BLG374E

Technical Communications for Engineers

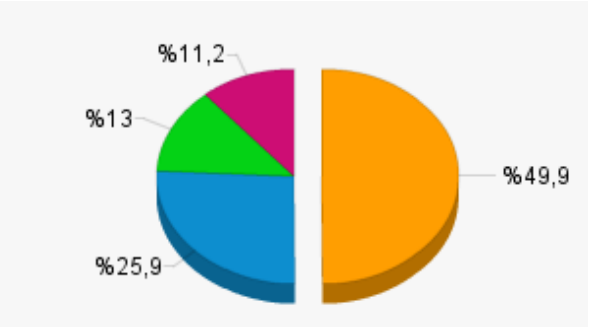
Graphics

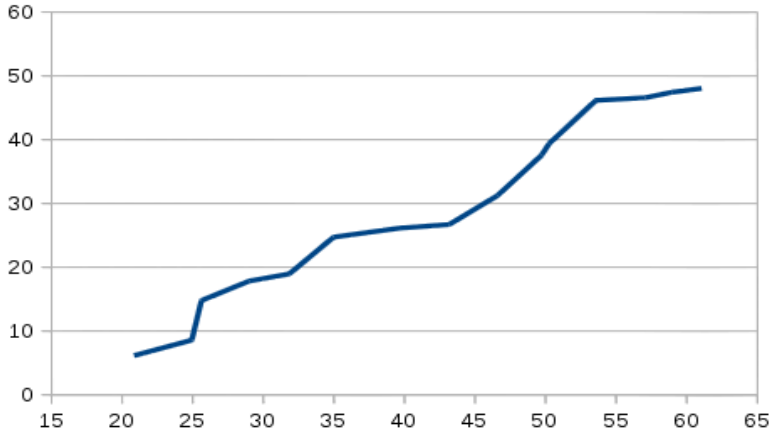
Lecture Contents:

- When to use what.
- Chart tips.
- Figures & text.
- Showing uncertainty.
- Table tips.
- Exercise.

When to use what

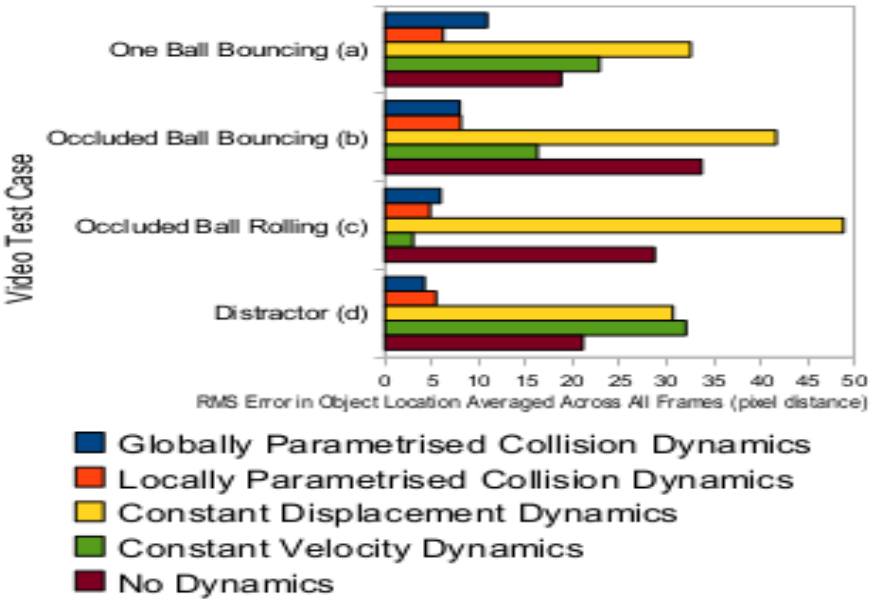
- Pie charts: Numbers are part of a total.
  - Example: % votes.
- Line charts: there is a continuous trend.
  - Example: CO2 concentration over time.
- Line charts: there is a continuous relationship.
  - Example: Weight v. height.



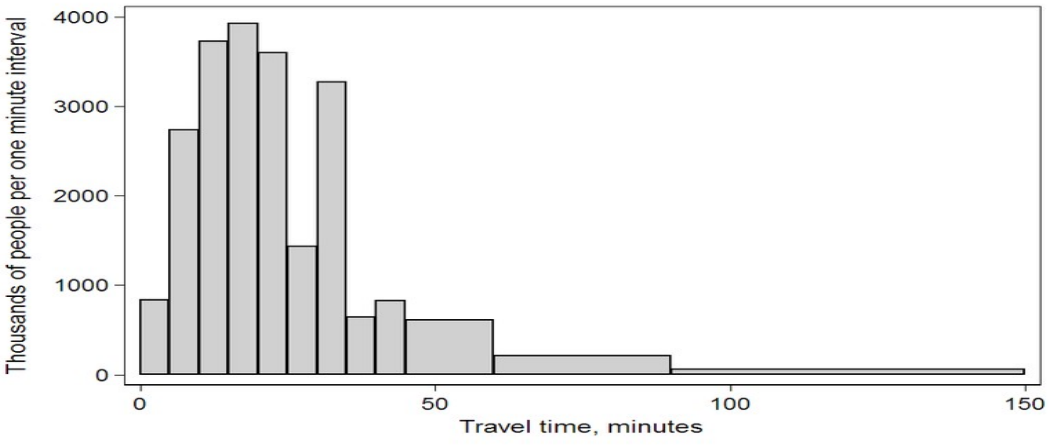


When to use what

- Column charts:
  - Discrete/ordinal categories.

