Università degli Studi di Napoli Federico II

Dipartimento di Ingegneria Elettrica e delle Tecnologie dell'Informazione

Classe delle Lauree Magistrali in Ingegneria Elettronica, Classe n. LM-29

Corso di Laurea Magistrale in Ingegneria Elettronica

Thesis

Title according to the official assignment

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Title Surname Name

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Chapter 1

Preparation and presentation of the thesis

This chapter contains useful information for the preparation and the presentation of the master degree thesis for students of Electronic Engineering (M61), at the University of Study of Naples Federico II.

The final test for the Master Degree course in Electronic Engineering consists in the preparation and discussion of a thesis, written with the help of a supervisor (eventually with one or two co-supervisors). This work is the final result of the student career and it testifies his/her ability in exploring in deep the topics encountered during the degree course.

1.1 The supervisor and the topic

The supervisor is one of the professors that the candidate encountered during the degree course. Usually, the student finds its supervisor through informal talks, once provided that the professor is available and the student is interested in the professor's topics of interest. The degree course, on its website `www.ingegneria-elettronica.unina.it`, has defined a page with a non-esaustive list of available theses topics, in order to facilitate the information exchange between students and professors.

In case the thesis is developed after an intra-moenia internship, among one of the laboratories of the departement, the tutor that has already followed the student during the internship becomes the supervisor.

The supervisor defines the thesis topic. As already mentioned, the supervisor can be helped by one (or two maximum) co-supervisor. Supervisor and co-supervisor must guide and assist the student during the thesis developement and also provide him all the needed methodological and practical

instruments. During the thesis are usually foreseen periodical meetings of the candidate with the supervisor, during which the ongoing work and the obtained results are discussed, also to define the future steps of the work.

1.2 Thesis in a company

Some theses can require part of the work to be done in a company. The degree course in Electronic Engineering promotes this kind of thesis, usually carried on as the culmination of an extra-moenia internship; in order to facilitate theses in a company, on the degree course website is also present a list of available intership available among companies in the electronic field.

For theses in a company, the supervisor from the University is necessarly complemented by a co-supervisor from the company.

The topic of the thesis is to identify accordingly to both the supervisor from the University and from the company, and also according to the goals of the degree course training. The co-supervisor from the company, in addition to the duties mentioned before, must also follow the activities of the studient during the stay in the company, giving him/her the needed assistance. The company can ask to the student and the University supervisor to declare that some of the information and the material concerning the work is not to publish during the working period.

For the theses in company too, during the activities, are generally foreseen meetings between the candidate, the supervisor from the Univeristy and the co-supervisor from the company, during which the results and future steps are discussed.

1.3 Thesis writing

The redaction of the thesis has to be carried on by the candidate indipendentely. A dissertation type thesis has the structure of a scientific article where it is required to derive, from the international literature, the most recent developments on the topic of interest, it is required to synthsize them, present them in an omogenous way, and finally compare the different approaches highlighting pros and cons of each of them. A sperimental type thesis has the structure of a scientific report, it faces a specific problem, typically within a more wide project of interest forthe supervisor, proposing a solution that is innovative if compared to the state of the art. A sperimental thesis also includes a validation of the proposed solution, made by means of experimental measuraments and/or numerical simulations.

1.3.1 Structure of the manuscript

The thesis can be prepared both in english or in italian and it is divided in chapters. This file offers an example for the structure of a thesis, as already pointed out in the introduction. The aim of the introductive chapter is already described in the introduction of this file, while examples of the bibliography references are reported later on. It's worth to say that the references must have a number and follow the style shown later, in the references part of this chapter [**?**] [**?**] [**?**].

The thesis must be printed in triple hard copy for the final presentation. Its electronic version is exclusevely to send to the supervisor and co-supervisor, at least seven days before the discussion. The format to use for the title page (and the rest) is available on the web site of the course, both in the .docx format and in LaTeX.

1.4 The final presentation

During the thesis discussion, the candidate has at his/her disposal **12 minutes** for the final presentation. The 12 minutes limit is imperative and the committee chairman will take care of the observance of this limit. Thus, te candidate must pay attention in synthesizing in a proper way the done work.

For the final presentation, the candidate has to use a *PowerPoint presentation*. For the time limit, the presentation must include a limited number of slides (more than 15 are not suggested!) and focus the attention on the main aspects of the thesis:

- the faced problem
- the state of the art
- the adopted methodologies
- the obtained results
- other...

highlighting, if it is the case, the personal contribution to the innovation. All the details are not essential and digressions are to avoid.

