Importance of the order of the modules in TransMob[1]

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Summary

1. Introduction
2. Dynamical evolution
3. Modelling challenges
4. Analysis of the order
5. Conclusion

TransMob

Reference paper

N. Huynh, P. Perez, M. Berryman and J. Barthélemy (2015), Simulating Transport and Land Use Interdependencies for Strategic Urban Planning - An Agent Based Modelling Approach, Systems

Studied area

3 Local government areas of New South Wales
+/- 180,000 inhabitants in 2011
68 Km2

28 suburbs (in grey)
+/- 180,000 inhabitants in 2011
68 Km2

1 Introduction

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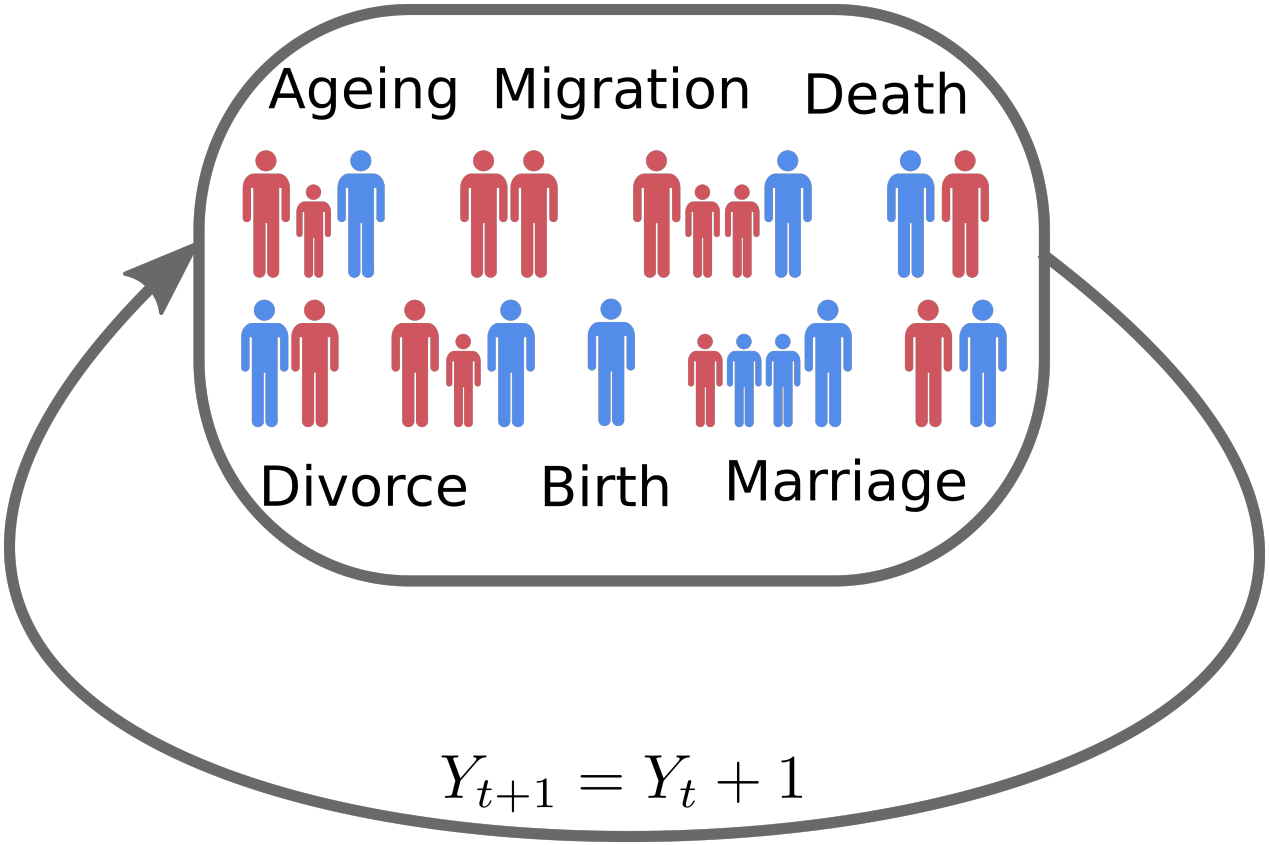
Ageing
Migration
Death
Divorce
Birth
Marriage
$Y_{t+1} = Y_t + 1$
$t < 30$

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Model each process

Analyse different methods and gather the needed data.