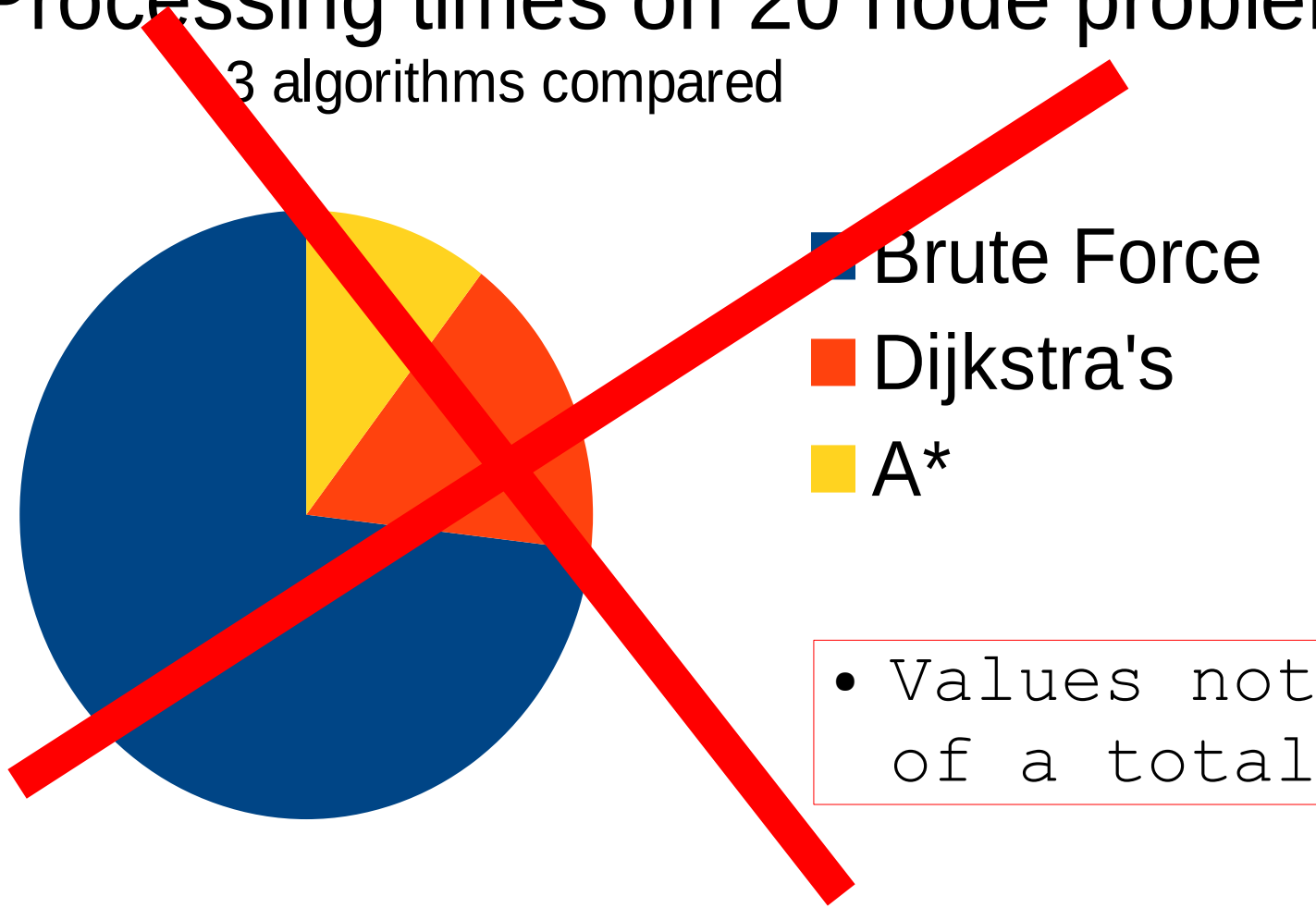


- Histograms:
  - When the area of the bar has meaning.



http://en.wikipedia.org/wiki/Histogram

Pie chart example: what is wrong with this?



- Values not ratios of a total.

What chart to use for?

- Number of participants aged 0-10,10-20,20-30,30-50,50-100?
- Performance of a usability task over multiple individuals?
- Performance of a usability task over time?

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Always give a title and/or caption.

- Figure should be self-contained.
- Answer:
  - *"What is this about?"*
  - *"What does this mean?"*

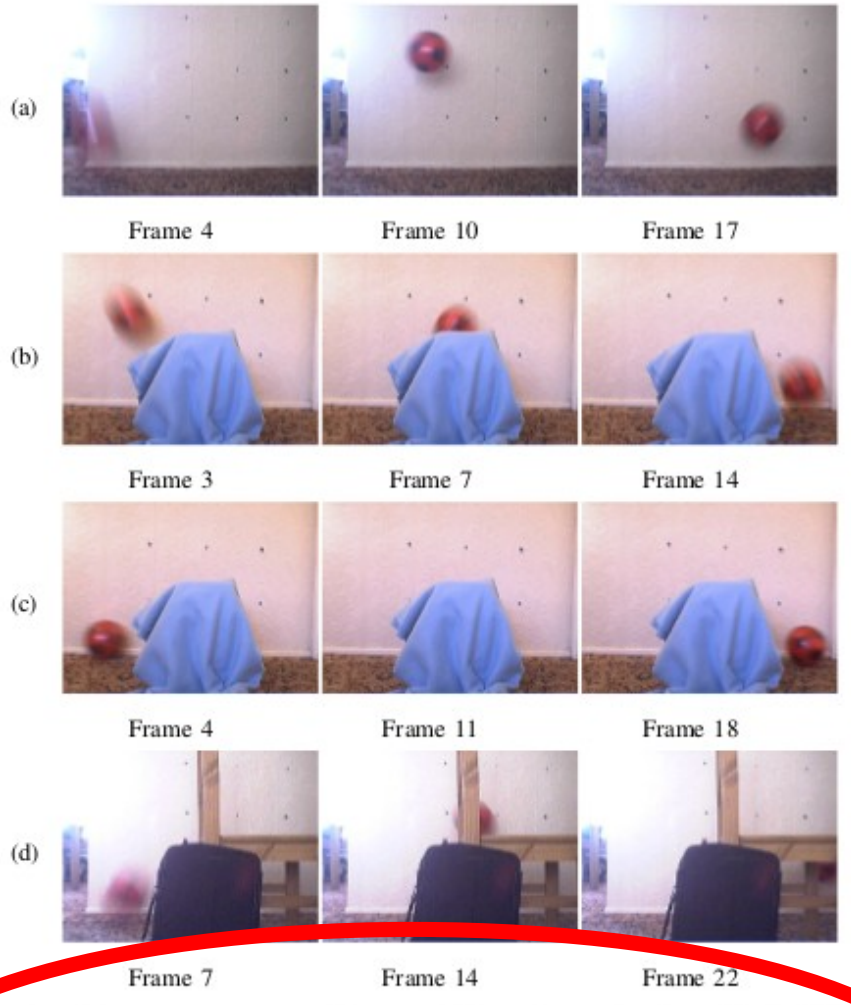


Fig. 3. Image sequences used to test 2D motion estimation. (a) A ball bounces across the field of view with glare, blur. (b) A ball bounces across the field of view, occluded by a stationary object mid-sequence. (c) A ball rolls across the field of view, again occluded by a stationary object. (d) A ball bounces across the field of view, with blur, glare, partial and full occlusion, and in the presence of a strong distractor.

Figures should be self-explanatory

Readers will want to scan figures first.

→ Sometimes the captions need to be long.

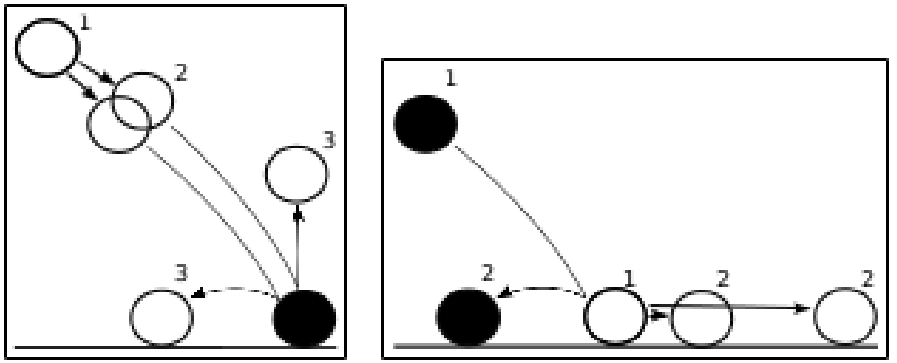


Figure 5.9: **Illustration (a)** illustrates how nonlinearity combined with some permuting noise can lead to large changes in reconstructed trajectory due to the nonlinearity of the dynamics model. If observations at time points 1 and 2 are used to calculate the trajectory of a ball and some permuting noise added to the observation at time 2 different resulting positions at time point 3 and later can be found. **Illustration (b)** shows one of many scenarios where a bad model fit can lead to incorrect reconstructed trajectory. If a trajectory is reconstructed incident on a stationary ball, that ball may roll different

Always label axes

"What does this number mean?"