It is important that the presentaion is accurately organized and proved, and that the student expose its work in a clear way to the committee. At the end of the presentation, the committee could also ask clarifications or curiosities to the candidate.

1.5 The degree mark

The committee attributes and records the final mark at the end of each graduation day. Even though the committee has full authority in the decision of the final mark, usually guide lines taking into account the student career are followed. For the formulation of the final mark, expessed out of 110, there are generally three contribution according to the relation:

$$V = A + B + C \tag{1.1}$$

In the equation 1.1, the **A** part is related to the average score calculated relying on the exams the student has sustained during the career, according to the relation $A = (11/3) \times M$ where **M** is the average score out of 30, calculating by weighing the mark of each exam with the relative CFU (the **A** is properly increased if the result of some exams is 30 cum laude).

The **B**, that is $B \leqslant 3$, is related to the student career and also takes into account the final mark of the bachelor degree.

The **C**, that is $C \leqslant 5$, finally, is assigned by the committee according to the final exam and thesis presentation.

1.6 The burocracy

Burocratic aspects regarding the thesis are in the domain of the students secretariat, at hich one should refer for any doubt, information or specific question. The student shall be required to be informed of the expiring dates for the delivering of all the necessary documents in advance.

Chapter 2

Typesetting of mathematical text

This chapter demonstrates a few examples of mathematical text typesetting.

2.1 Basic examples

A number in the mathematical mode with decimal point: $\pi \doteq 3.141\,592\,653\,589$.
Test on a 5% level, 95% confidence interval.
We have $\operatorname{var}(X) = \mathsf{E}\, X^2 - \left(\mathsf{E}\, X\right)^2$.

2.2 Mathematical expressions

Let

$$\mathbb{X} = \begin{pmatrix} \boldsymbol{x}_1^\top \\ \vdots \\ \boldsymbol{x}_n^\top \end{pmatrix}.$$

Note the period after the matrix. The mathematical text is a part of the sentence grammar and requires standard punctuation. Expressions that will be referenced should be numbered:

$$\mathbb{X} = \begin{pmatrix} \boldsymbol{x}_1^\top \\ \vdots \\ \boldsymbol{x}_n^\top \end{pmatrix}. \tag{2.1}$$

Expression (2.1) defines matrix $\mathbb{X}$. To achieve better readability and organization, it is advised to number only those expressions that are referenced. Do not number all displayed expressions automatically.

Aligning of expressions into several columns:

$$\begin{aligned} S(t) &= \mathsf{P}(T > t), && t > 0 && \text{(right-continuous)}, \\ F(t) &= \mathsf{P}(T \le t), && t > 0 && \text{(right-continuous)}. \end{aligned}$$

Two binded equations:

$$\left.\begin{aligned} S(t) &= \mathsf{P}(T > t) \\ F(t) &= \mathsf{P}(T \le t) \end{aligned}\right\} \quad t > 0 \qquad \text{(right-continuous)}. \tag{2.2}$$

Two centered unnumbered equations:

$$\boldsymbol{Y} = \mathbb{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon},$$

$$\mathbb{X} = \begin{pmatrix} 1 & \boldsymbol{x}_1^\top \\ \vdots & \vdots \\ 1 & \boldsymbol{x}_n^\top \end{pmatrix}.$$

Two centered numbered equations:

$$\boldsymbol{Y} = \mathbb{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}, \tag{2.3}$$

$$\mathbb{X} = \begin{pmatrix} 1 & \boldsymbol{x}_1^\top \\ \vdots & \vdots \\ 1 & \boldsymbol{x}_n^\top \end{pmatrix}. \tag{2.4}$$

Definition organized by cases:

$$P_{r-j} = \begin{cases} 0 & \text{if } r-j \text{ is odd}, \\ r!\,(-1)^{(r-j)/2} & \text{if } r-j \text{ is even}. \end{cases}$$

Note the use of punctuation in the equation. Commas and periods are placed according to the standard English language rules.

$$\begin{aligned} x &= y_1 - y_2 + y_3 - y_5 + y_8 - \dots && \text{by (2.3)} \\ &= y' \circ y^* && \text{by (2.4)} \\ &= y(0)y' && \text{by Axiom 1.} \end{aligned} \tag{2.5}$$