Wide range of methods :

- Probabilistic methods based on rates;
- Discrete choice modelling;
- Heuristics models (Genetic Algorithms, ...);
- ...

Order of these processes

1. Ageing
2. Deaths
3. Births
4. Marriages
5. Divorces

$? \rightleftarrows ?$

1. Deaths
2. Ageing
3. Births
4. Divorces
5. Marriages

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Number of possible combinations

We have all possible permutations of the 5 processes

$\Rightarrow$ 120 possibilities

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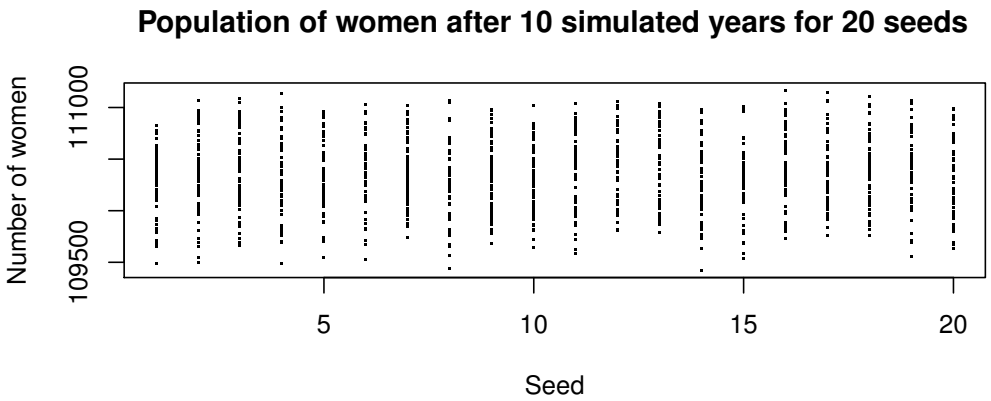
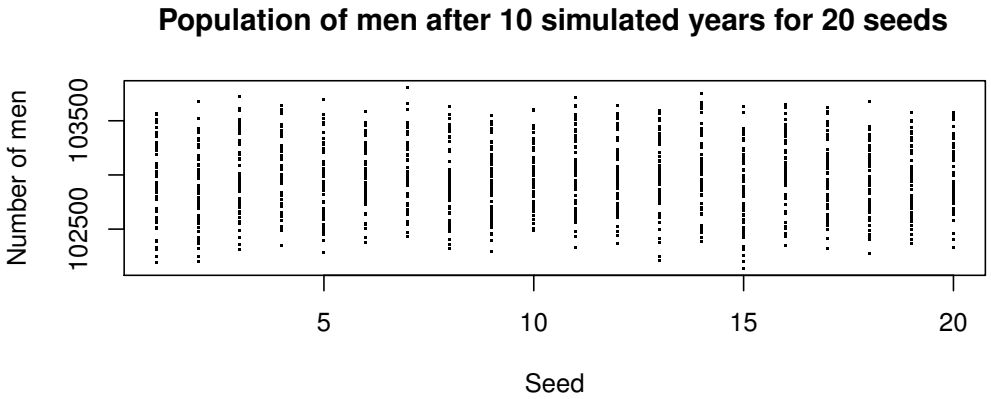
generation

