

THESIS TITLE IN ENGLISH

Name Surname

**Doctoral Dissertation**  
**Jožef Stefan International Postgraduate School**  
**Ljubljana, Slovenia, Month 2013**

**Supervisor:** Jožef Stefan Institute, Ljubljana, Slovenia  
**Co-supervisor:** Jožef Stefan Institute, Ljubljana, Slovenia

**Evaluation Board:**  
title Name Surname, Chairman, Affiliation  
title Name Surname, Member, Affiliation  
title Name Surname, Member, Affiliation

**MEDNARODNA PODIPLOMSKA ŠOLA JOŽEFA STEFANA**  
**JOŽEF STEFAN INTERNATIONAL POSTGRADUATE SCHOOL**



Name Surname

**THESIS TITLE IN ENGLISH**

**Doctoral Dissertation**

**NASLOV NALOGE V SLOVENŠČINI**

**Doktorska disertacija**

*Supervisor:* title Name Surname

*Co-supervisor:* title Name Surname

Ljubljana, Slovenia, Month 2013



This is dedication page...



# Contents

<b>Abstract</b>	<b>ix</b>
<b>Povzetek</b>	<b>xi</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Citations . . . . .	1
1.2 Publications related to the dissertation . . . . .	1
1.3 Abbreviations . . . . .	2
1.4 Contribution . . . . .	2
1.5 Organization of the thesis . . . . .	2
1.6 Definitions, Theorems, Lemmas . . . . .	2
1.7 Algorithms . . . . .	2
1.8 Formatting figures . . . . .	3
1.8.1 Subsection . . . . .	3
1.9 Formatting Tables . . . . .	4
<b>2 Acknowledgements</b>	<b>5</b>
<b>3 References</b>	<b>7</b>
<b>List of Figures</b>	<b>11</b>
<b>List of Tables</b>	<b>13</b>
<b>List of Algorithms</b>	<b>15</b>
<b>Appendix A: Bibliography</b>	<b>19</b>
<b>Appendix B: Biography</b>	<b>21</b>





## Abstract

The Abstract should be written in the file *Abstract.txt*.



## Povzetek

Povzetek se piše v dokumentu *Povzetek.tex*



# 1 Introduction

This Chapter explains how to provide citations, publications related to the dissertation and abbreviations throughout the thesis.

## 1.1 Citations

In order to use the correct bibliography style, the bibliography style *mps4\_5* is included in the main file *thesis.tex*. Several examples for citations are provided in continuation.

1. Article citation: Saaty (2003b), (Saaty, 2003a)
2. Web page citation: (The Economist, 2010)
3. Author citation: Zopounidis and Doumpos (2006)
4. Book citation: (Bohanec, 2011)
5. Conference article citation: (Baracscai and Dörfler, 2003)
6. Several citations:
  - (Bohanec, 2011; Burstein and Holsapple, 2008; Power, 2002)
  - (Skinner, 1999; Howard, 1968)
  - (E.Triantaphyllou, 2000; French, 1986; Bouyssou et al., 2006)
  - (Figueira et al., 2005)
  - (Jacquet-Lagrece and Siskos, 1982)
  - (Saaty, 2008)
  - (Moshkovich and Larichev, 1995)
  - (Greco et al., 2001)
  - (Adam and Humphreys, 2008; Figueira et al., 2005; Bouyssou et al., 2006)
  - (Menzies and Richardson, 2006; Saaty, 2008; Zadeh, 1975; Guo et al., 2009; Barron and Barrett, 1996)

## 1.2 Publications related to the dissertation

Publications related to the dissertation should be entered in *myPublication.bib* file. In order to enter them in Chapter ??, one should cite (include) them in the file *my\_publications.tex*.

In order a publication to appear in the chapter *Publications related to the dissertation*, after changing the file *my\_publications.tex*, one has to run *bibtex bu.aux* for all *bu\*.aux* files (*bu1.aux*, *bu2.aux* etc.). After compiling, the references to the publications will appear.

### 1.3 Abbreviations

The first occurrence of an abbreviation has to be followed with its long explanation. See the examples below for different types of abbreviations.

To add a new abbreviation, in the file *abbreviation.txt* use the following command:

```
\newacronym<label>{<abbrv>}{<full>}
```

In order to make the abbreviations appear in the list of abbreviations, the following procedure should be applied:

1. Apply latex compile twice (from the editor or in command line by using the command `latex thesis.txt`)
2. Run the following two commands in command line:

```
makeindex -s thesis.ist -t thesis.alg -o thesis.acr thesis.acn
```

```
makeindex -s thesis.ist -t thesis.gls -o thesis.gls thesis.glo
```

Afterwards the latex compile will include the list of abbreviations. Any content changes in the file *abbreviation.txt*, require repeating the above procedure in order for changes to take effect.