Two unnumbered aligned equations:

$$L(\boldsymbol{\theta}) = \prod_{i=1}^{n} f_i(y_i;\, \boldsymbol{\theta}),$$

$$\ell(\boldsymbol{\theta}) = \log\bigl\{L(\boldsymbol{\theta})\bigr\} = \sum_{i=1}^{n} \log\bigl\{f_i(y_i;\, \boldsymbol{\theta})\bigr\}.$$

Two aligned equations, the first numbered:

$$L(\boldsymbol{\theta}) = \prod_{i=1}^{n} f_i(y_i;\, \boldsymbol{\theta}), \tag{2.6}$$

$$\ell(\boldsymbol{\theta}) = \log\bigl\{L(\boldsymbol{\theta})\bigr\} = \sum_{i=1}^{n} \log\bigl\{f_i(y_i;\, \boldsymbol{\theta})\bigr\}.$$

Two-line equation, the first line aligned left, the second line aligned right, unnumbered:

$$\begin{aligned}\ell(\mu,\, \sigma^2) = \log\bigl\{L(\mu,\, \sigma^2)\bigr\} &= \sum_{i=1}^{n} \log\bigl\{f_i(y_i;\, \mu,\, \sigma^2)\bigr\} \\ &= -\frac{n}{2}\, \log(2\pi\sigma^2)\, -\, \frac{1}{2\sigma^2} \sum_{i=1}^{n} (y_i - \mu)^2.\end{aligned}$$

Two-line equation, aligned to =, numbered in the middle:

$$\begin{aligned}\ell(\mu,\, \sigma^2) = \log\bigl\{L(\mu,\, \sigma^2)\bigr\} &= \sum_{i=1}^{n} \log\bigl\{f(y_i;\, \mu,\, \sigma^2)\bigr\} \\ &= -\frac{n}{2}\, \log(2\pi\sigma^2)\, -\, \frac{1}{2\sigma^2} \sum_{i=1}^{n} (y_i - \mu)^2.\end{aligned} \tag{2.7}$$

Chapter 3

Tables, figures, software code

The inclusion of tables and figures in a scientific publication follows certain common and certain specific rules. Tables and figures are not included inside the text but placed either on dedicated pages or floated at the top or the bottom of a text page. LaTeX handles floating figures and tables automatically. Every table and figure must be numbered and accompanied with a legend. The legend should describe the contents of the table of figure with enough detail so that the reader can understand them without studying the text of the publication. Each table and figure should be refrenced by its number in the text. The text should summarize the most important conclusions that can be drawn from the table of figure. The text should be easy to follow and understand even without seeingf the figures and tables (and on the contrary, the figures and tables should be easy to understand even without reading the text). Figures and tables should be referenced indirectly in the sentences: instead of *"Table 3.1 shows that men are on average* 9.9 *kg heavier than women"* we write *"Men are on average* $9,9$ *kg heavier than women (see Table 3.1).*

3.1 Tables

Tables should be formatted according to the following rules:

- Avoid vertical lines. Separate the table from the surrounding text (even the legend) by stronger horizontal lines. Separate the header from the table and different parts of the table from each other by thinner horizontal lines. This table format can be obtained in LaTeX by loading the package `booktabs`. If a stronger separation of the columns is desired it can be achieved by including an additional vertical space.
- Do not change the type, format and meaning of the cells in a single

column (never include means in some cells and percentages in other cells of the same column).

- Do not repeat the same cell contents many times. If the table includes the column "Variance", which contains the value 0.5 in the first ten cells and 1.5 in the next ten cells, delete this column and find another way to communicate the value of the variance. For example, the table can be divided into two separate tables and the variance given in the legend. Or additional rows can be included between the parts of the table informing what was the variance in the subsequent rows.
- Numeric columns in the table should be aligned on the decimal point.
- Tables sometimes include abbreviations that are not used elsewhere in the text. These abbreviations should be explained in the legend or in notes under the table. These notes can be also used to provide more detail on the meaning of selected columns or cells.