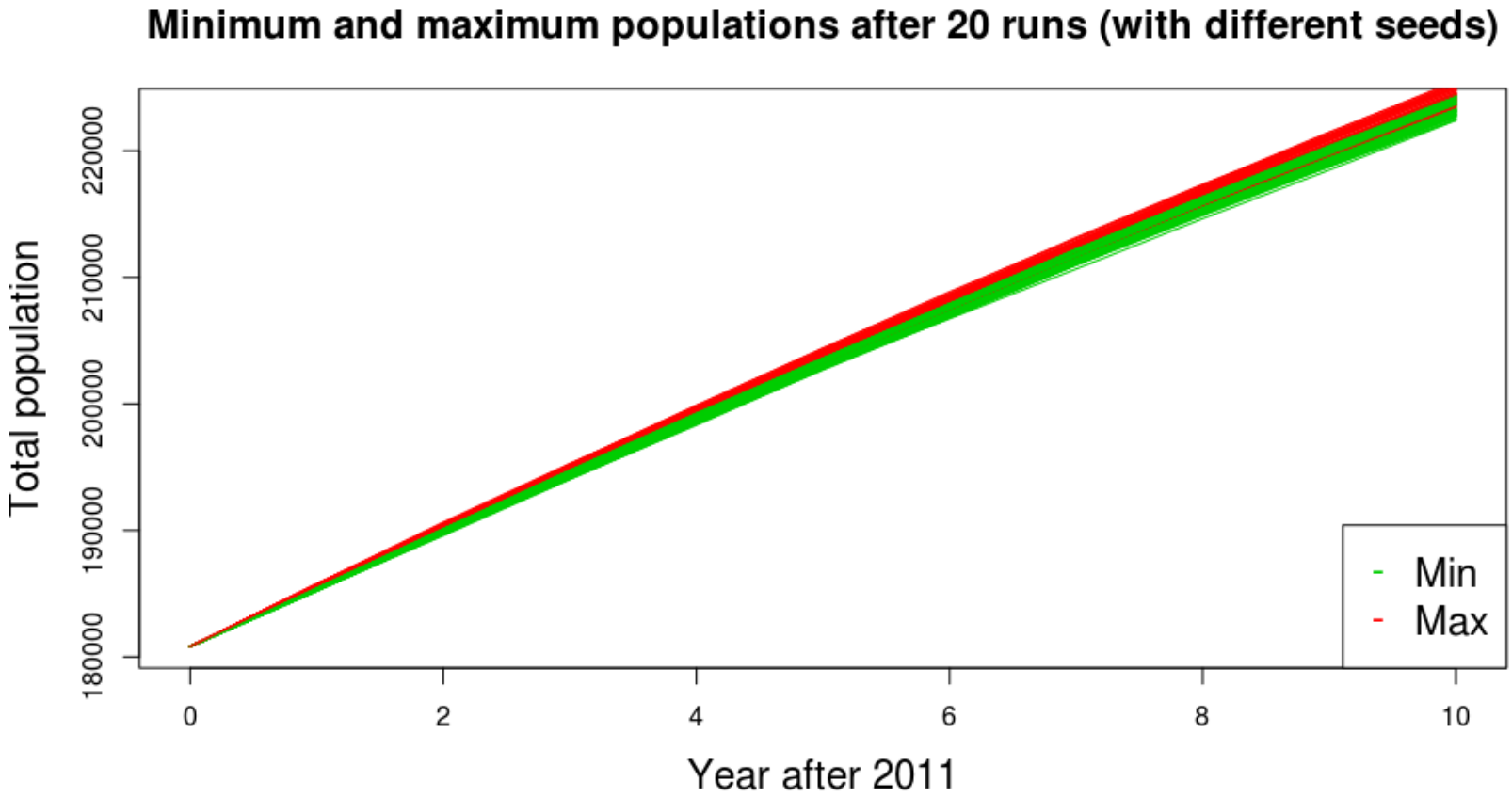
60 orders and 20 seeds of the random number generator