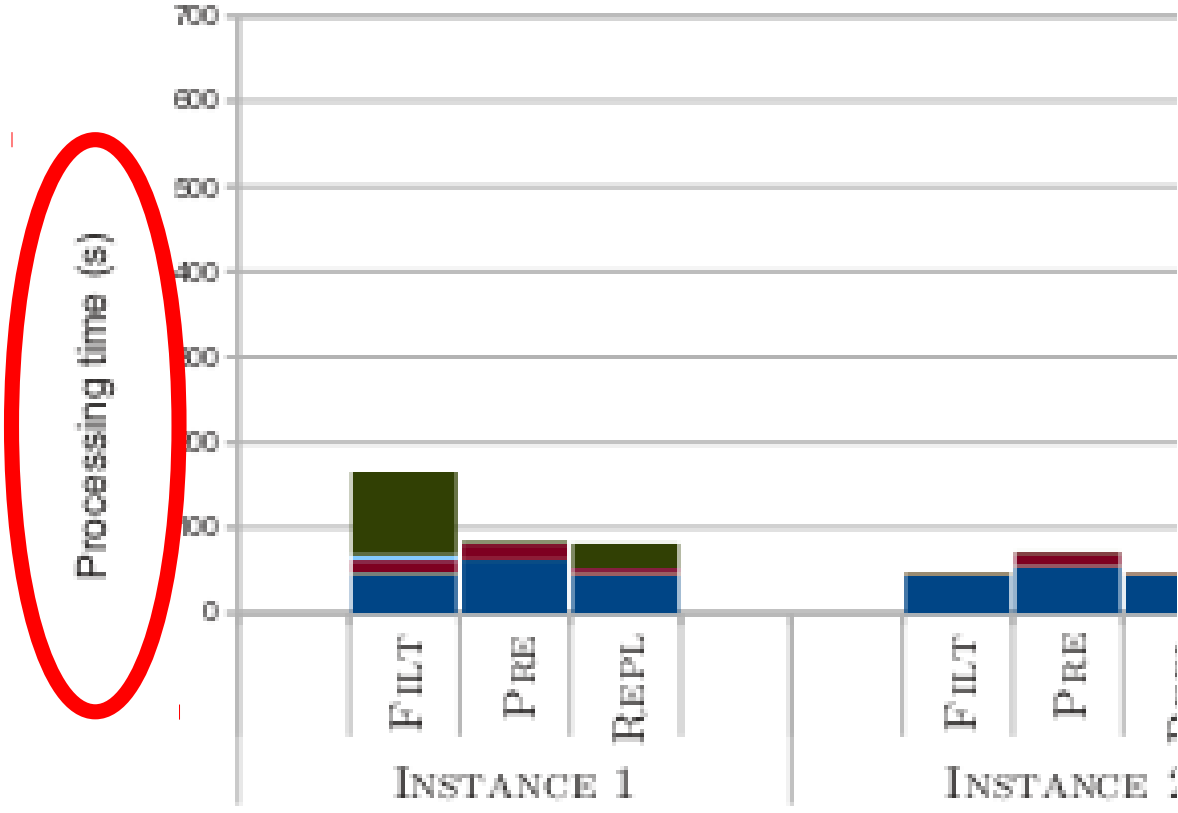
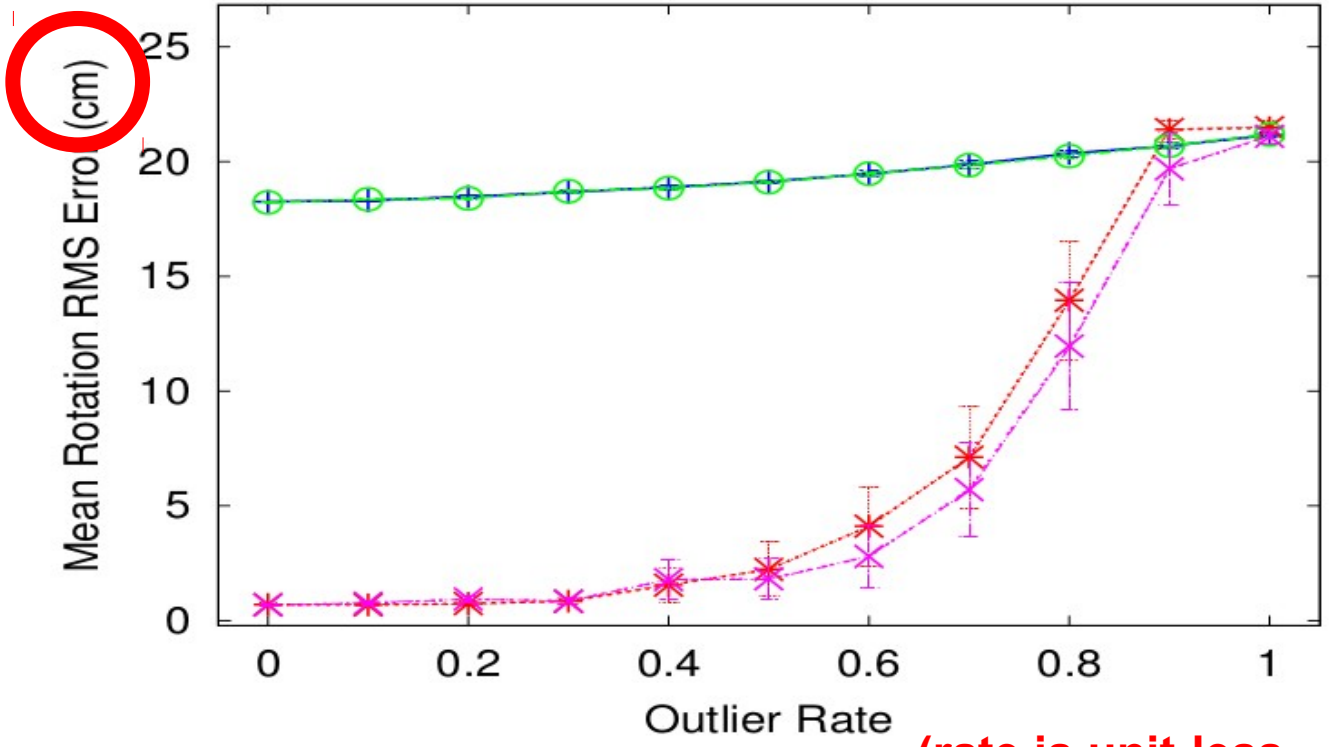


Fig. 3. Empirical computation time for compu

Always put units in figures and tables

"Is this 500 metres or 500 seconds?"