3.2 Figures

Some advice on figures and diagrams:

- Create the figure in the same size that will be used in the thesis. Excessive magnification or reduction of figures causes poor readability.
- The axes of a graph must be carefully annotated in the same language the thesis is written in. Units of measurement (kg, minutes, ...) should be provided when applicable. When the graph plots a function $h(x)$ the axes should be annotated by x a $h(x)$. Each axis must have a clearly defined scale (tickmarks, labels).
- If a two-dimensional scatterplot includes a large number of points make sure that the points do not turn into black cloud. If the number of points is too large reduce the size of the plotting symbol or select a subset of the points. Plots that include thousands of points make problems in electronic documents, they increase the size too much.

Effect	**Estimate**	**Std. error**[a]	**P-value**
Intercept	−10.01	1.01	—
Gender (male)	9.89	5.98	0.098
Height (cm)	0.78	0.12	< 0.001

Note: [a] Standard error of the estimator by the Monte Carlo method.

Table 3.1: Maximum likelihood estimates from model M.

- If the thesis is to be printed on a black-and-white printer, do not use colors. Lines can be distinguished by the type (solid, dotted, ...), areas can be filled by various shades of grey or
  The meaning of the line types and area shading should be explained in the legend or directly in the plot.

The command `\psfrag` can replace parts of `ps/eps` files (usually annotations in the graphs) by an arbitrary sequence of LaTeX commands, as the following examples illustrate.

3.3 Software code

Software code or computer output (if needed in the thesis) should be formatted differently from the other text. One option is to use LaTeX package `fancyvrb` (fancy verbatim), which is used to define the environment `PCinout` in the master file `BcPrace.tex`. With this environment, we can generate the following examples:

```
> mean(x)
[1] 158.90
> objekt$mean
[1] 158.90
```