The first occurrence of an abbreviation has to be followed with its long explanation. Several examples of usage of long abbreviations are given in continuation.

- test

### 1.4 Contribution

This is a new section.

### 1.5 Organization of the thesis

This is a new section.

This Chapter explains how to provide Definitions, Theorems, Lemmas and Algorithms in the thesis.

### 1.6 Definitions, Theorems, Lemmas

**Definition 1.1** *This is definition.*

**Theorem 1.1** *This is theorem.*

**Lemma 1.1** *This is lemma.*

### 1.7 Algorithms

This is an example of how to write an Algorithm by using the packages *algorithm* and *algorithmic*.

This Chapter provides examples of formatting Figures and Tables.

---

**Algorithm 1.1** Regression algorithm for FNAC structure and dependent variable in the  $p$  position

---

```

1:  $v \leftarrow 0.5$ 
2:  $q \leftarrow 0.5$  ▷ calculate median regression for  $q = \frac{1}{2}$ 
3: if  $p == n$  then ▷ if regression variable is positioned last; n is the number of random variables/attributes;
4:    $v \leftarrow [1 - u^{-\theta} + (qu^{1+\theta})^{-\frac{\theta}{1+\theta}}]^{-\frac{1}{\theta}}$  ▷ calculate  $v$ 
5: else
6:   for  $j = 1 \rightarrow (n - p)$ ,
7: (or  $j = 1 \rightarrow (n - 2)$ , when  $p=1,2$ ) do ▷ if position of regression variable other than the last
8:    $q \leftarrow v$  ▷ replace  $q$  with the value of  $v$ 
9:    $v \leftarrow [1 - u^{-\theta} + (qu^{1+\theta})^{-\frac{\theta}{1+\theta}}]^{-\frac{1}{\theta}}$  ▷ recalculate the new value of  $v$ 
10:   $i \leftarrow i - 1$ 
11: end for ▷  $p$  is the output variable position
12:  $q \leftarrow v$  ▷ replace  $q$  with the value of  $v$ 
13:  $v \leftarrow [1 - u^{-\theta} + (qu^{1+\theta})^{-\frac{\theta}{1+\theta}}]^{-\frac{1}{\theta}}$  ▷ recalculate  $v$ ; if  $p = 1$ ,  $u = u_2$ ; if  $p = 2$ ,  $u = u_1$ 
14: end if
15:  $u \leftarrow F_1(x_1)$  ▷ replace  $u$  by  $F_1(x_1)$ 
16:  $v \leftarrow F_2(x_2)$  ▷ replace  $v$  by  $F_2(x_2)$ 

```

---

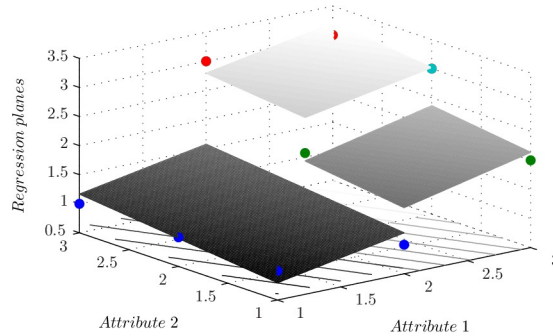


Figure 1.1: Sample figure.

## 1.8 Formatting figures

An example of how to format a figure is provided on Figure 1.1.

### 1.8.1 Subsection

This is an example of subsection.

**This is a pragraph** This is an example of a paragraph within the subsection 1.8.1.

#### Subsubsection

This is an example of subsubsection. The maximal depth of numbered subsections is 2.

## 1.9 Formatting Tables

An example of how to format a table is given in Table 1.1. Shadings are not a requirement.

Table 1.1: Qualitatively described problem

No.	QA <sub>1</sub>	QA <sub>2</sub>	QC
1	good	good	good
2	better	good	good
3	good	better	good
4	good	the best	good
5	the best	good	better
6	better	better	better
7	the best	better	the best
8	better	the best	the best
9	the best	the best	the best



## 2 Acknowledgements

The research of the author was supported by Ad Futura Programme of the Slovene Human Resources and Scholarship Fund. I would also like to acknowledge the support of the Slovenian Research Agency through Research Programme XY-ZZVR.