(rate is unit-less – 0 to 1)

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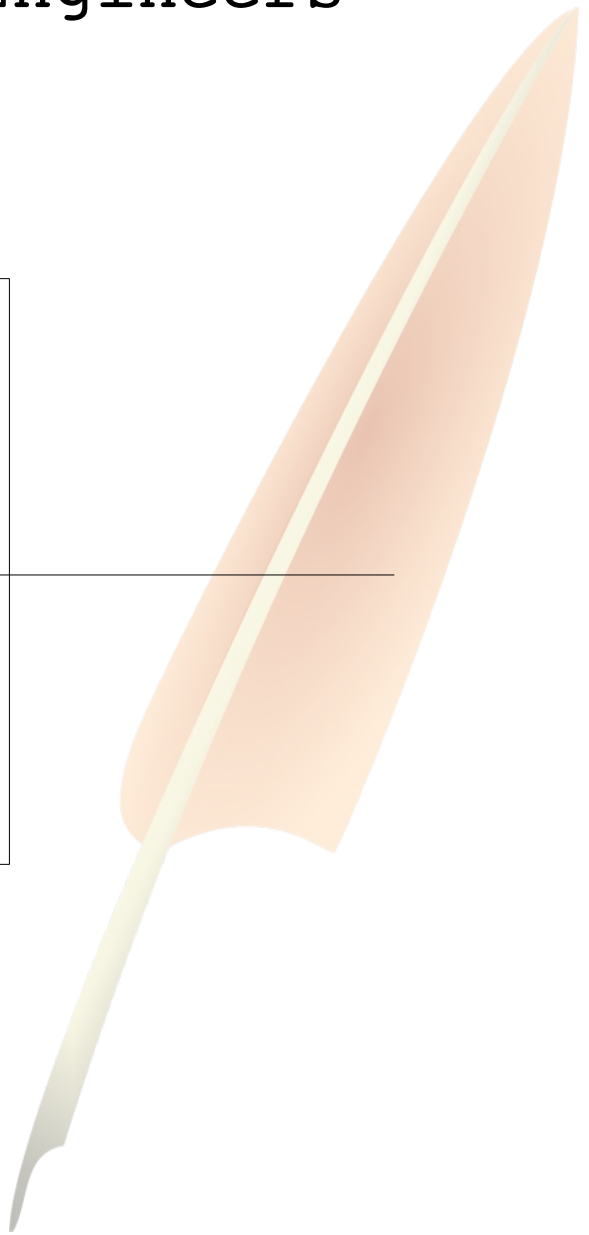

Figures and text

- Give figures & tables a figure number.
- Refer to number in text.
- Questions asked by reader:
  - "Which figure is meant here?"
  - "Where can I find more about this figure?"

Example of figure numbering

taken to be the Dirac delta $K(\boldsymbol{a}) = \delta(\boldsymbol{a})^3$. This means that the approximated probability distribution has finite support[4].

Figure 6.2 contains a pictorial representation of such a set of particles.

Thus, the probability distribution over the current state given all observations to

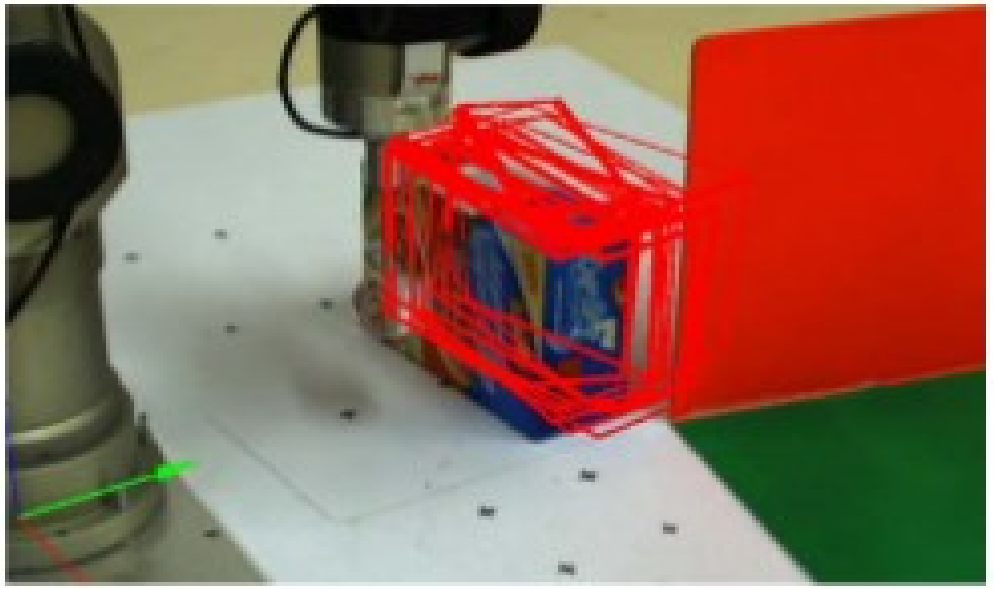

Figure 6.2: A pictorial representation of 20 particles representing 20 hypothesis poses.

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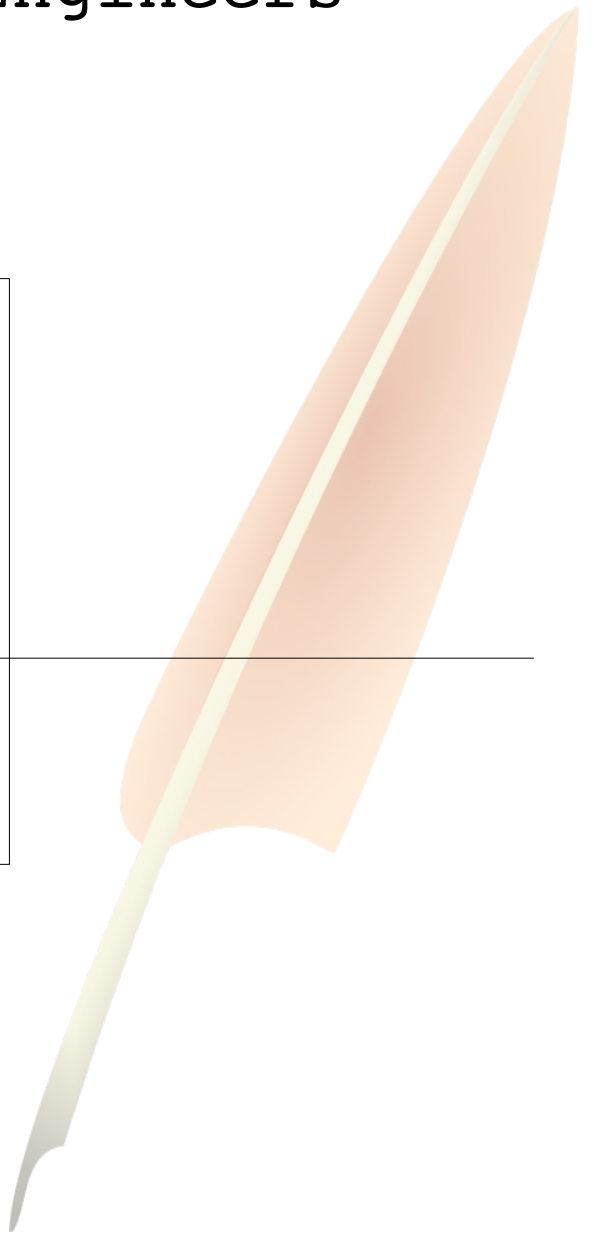

