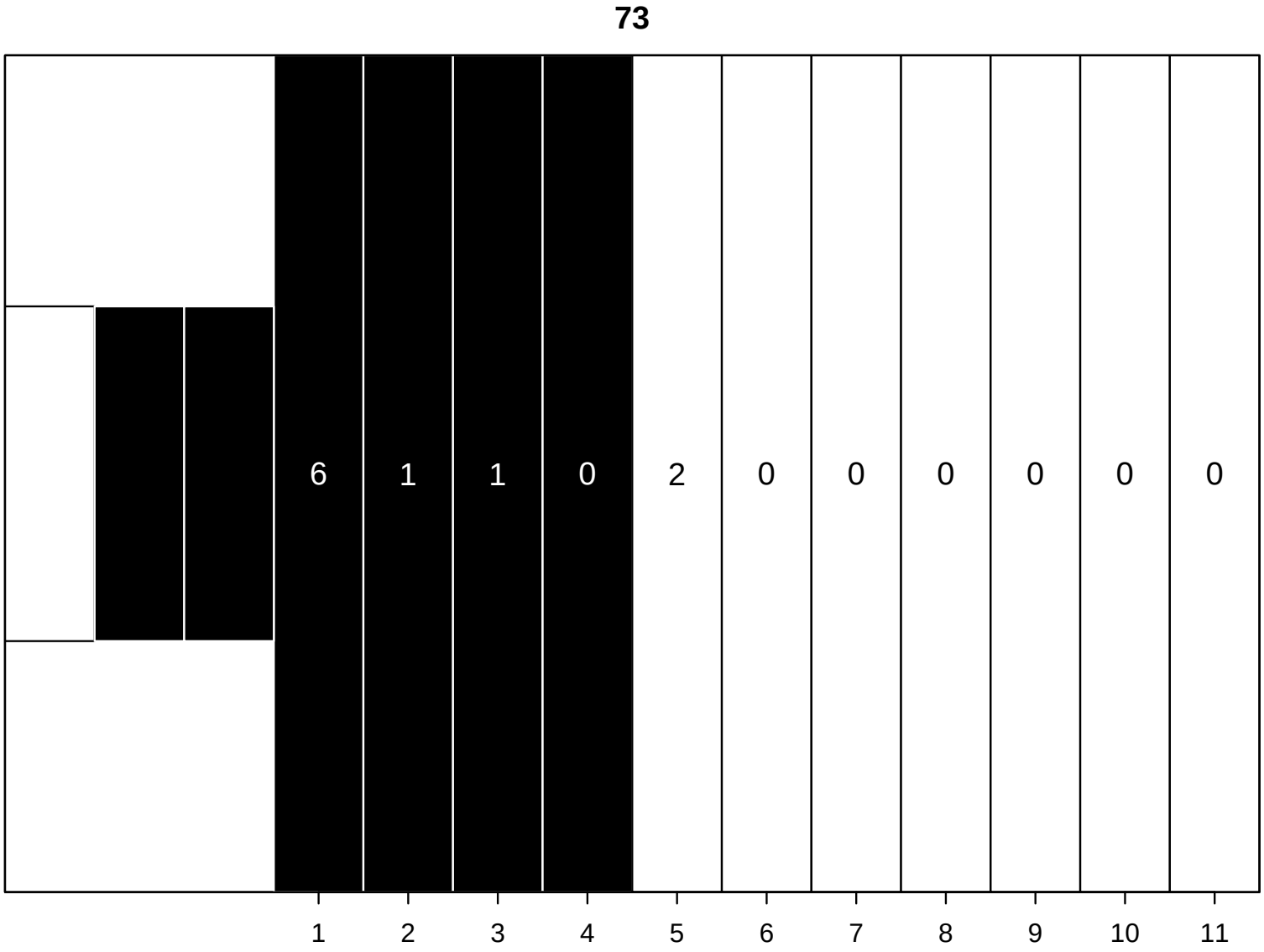
Machine Learning: Bootstrapping



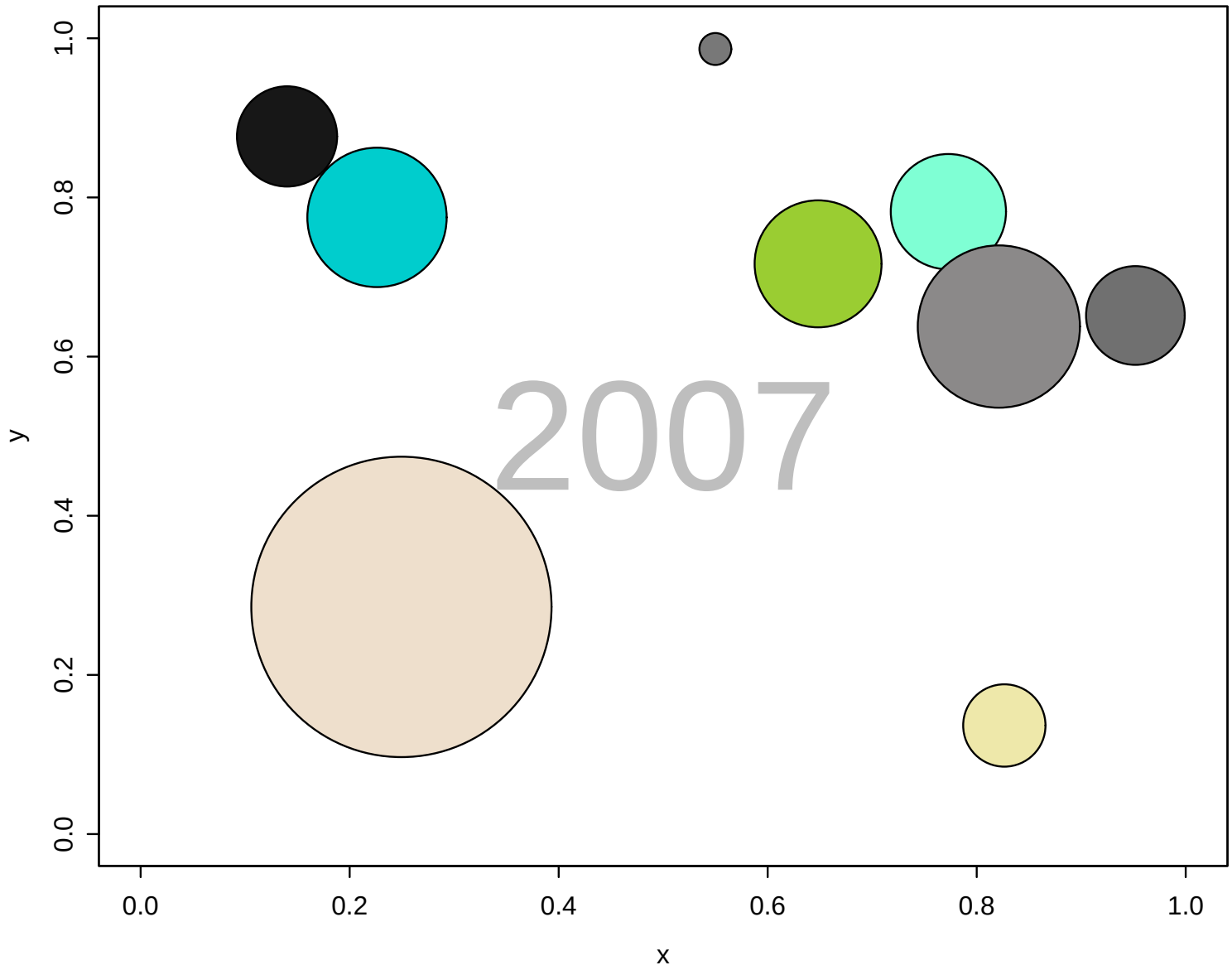
Machine Learning: k-Nearest Neighbor Algorithm



Simulation of A Chemical Experiment



Social-Economic Changes Over Time



Thanks!

A weird name card...