Smaller font:

```
> mean(x)
[1] 158.90
> objekt$mean
[1] 158.90
```

No frame:

```
> mean(x)
[1] 158.90
> objekt$mean
[1] 158.90
```

Narrow frame:

```
> mean(x)
[1] 158.90
> objekt$mean
[1] 158.90
```

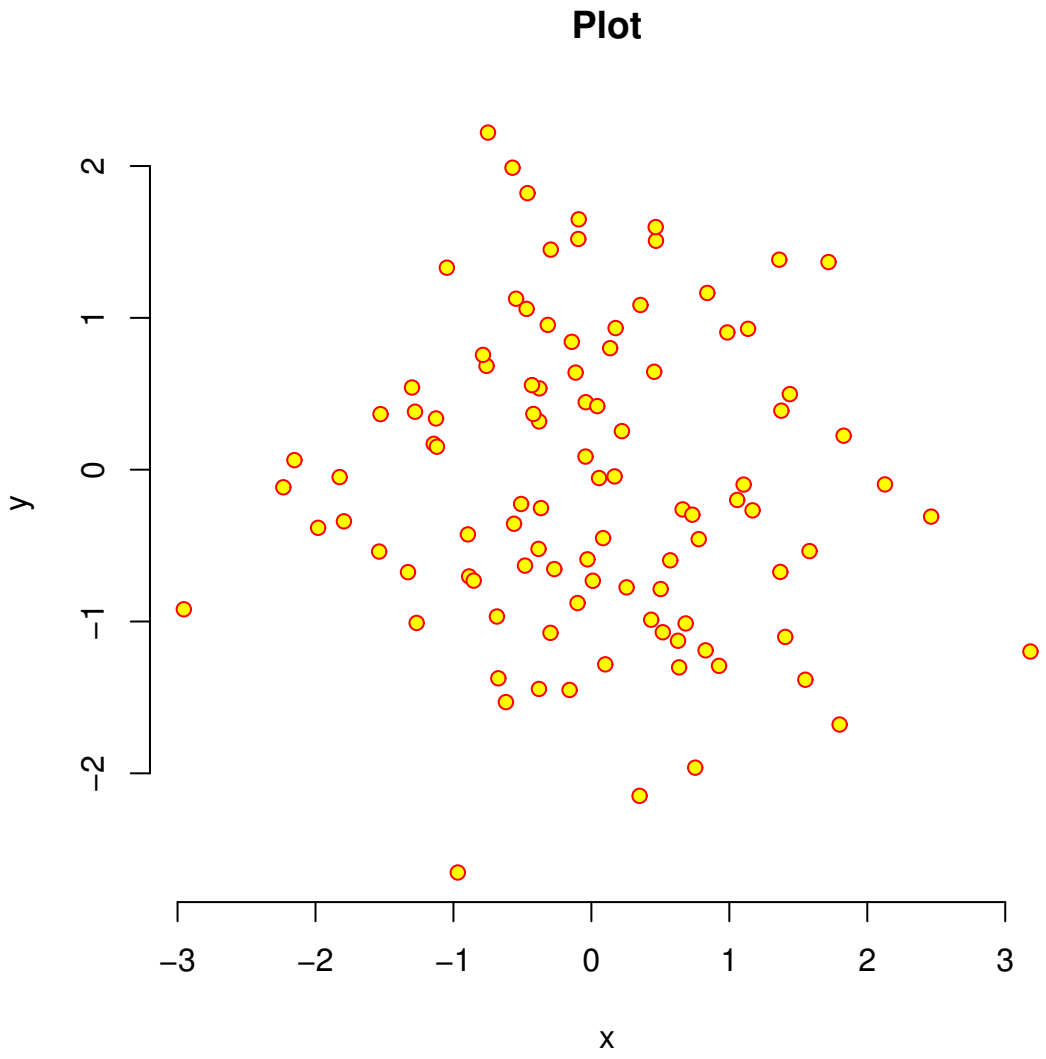

Figure 3.1: Random sample from distribution $\mathcal{N}_2(\mathbf{0}, I)$.

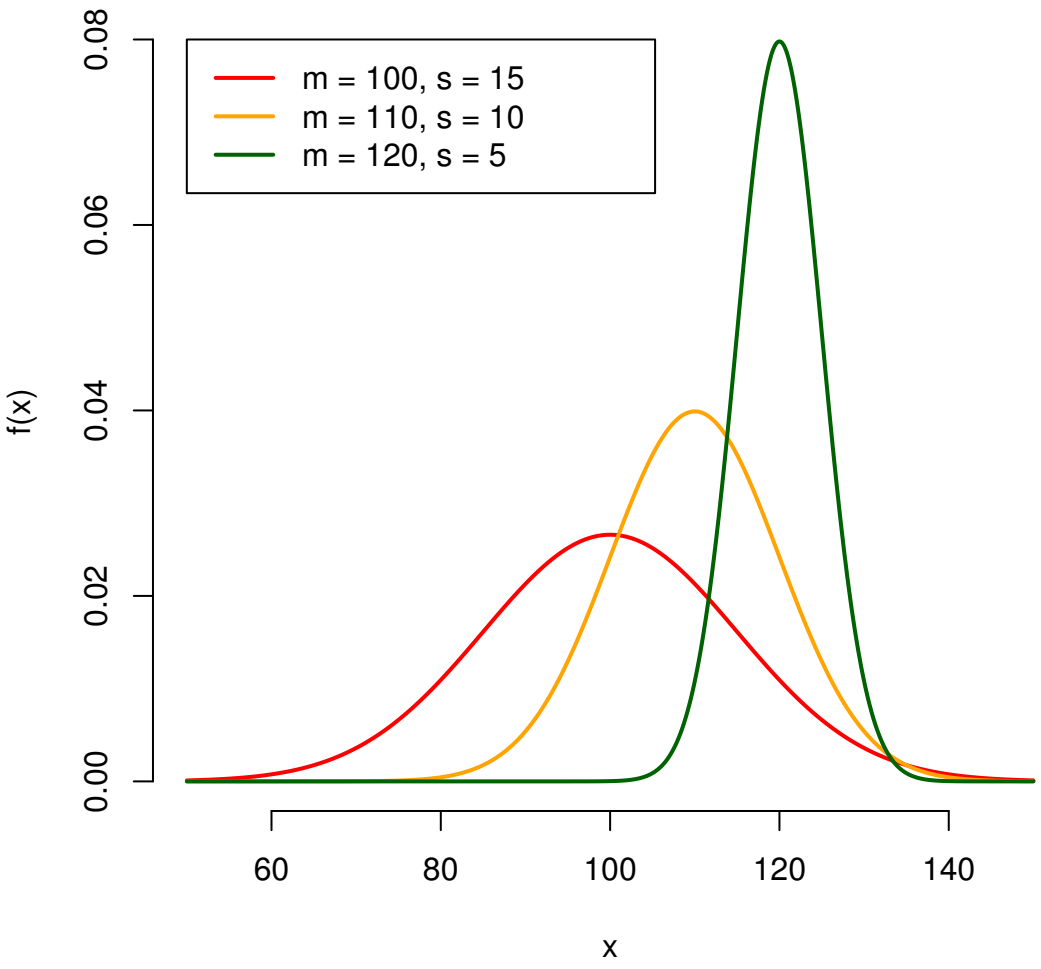

Figure 3.2: Densities of several normal distributions.