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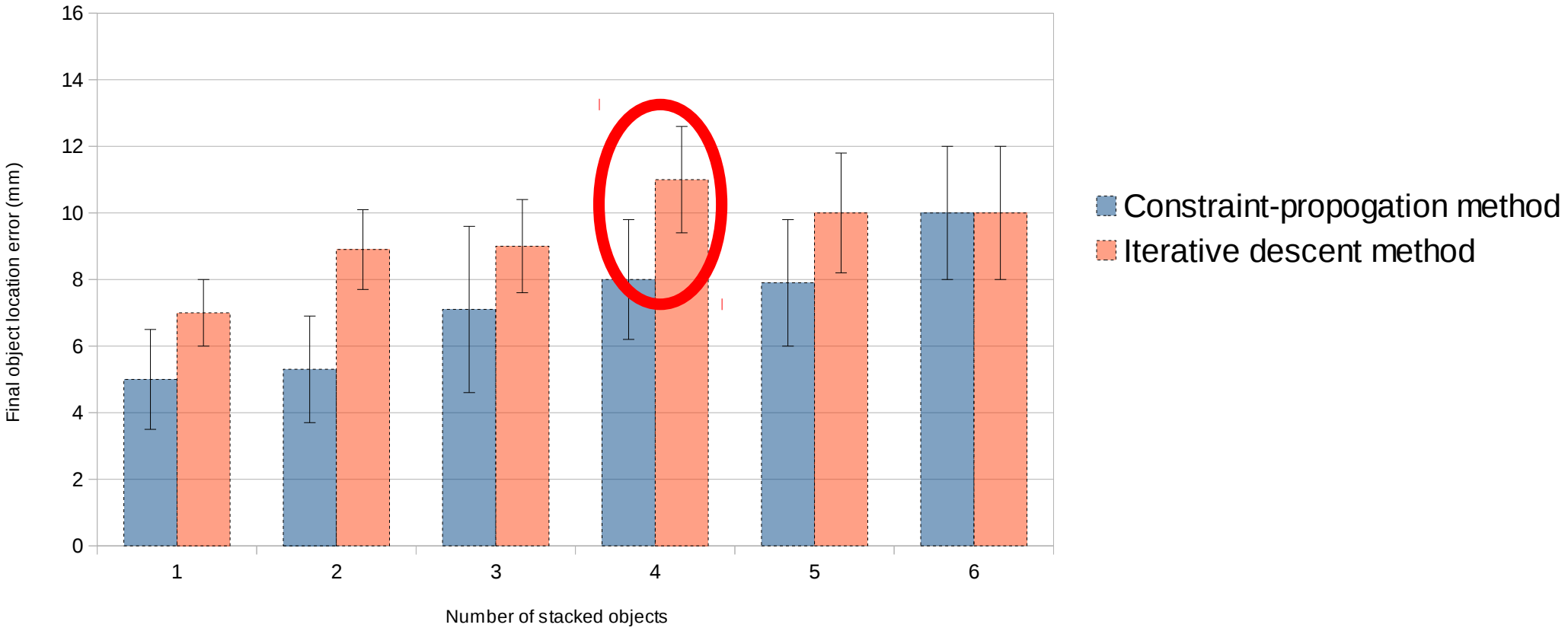
Showing uncertainty with charts: confidence interval

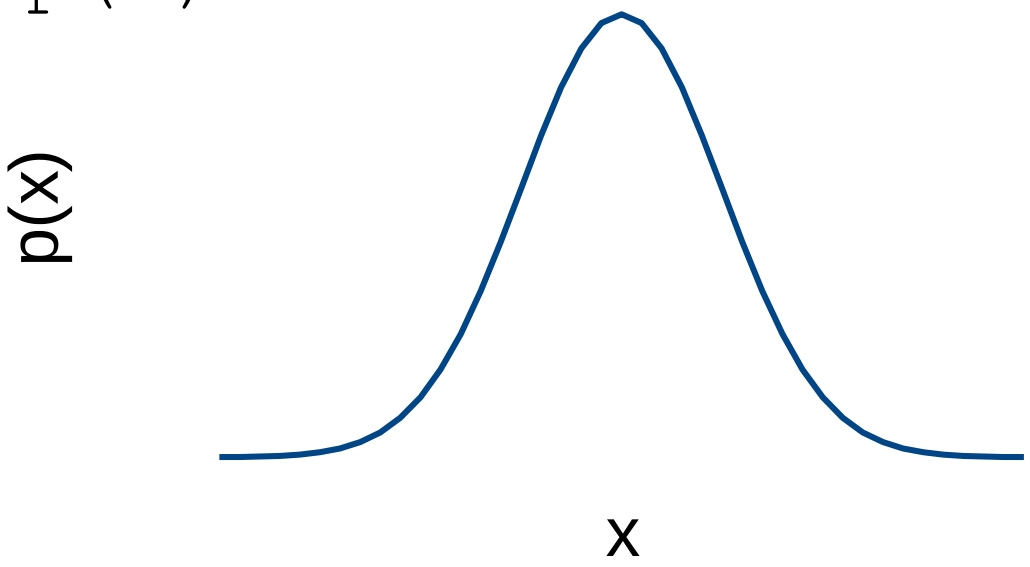
Error of simulation solution methods with increasing number of stacked objects

(with 95% confidence interval)



Definition of 95% confidence interval

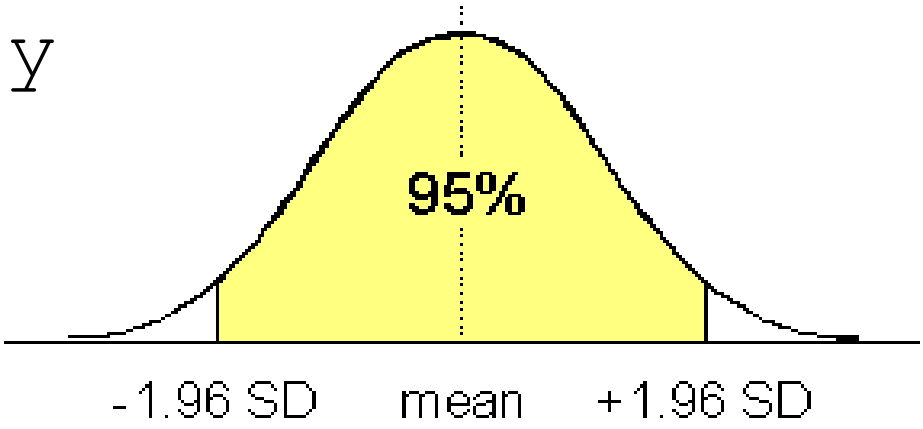
- IF data is distributed according to p(x).



- 95% of time interval would contain true value.

Calculation of 95% confidence interval

Assume data normally distributed.