Stability and independence on the seed

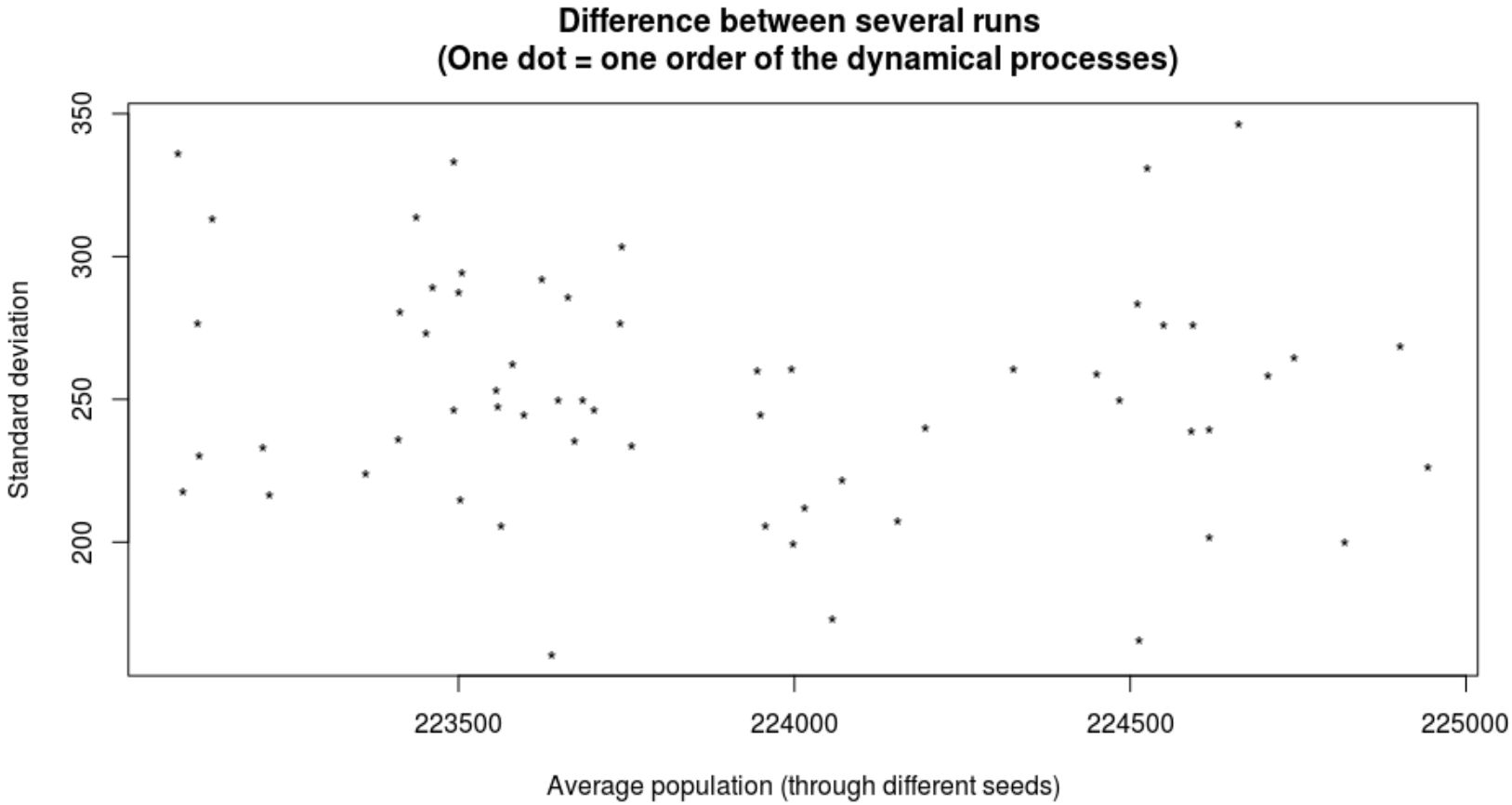




Stability for 20 seeds and the 60 admissible orders



Population for each order



Importance of the order

Classification

Classify the generations to analyse the orders that are grouped in a class.

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Input to the classification :

- Number of women after 10 years;
- Number of men after 10 years;

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- Number of women after 10 years;
- Number of men after 10 years;
- Number of less than 30 years old after 10 years;
- Number of 31-60 years old after 10 years;
- Number of more than 61 years old after 10 years.

Correlations

	women	men	less30	31_60	more61
P_age	0.507	0.544	-0.021	0.232	0.678
P_death	-0.555	-0.575	0.020	-0.245	-0.730
P_div	0.189	0.148	0.324	-0.014	0.003
P_mariage	-0.220	-0.192	-0.417	0.031	0.008
P_birth	0.322	0.331	0.124	0.090	0.338
seed	-0.033	-0.027	0.041	-0.189	-0.013

red = higher than 0.5
green = between 0.3 and 0.5
blue = lower than 0.05

Classification method

K-means

Minimises the variance intra-classes and maximises the variance between classes.