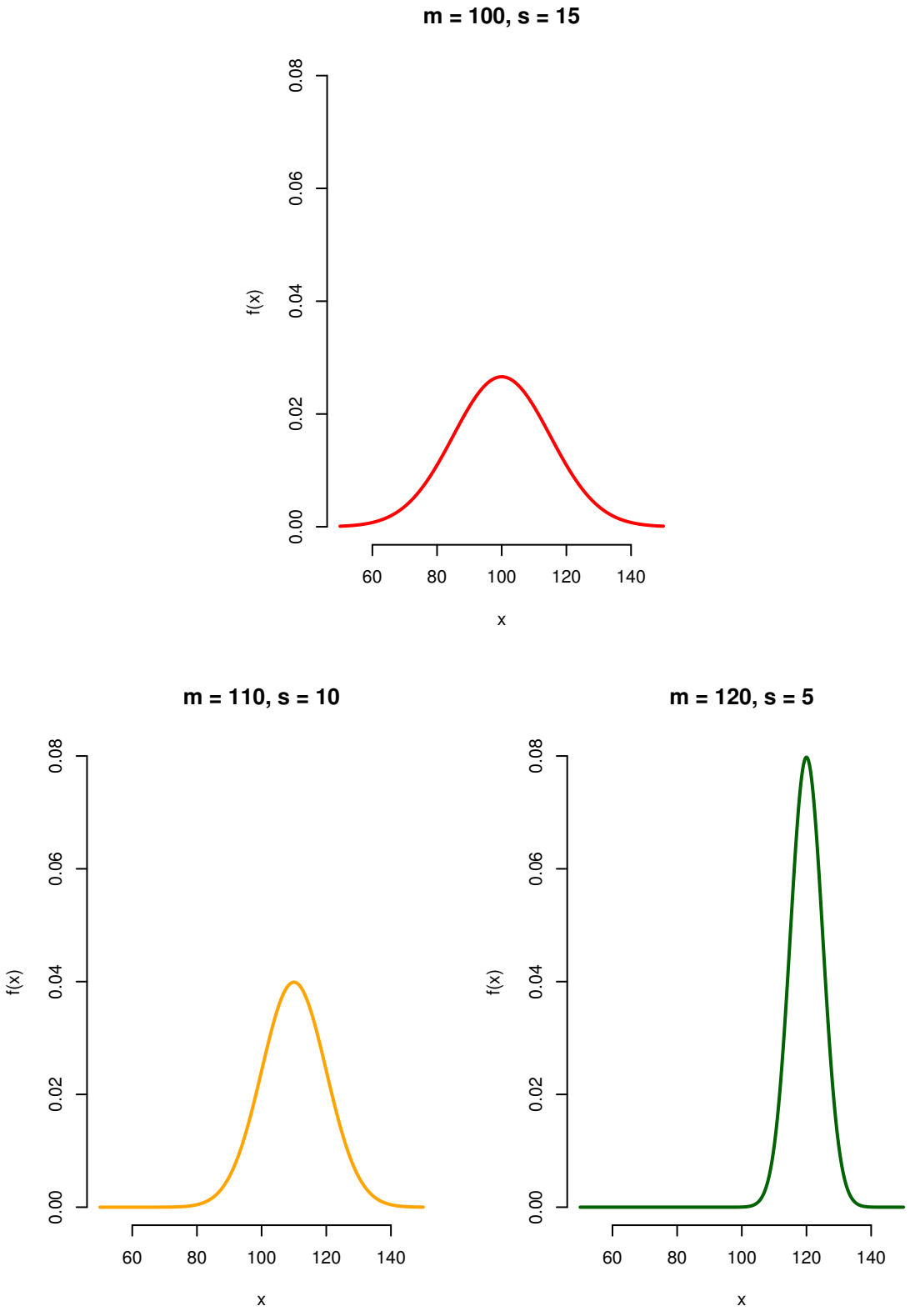

Figure 3.3: Densities of several normal distributions.

Conclusions

The conclusion of the thesis has to sum up the main considerations and results of the whole work, eventually addressing future steps to continue the work on the discussed topic.