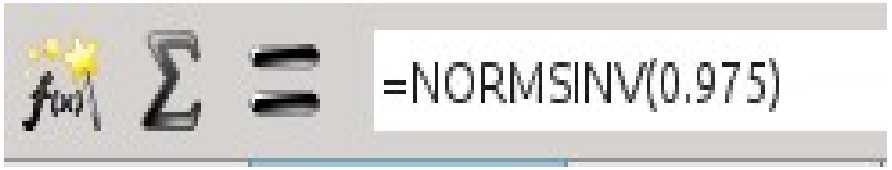
$\sigma/\sqrt{N}$ is standard error

$$95\% = 0.95 = P\left(-1.96 \leqslant \frac{\bar{X} - \mu}{\sigma/\sqrt{N}} \leqslant 1.96\right)$$

$$0.95 = P\left(\mu - 1.96\,\sigma/\sqrt{N} \leqslant \bar{X} \leqslant \mu + 1.96\,\sigma/\sqrt{N}\right)$$

Calculation of 95% confidence interval (spreadsheet)

Critical value:



Standard error:

5.3
3.3
4.5
2.2
2.2
9.4

=stddev(E164:E169)/sqrt(count(E164:E169))

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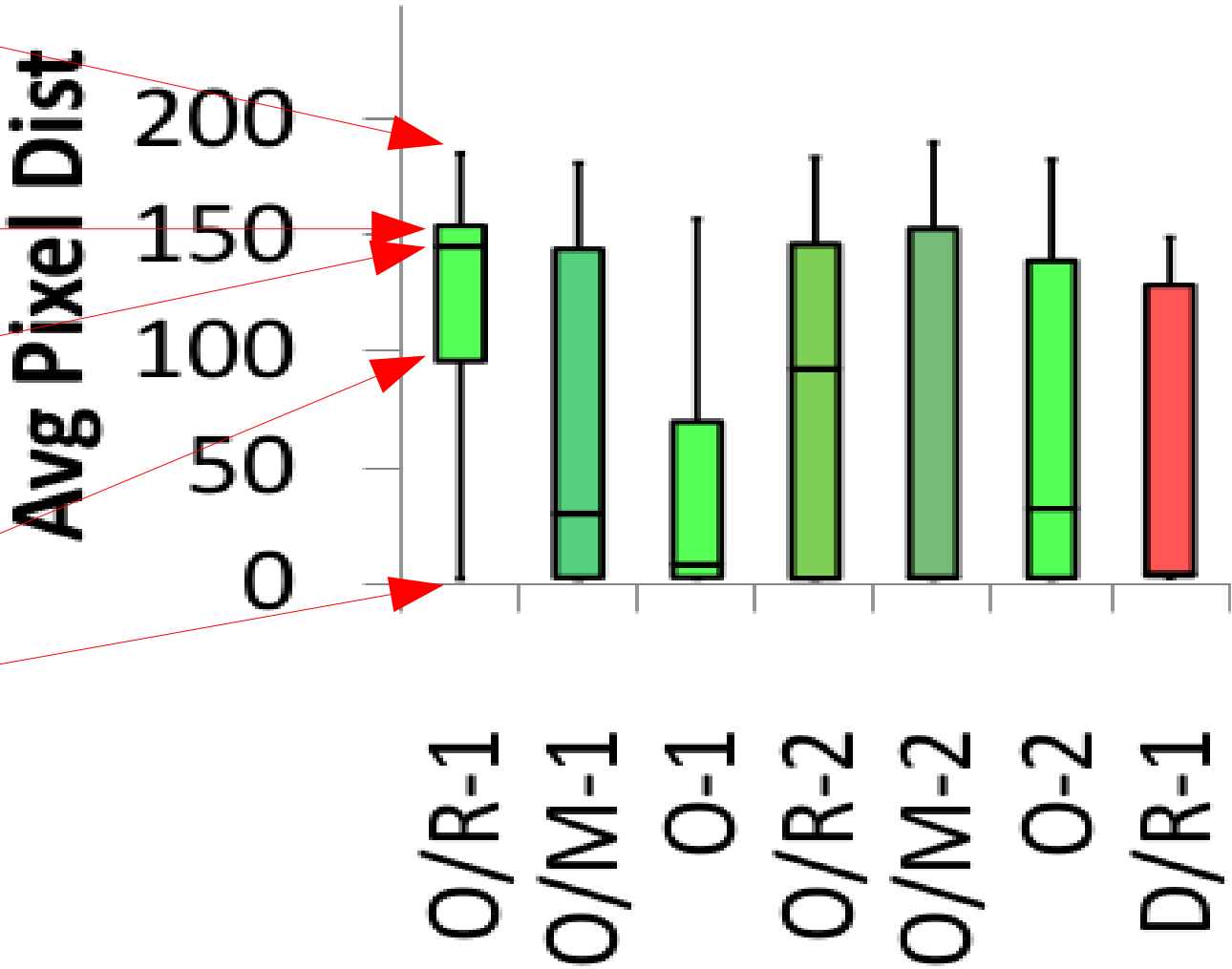
Showing uncertainty: box-whisker plots

- Maximum.
- Upper quartile.
- Median.
- Lower quartile.
- Minimum.



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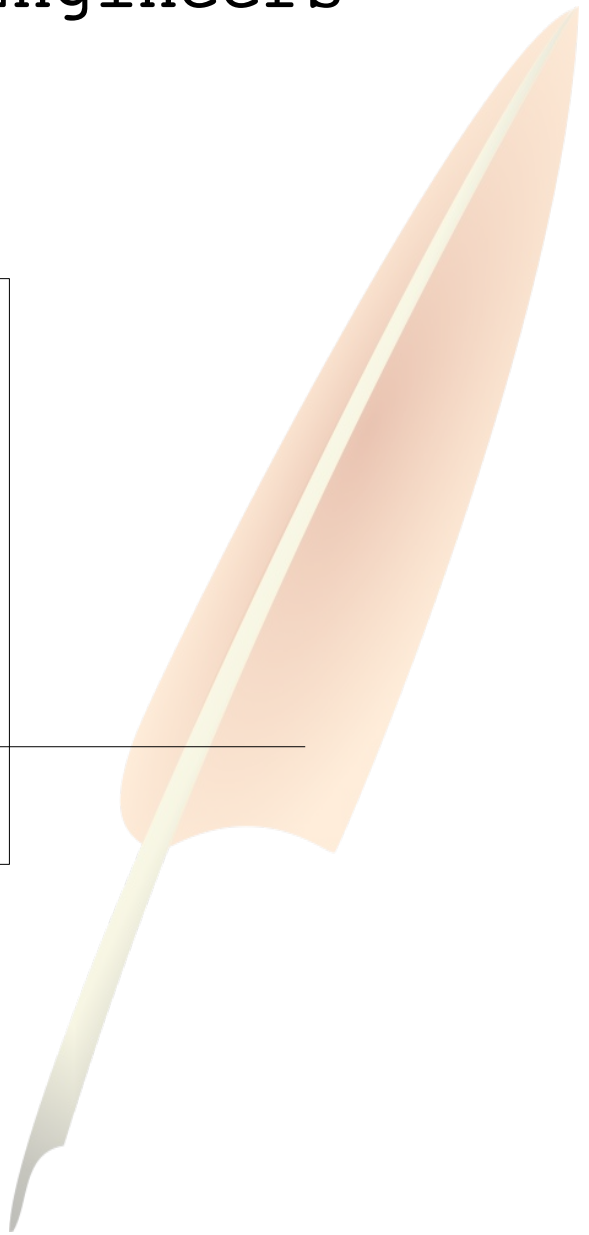


Table tips

Tables can be better than text.