### 3 References

- Adam, F.; Humphreys, P. (eds.) *Encyclopedia of Decision Making and Decision Support Technologies* (Information Science Reference, 2008).
- Baracscai, Z.; Dörfler, V. Automated fuzzy-clustering for doctus expert system. In: *Paper presented at International Conference on Computational Cybernetics*, Siófok, Hungary. (2003).
- Barron, F.; Barrett, B. The efficacy of smarter — simple multi-attribute rating technique extended to ranking. *Acta Psychologica* **93**:23–36 (1996).
- Bohanec, M. *Odločanje in modeli* (DMFA, Ljubljana, 2006).
- Bohanec, M. *DEXi: Program for Multi-Attribute Decision Making: User's manual: version 3.03*. IJS Report DP-10707, Jožef Stefan Institute, Ljubljana (2011).
- Bouyssou, D.; Marchant, T.; Pirlot, M.; Tsoukiàs, A.; Vincke, P. *Evaluation and Decision Models with Multiple Criteria: Stepping Stones for the Analyst*. (Springer, Boston, USA, 2006).
- Burstein, F.; Holsapple, C. W. (eds.) *Handbook on Decision Support Systems 1: Basic Themes* (Springer-Verlag Berlin Heidelberg, 2008).
- E.Triantaphyllou. *Multi-Criteria Decision Making Methods: A Comparative Strudy* (Kluwe Academic Publishers, Dordrecht, Netherlands, 2000).
- Figueira, J.; Greco, S.; Ehrgott, M. *Multi Criteria Decision Analysis: State of the art surveys*. (Springer Verlag, Boston, Dordrecht, London, 2005).
- French, S. *Decision theory: an introduction to the mathematics of rationality* (Halsted Press, New York, NY, USA, 1986). ISBN 0470203080.
- Greco, S.; Matarazzo, B.; Slowinski, R. Rough sets theory for multicriteria decision analysis. *European Journal of Operational Research* **129**:1–47 (2001).
- Guo, M.; Yang, J.; Chin, K.; Wang, H.; Liu, X. Evidential reasoning approach for multi-attribute decision analysis under both fuzzy and interval uncertainty. *IEEE Transactions on Fuzzy Systems* **17**(3):683–697 (2009).
- Howard, R. A. The foundations of decision analysis. *IEEE Transactions on Systems Sciences and Cybernetics* **SSC-4**(3):211–219 (1968).
- Jacquet-Lagrange, E.; Siskos, J. Assessing a set of additive utility functions for multicriteria decision making, the uta method. *European journal of Operational Research* **10**(2):151–164 (1982).
- Menzies, T.; Richardson, J. Qualitative modeling for requirements engineering (2006).

- MILEVA-BOSHKOSKA, B.; BOHANEĆ, M. Non-linear methods for ranking qualitative non-monotone decision preferences. In: Marko, B.; Matjaž, G.; Vladislav, R.; Tanja, U.; Mojca, B.; Dunja, M.; Marko, G.; Marjan, H.; Urban, K.; Olga, M.; Jadran, L.; Leon, Ž.; Andrej, G.; Andrej, B. (eds.) *Zbornik 13. mednarodne multikonference Informacijska družba - IS 2010, 11.-15. oktober 2010 : zvezek A : volume A, (Informacijska družba)*, 31–34 (Ljubljana: Institut Jožef Stefan, 2010).
- MILEVA-BOSHKOSKA, B.; BOHANEĆ, M. Copula regression based ranking of non-linear decision options. In: Dejan, P.; Aleš, T.; Brigita, R.; Bogdan, P. (eds.) *3. študentska konferenca Mednarodne podiplomske šole Jožefa Stefana = 3rd Jožef Stefan International Postgraduate School Students Conference, 25. maj 2011, Ljubljana, Slovenija. Zbornik prispevkov.*, 91–97 (Ljubljana: Mednarodna podiplomska šola Jožefa Stefana, 2011a).
- MILEVA-BOSHKOSKA, B.; BOHANEĆ, M. Ranking of non-linear qualitative decision preferences using copulas. In: F, D. (ed.) *Proceedings of the EWG-DSS London-2011 Workshop on Decision Systems, June 23rd-24th, 2011, London*, 48 (Toulouse: IRIT: = Institut de Research en Informatique de Toulouse, 2011b).
- MILEVA-BOSHKOSKA, B.; BOHANEĆ, M. Ranking of qualitative decision options using copulas. In: 2011, O. (ed.) *International Conference on Operations Research, August 30 to September 2, 2011, Zurich, CH. Book of abstracts.*, 32 (Zurich: IFOR: = Institute for Operations Research, 2011c).
- MILEVA-BOSHKOSKA, B.; BOHANEĆ, M. A method for ranking non-linear qualitative decision preferences using copulas. *International Journal of Decision Support System Technology* **2** (2012a).
- MILEVA-BOSHKOSKA, B.; BOHANEĆ, M. Ranking of qualitative decision options using copulas. In: Diethard, K. (ed.) *Operations research proceedings 2011 : selected papers of the International Conference on Operations Research (OR 2011), August 30 - September 2, 2011, Zurich, Switzerland, (Operations research proceedings)*, 103–108 (Berlin; Heidelberg, 2012b).
- MILEVA-BOSHKOSKA, B.; BOHANEĆ, M.; ŽNIDARŠIČ, M. Experimental evaluation of methods for ranking qualitatively assessed data-mining workflows. In: Ana, R.; Frada, B. (eds.) *Fusing decision support systems into the fabric of the context: [presented at 16th IFIP WG8.3 International Conference on Decision Support Systems, June 28-30 2012, Anávisos, Greece]*, vol. (Frontiers in artificial intelligence and applications, vol. 238), 175–184 (Amsterdam: IOS Press, 2012).
- Moshkovich, O.; Larichev, H. Zapros-lm– a method and system for ordering multiattribute alternatives. *European Journal of Operational Research* **82**:503–521 (1995).
- Power, D. *Decision support systems: concepts and resources for managers* (Quorum Books division Greenwood Publishing, 2002).
- Saaty, T. L. Decision-making with the ahp: Why is the principal eigenvector necessary. *European Journal of Operational Research* **145**:85–91 (2003a).
- Saaty, T. L. Why the magic number seven plus or minus two. *Mathematical and Computer Modelling* **38**:233–244 (2003b).
- Saaty, T. L. Decision making with the analytic hierarchy process. *Int. J. Services Sciences* **1**(2) (2008).

