

Longitudinal cardiorenal data

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About longitudinal data, or observations in a time horizon

- Complete or incomplete in one trajectory
- Difference to a cross-sectional study
- Longitudinal study and evolution of variables
- Dependant data

Virtual Population

- Moss et al (2012)'s virtual population of Guyton's model of whole-body circulatory regulation model was sampled
- The virtual population was a sample of individuals taken from a virtual population on the basis of exhibiting conditions similar to those of a real-world patient
- Guyton model was purposed for in silico exploration of pathophysiological states and treatment strategies for purpose of sensitivity study
- 96 parameters and 276 output variables
- 32 cardiac, 21 renal, 16 autoregulation, 16 hormonal, 11 local circulation, and 4 thirst-related.

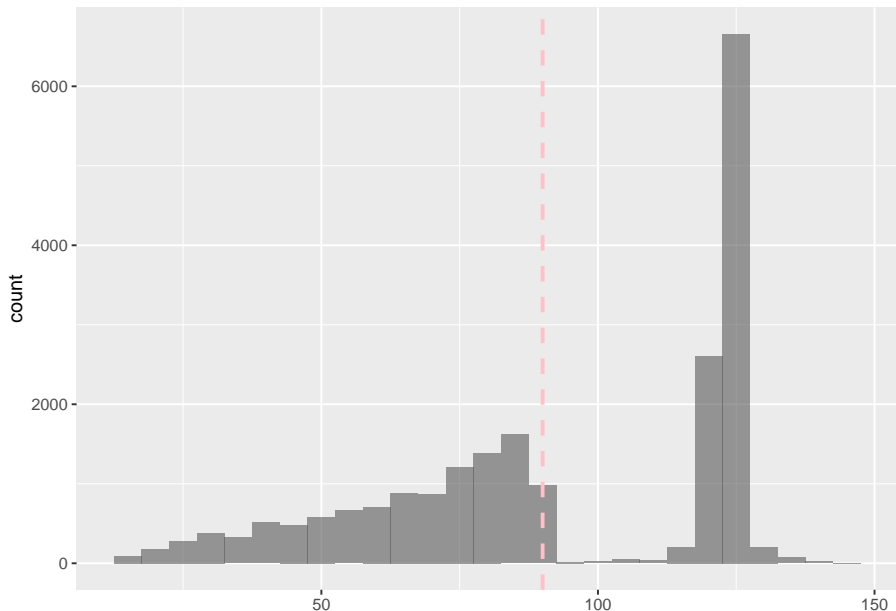
Time horizon for cardiorenal data

- Time points are unequi-spaced
- Four time points : 1 hour, 1 day, 1 week, 1 month

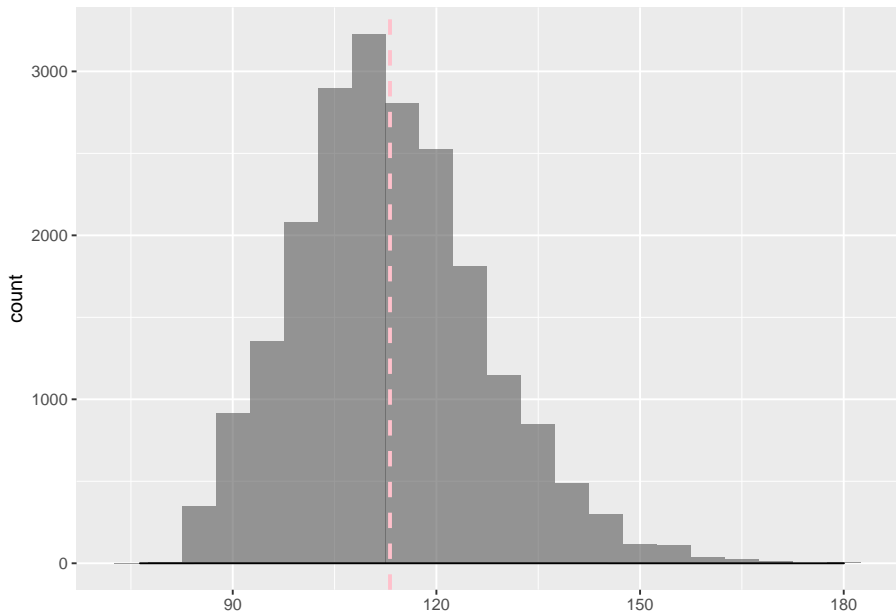
Method

- Between 2'000-3'000 patients had kidney failure ($\text{GFR} < 90 \text{ L/min}$) in each time point
- I sampled all of the kidney failure cases and 2'500 patients without kidney failure at each time point.
- I mapped the time trajectory of two variables; GFR and MAP
- I clustered using supervised learning of the mean GFR across four time points
- The model is ready for further analysis (e.g. mixed model regression)