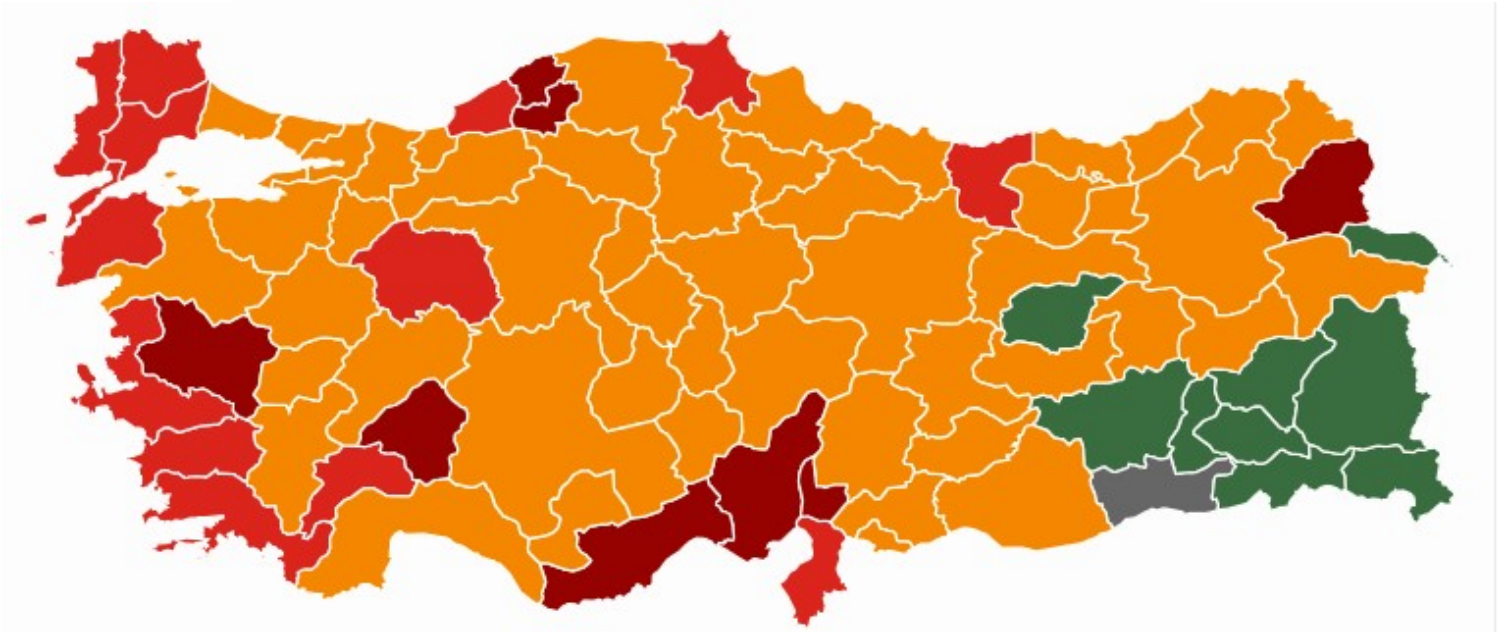
AKP has won 18 m
areas, 32 region
districts. CHP w
metropolitan are
and 162 district
metropolitan are
and 107 district
metropolitan are
and 67 districts

http://secimsonuclari2014.mynet.com/

Türkiye Geneli Belediye Başkanlıkları

Parti	Büyükşehir	İl	İlçe	Belde	Toplam
AK PARTİ	18	32	556	135	741
CHP	6	7	162	14	189
MHP	3	5	107	27	142
BDP	2	7	67	11	87
SP	0	0	8	10	18
BBP	0	0	6	1	7
DP	0	0	6	1	7

Graphics can be better than tables



http://secimsonuclari2014.mynet.com/ 31 Mar 2014

Table tips

- Use column headings.
- Alignment:
  - Text: left.
  - Numbers: right.
- Titles above tables.
  - Use "Table 1" not "Figure 1".
- Cite source.

Table 1: 2011 Turkey General Elections Results
(secim.mynet.com, accessed 2014-03-31)

Party	Vote (%)
AKP	49.9
CHP	25.9
MHP	13.0
Independent	6.7
SP	1.2
HAS	0.8

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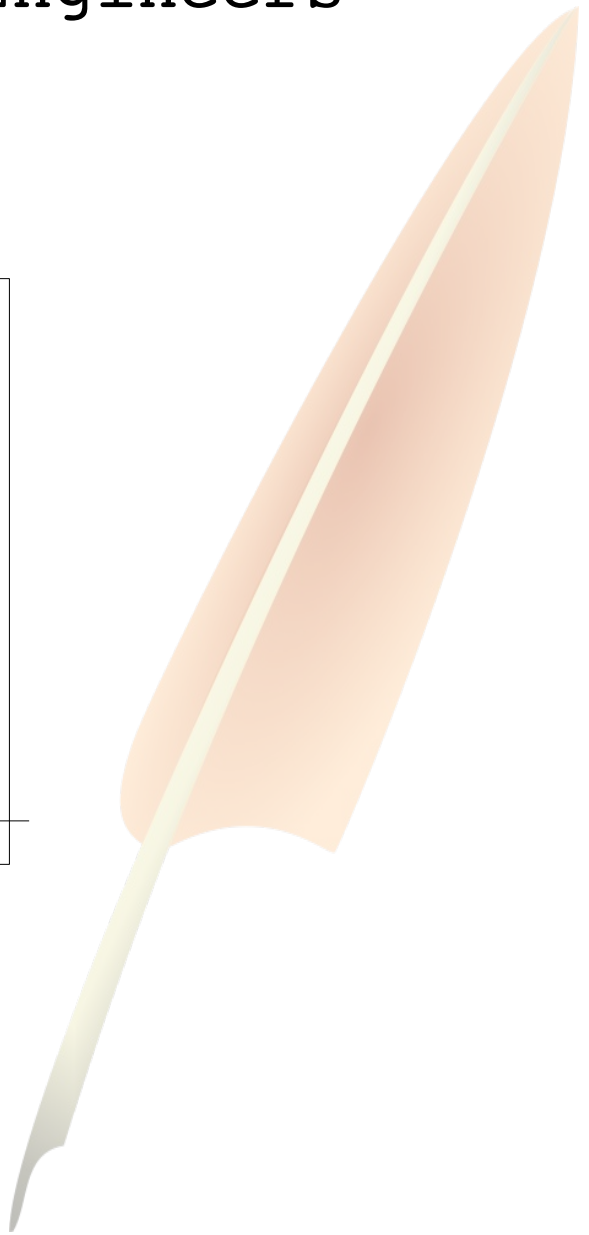
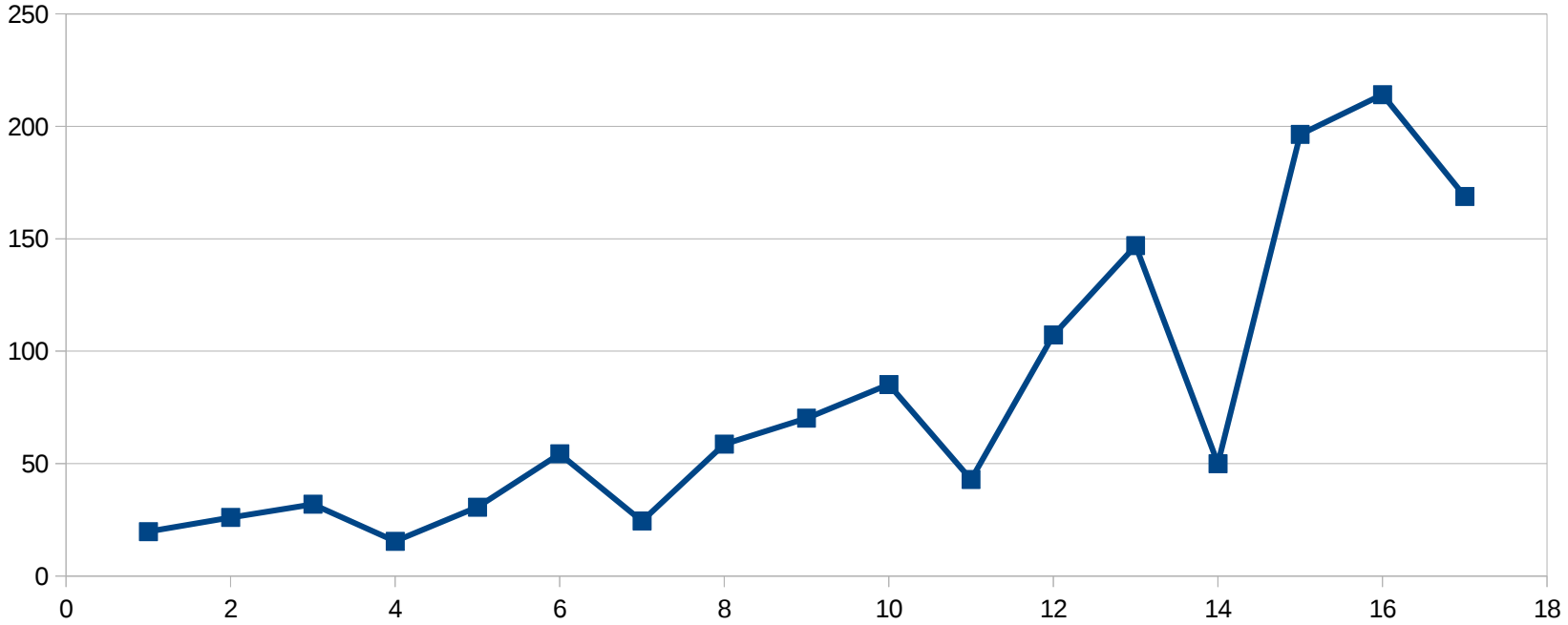