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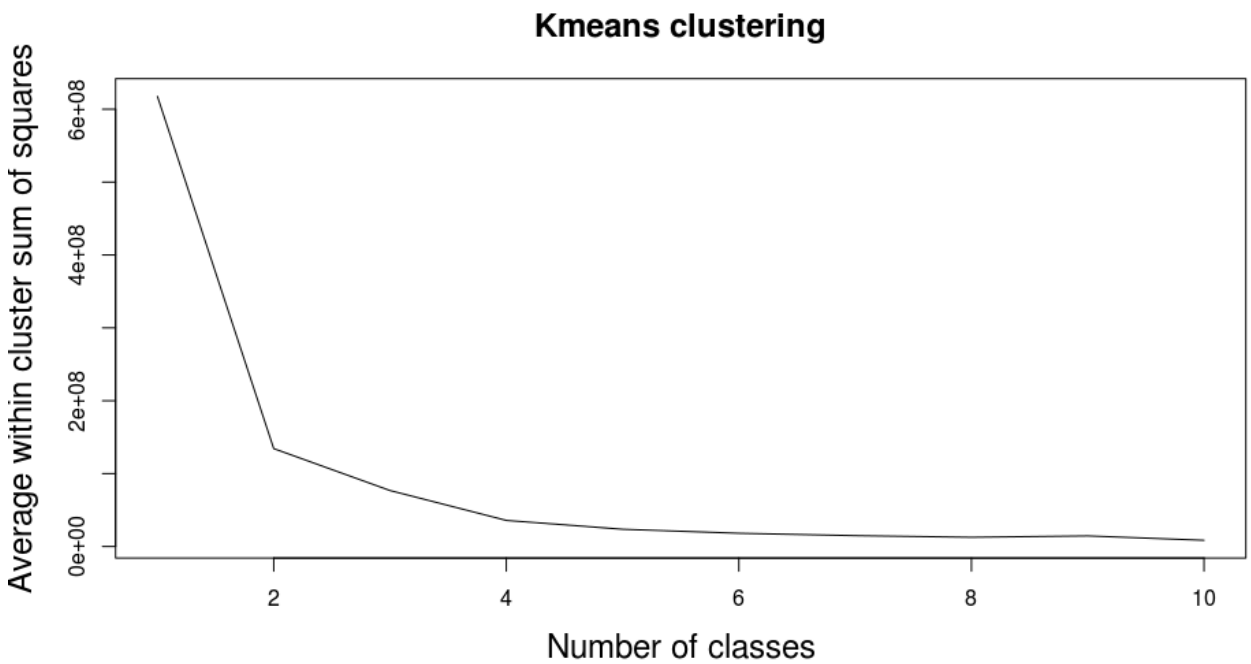
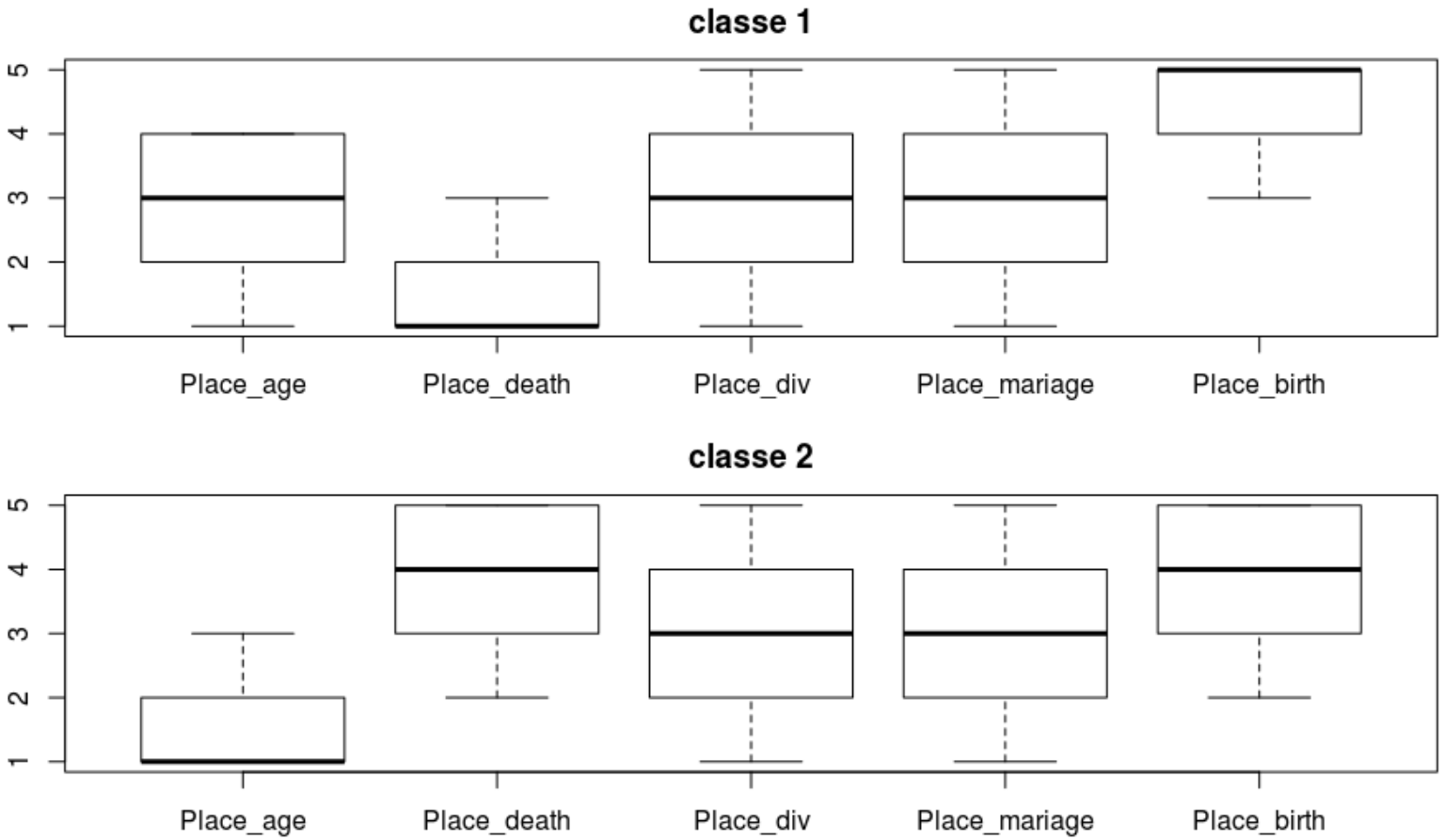