Skinner, D. *Introduction to Decision Analysis, A practitioner's Guide to Improving Decision Quality* (Probabilistic Publishing, Gainesville, 1999).

The Economist. The tyranny of choice. You choose. (2010). URL <http://www.economist.com/node/17723028>.

Zadeh, L. The concept of a linguistic variable and its application to approximate reasoning (i)(ii)(iii). *Information Sciences* 9, 43–80, 199–249, 301–357 (1975).

Zopounidis, C.; Doumpos, M. Multiple-criteria decision making. In: *Encyclopedia of Management* (Thomson, Gale, Farmington Hills, Michigan, USA, 2006).



## List of Figures

1.1	Sample figure. . . . .	3
-----	------------------------	---





## List of Tables

1.1	Qualitatively described problem . . . . .	4
-----	-------------------------------------------	---



## List of Algorithms



# Appendices



## Appendix A: Bibliography

### Publications related to the dissertation

#### 1.01 Original scientific article

- MILEVA-BOSHKOSKA, B.; BOHANEK, M. A method for ranking non-linear qualitative decision preferences using copulas. *International Journal of Decision Support System Technology* **2** (2012a)
- MILEVA-BOSHKOSKA, B.; BOHANEK, M.; ŽNIDARŠIČ, M. Experimental evaluation of methods for ranking qualitatively assessed data-mining workflows. In: Ana, R.; Frada, B. (eds.) *Fusing decision support systems into the fabric of the context: [presented at 16th IFIP WG8.3 International Conference on Decision Support Systems, June 28-30 2012, Anávisos, Greece]*, vol. (Frontiers in artificial intelligence and applications, vol. 238), 175–184 (Amsterdam: IOS Press, 2012)
- MILEVA-BOSHKOSKA, B.; BOHANEK, M. Ranking of qualitative decision options using copulas. In: Diethard, K. (ed.) *Operations research proceedings 2011 : selected papers of the International Conference on Operations Research (OR 2011), August 30 - September 2, 2011, Zurich, Switzerland, (Operations research proceedings)*, 103–108 (Berlin; Heidelberg, 2012b)

#### 1.08 Published scientific conference contribution

- MILEVA-BOSHKOSKA, B.; BOHANEK, M. A method for ranking non-linear qualitative decision preferences using copulas. *International Journal of Decision Support System Technology* **2** (2012a)
- MILEVA-BOSHKOSKA, B.; BOHANEK, M.; ŽNIDARŠIČ, M. Experimental evaluation of methods for ranking qualitatively assessed data-mining workflows. In: Ana, R.; Frada, B. (eds.) *Fusing decision support systems into the fabric of the context: [presented at 16th IFIP WG8.3 International Conference on Decision Support Systems, June 28-30 2012, Anávisos, Greece]*, vol. (Frontiers in artificial intelligence and applications, vol. 238), 175–184 (Amsterdam: IOS Press, 2012)
- MILEVA-BOSHKOSKA, B.; BOHANEK, M. Ranking of qualitative decision options using copulas. In: Diethard, K. (ed.) *Operations research proceedings 2011 : selected papers of the International Conference on Operations Research (OR 2011), August 30 - September 2, 2011, Zurich, Switzerland, (Operations research proceedings)*, 103–108 (Berlin; Heidelberg, 2012b)





## Appendix B: Biography

This is biography...