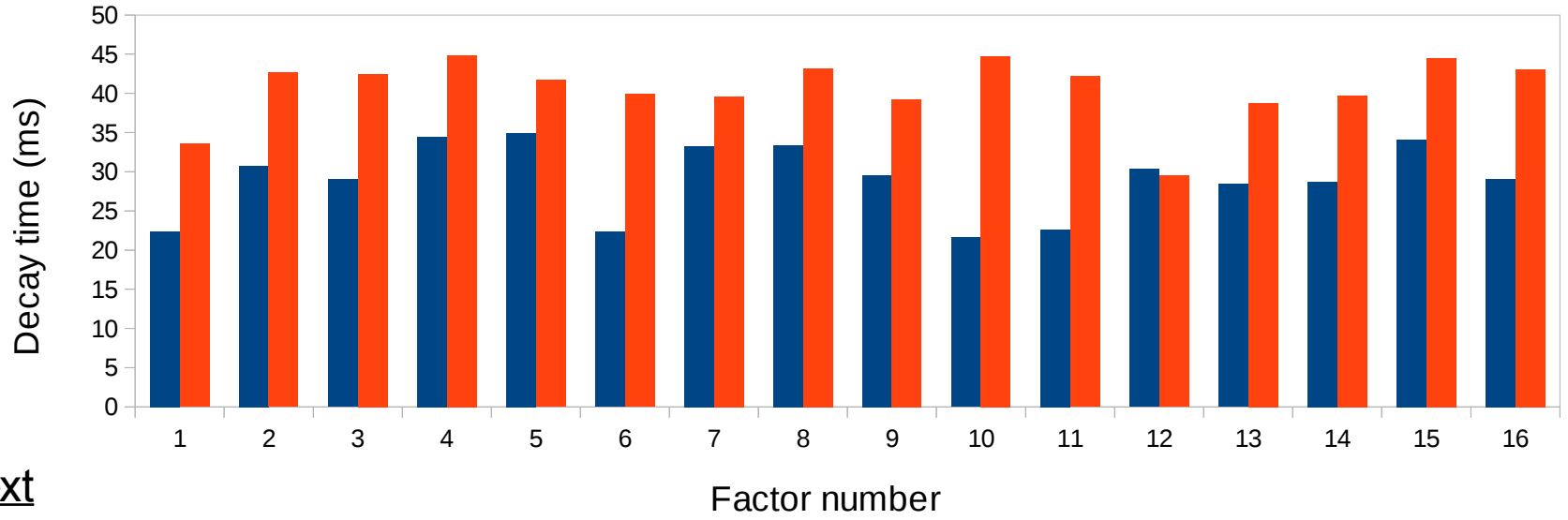
Exercise: what is wrong here?



- No title.
- No axis labels.

Exercise: what is wrong here?

Figure 2: Impact of protein factors on decomposition rate



Text

The figure shows the decay time with respect to introduced protein factors via:

- in vivo introduction.
- in vitro introduction.

- No legend.
- Figure number not used in text.

Exercise: make a chart (in groups)

Amount of time to create a video montage in seconds (successive trials, one individual):

- 325.7, 415.6, 210.4, 56.6, 57.6, 45.5, 51.3, 45.7, 44.4, 51.6.

Exercise: Create:

- A chart showing trend over time.
- Accompanying text.

Exercise: make a chart (in groups)

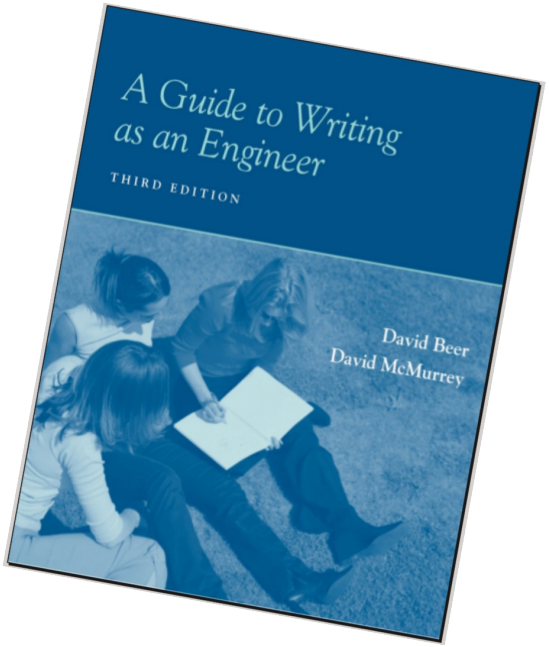
Amount of time to create a video montage in seconds (several individuals, 3rd attempt):

- 89.3, 51.6, 210.4, 56.6, 67.6, 75.5, 81.3, 55.7, 74.4, 171.6.

Exercise: Create:

- A chart showing the uncertainty in this data.

Reading



Beer & McMurrey Chapter 7.

"Constructing Engineering Tables and Graphics"