Classification results



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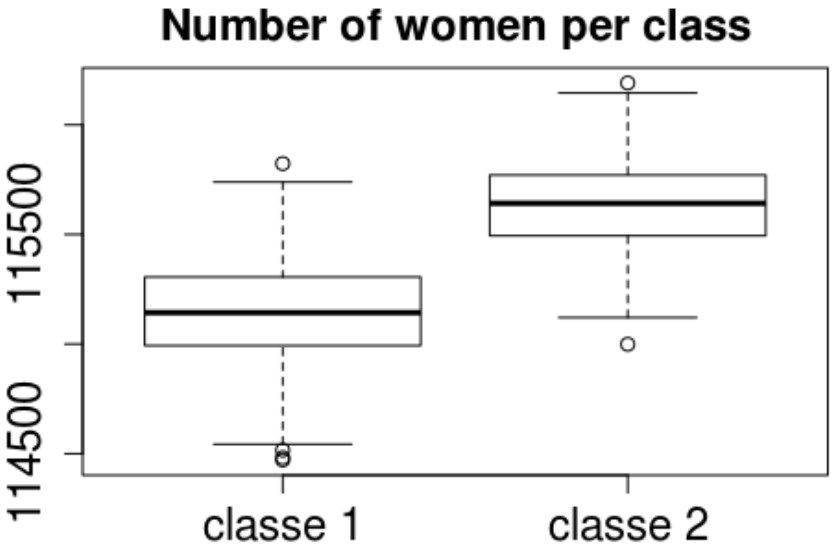

