Use of tables, figures, examples, and similar elements

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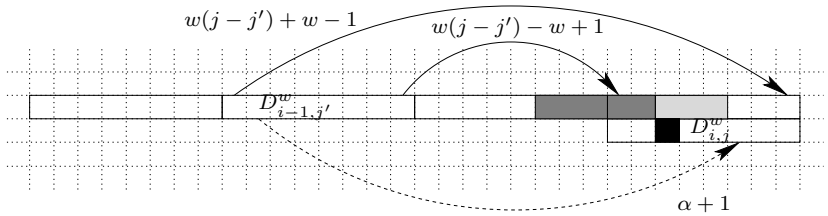
1 Figures and tables

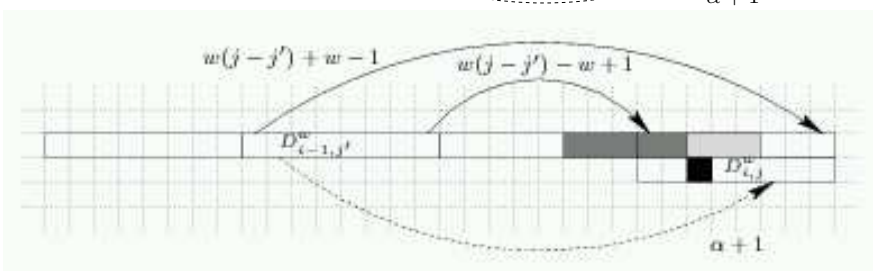
1.1 General rules

- Notice: all graphs, pictures or drawings are called **figures**.
- Figures illustrate the models or the results, and tables give summaries. Usually there are never too many figures and tables, but remember two rules
  1. All figures and tables must be referred in the text.
  2. There is no sense to express trivial things as a figure or a table (e.g. a table, which contains only two lines).
- If there is no need to refer to a figure/table in the text, the figure/table is probably not needed!
- Avoid repeating the same data in several places. An informative table or figure supplements rather than duplicates the text. Refer to all tables/figures, and tell the reader what to look for.
- Discuss only the most important items of the table in the text.
- A figure should be easy to understand. Do not present any unnecessary details.
- If two tables/figures should be compared, position them next to each other.

1.2 Vector graphics

Draw the figures by a tool which uses vector graphics, not raster graphic (bitmaps)! There is a big difference in quality:





(The bitmap file was also about 30 times larger!)

1.3 Captions

- Each table or figure should be understandable by its own. Give a brief but clear explanation or a title in the caption.
- Explain all special abbreviations, symbols, special use of underlinings, dashes, parantehses, etc.
- Use the same style in all tables. If you use abbreviation *stdev* for standard deviation in one table, then do not use *sd* in another table.
- If you copy (draw again) a table or a figure from some other source, then give a reference to the original source in the end of caption, e.g.

  "Table 5. Plaa-plaa-plaa. Note. From $[ref]$."

  A page number is needed, if the table or figure is from a book.

1.4 Tables and figures in latex

- Notice: Refer to tables and figures by numbers. Do not write "the table below". In latex this is implemented by using labels

- The tables are encapsulated between `\begin{table}`and `\end{table}`commands. Similarly, the figures are encapsulated between `\begin{figure}`and `\end{figure}`commands.
- Inside table or figure environment you can write the caption for the figure/table, and define a label (after the caption).

1.5 Expressions

When you refer to figures and tables you can use the following expressions:

- The results are summarized/reported in Table 1
- The results are represented in
- Figure 2 illustrates
- In the Figure we observe
- The model is given in Figure 7
- etc.

Notice the capital letters!

2 Lists

- Lists are not separate objects, and they are introduced in the text.
- Use list only when they are necessary! E.g.

  "The main criteria of X are (the following):"

  - Criterion 1
  - Criterion 2
  - ...

  Or "The method consists of five steps:" + a list
- If you list only a couple of items, you can usually write them without a list. Use lists when the clarify things!

3 Referring to chapters or sections

- The following chapters and sections can be referred easily in latex, even if you don't know there numbers yet.
- You just have to define a unique label name for the referred chapter.
- In the beginning of the referred chapter, you write

  ```
  \chapter{Conclusions}
  \label{concl}
  ```

  And when you want to refer it you write

  "The final conclusions are drawn in Chapter `\ref{concl}`

- Notice that you can invent the labels yourself, if they are just unique and not reserved words in latex. E.g. above label could be simply "c", but now there is a danger that you will give the same name for another object.

Useful expressions when you refer to chapters or sections

- The problem is discussed in Chapter X
- We will return to this topic in Section Y
- This problem is analyzed in ...
- etc.

Notice the capital letters!

4 Algorithms

- Give only the main algorithms in the text, and in an appropriate abstraction level (pseudocode)
- Fix the pseudocode notation and use it systematically

- Simple methods can be described by a numerated list of steps
- Logical and set operations are often useful when you describe algorithms in an abstract level (for all $x_i \in X$, $T = T \cup \{p_i\}$, find such $S \subsetneq T$ that $q(S)$,...)
- If you writer longer algorithms, insert them into a figure or an environment of their own. Now they can be referred like tables and figures: "The *EM* algorithm for probabilistic clustering in given in Alg. 1"
- Later in this course, we will introduce a latex environment for writing algorithms.

5 Examples and definitions

5.1 Definition

A good definition

- explains the defined concept.
- is not a circular argument (where x is defined by y and y by x).
- is not expressed by negative terms, if possible. (Sometimes you cannot avoid this. E.g. statistical dependency is defined by statistical independency, because independency can be defined unambiguously.)
- doesn't contain unclear, vague, or descriptive language (i.e. is exact).
- defines only what is needed (i.e. the scope is restricted).

5.2 In latex

In latex, you can easily define environments for writing examples or definitions in a systematic way. The examples or definitions are numbered automatically and you can refer to them without knowing the actual number.
In the header you define `\newtheorem{example}{Example}`
In text you write
"The problem is demonstrated in the following example:"

```
\begin{example}
\label{example:bayes}
Write the example here.
\end{example}
```

When you want to refer to the example afterwards, you can write
"Let the problem be the same as in Example `\ref{example:bayes},...''`

5.3 Expressions for referring to a definition

- The definition of ... is the following:
- The definition of ... is as follows:
- Formally, we define

6 Equations

6.1 Without equation numbers

If you don't need equation numbers, you can write the equations simply between double $ characters: $$<equation>$$.
E.g. "The prior probability of X is updated by *Bayes rule*, given new evidence Y:

$$P(X|Y)\frac{P(X)P(Y|X)}{P(Y)}.$$

Remember the full stop in the end of the equaton, if the sentence finishes!
If the sentence continues, then you need comma:
"The dependency is described by equation

$$< equation >,$$

where a is sg. and b is sg."

6.2 With equations numbers

If you want to give an equation a reference number, you have to use commands `\begin{equation}`and `\end{equation}`.

$$P(X|Y)\frac{P(X)P(Y|X)}{P(Y)} \tag{1}$$

Now the equation is written in the math mode, and you don't need $ characters.
If you want to refer to some previous equation, you have to give it a label like for examples.

6.3 Text inside equations

Often you need also text inside an equation. To write text, you have to change to the text mode by `\textrm{text}`command.
For example, writing

```
$$A=\{(x,y)~|~x \in X, y \in Y \textrm{ and for all even } x, y
\textrm{ is odd}\}$$
```

produces the following:

$$A=\{(x,y)~|~x \in X, y \in Y \textrm{ and for all even } x, y \textrm{ is odd}\}$$