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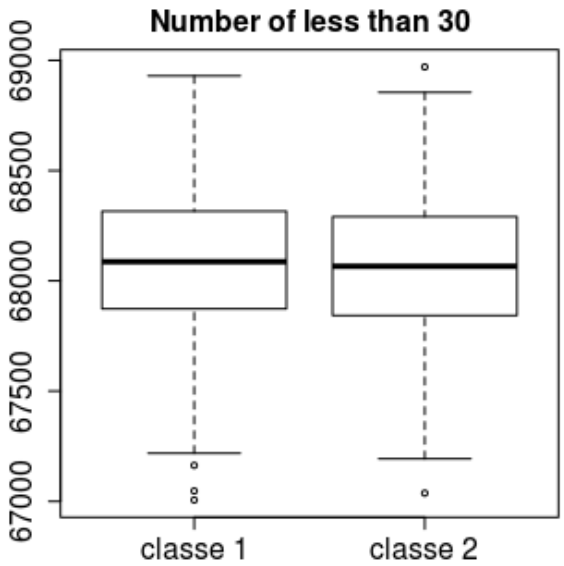

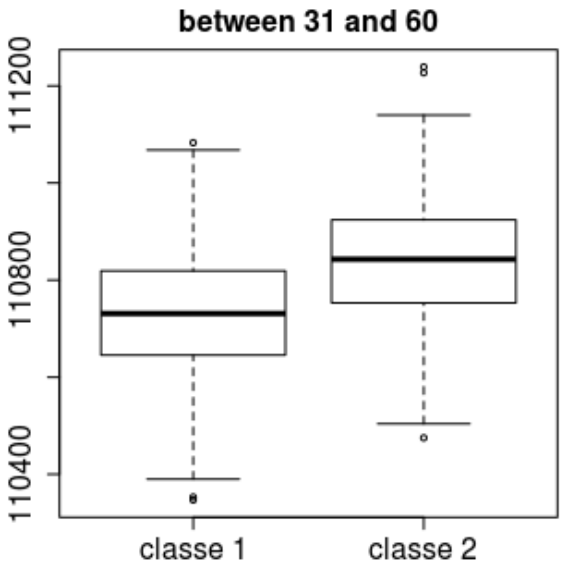

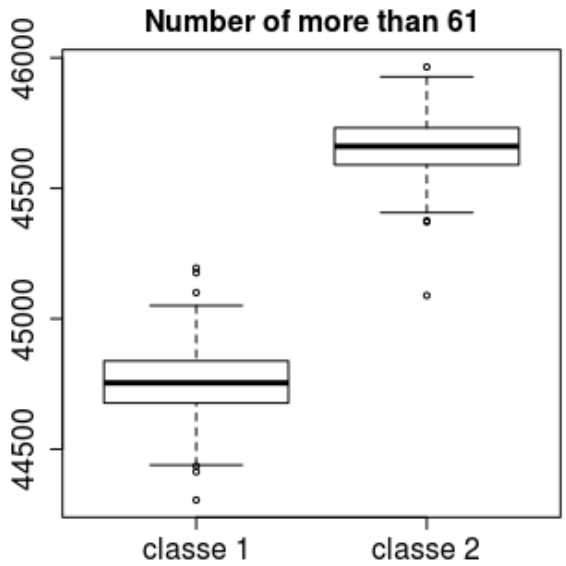

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  - Place of ageing and death;
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  - Other processes not determinant at this level.
- Importance of the order of the modules in agent-based models.

Future work

- Try to avoid to choose the place of death and age by:
  - Add a birthday to each individual and adapt each probability to the fact that a part of the year he had one year less than the other part (linear combination of the probabilities ponderated by the number of days in each age)
  - Add a death day to determine if, for example, the mother die before giving birth to her baby.

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- SMART at Wollongong university

Thanks for your attention !