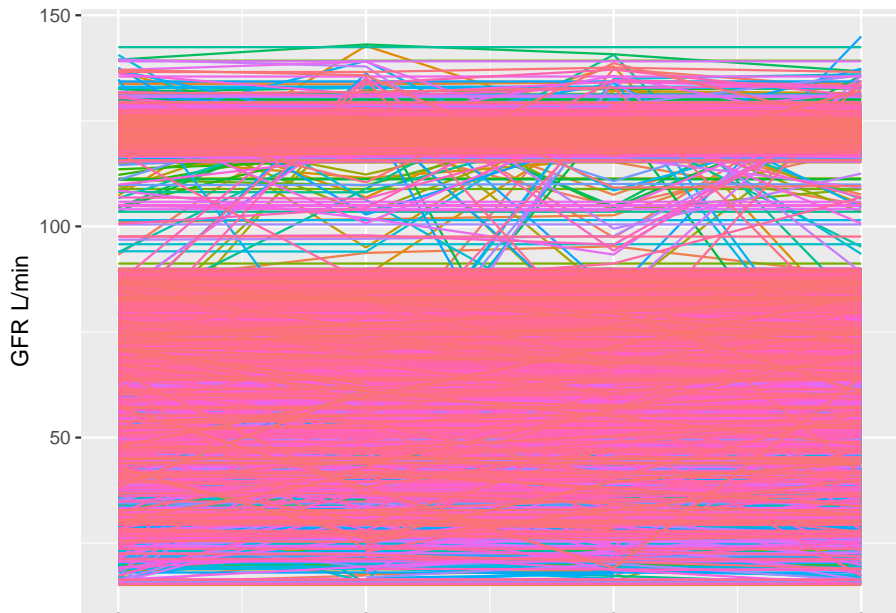
Distribution of GFR with 90 L/min threshold



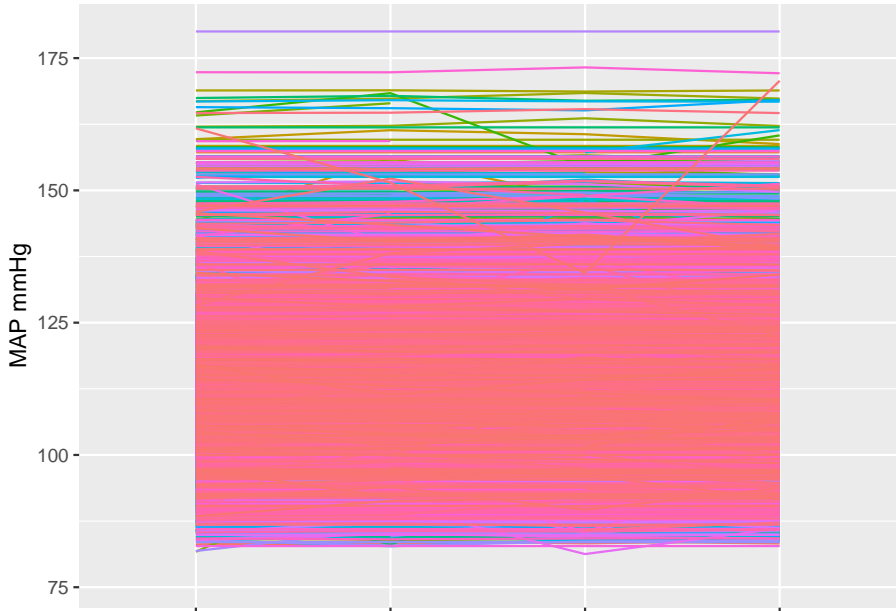
Distribution of MAP values with mean indicated



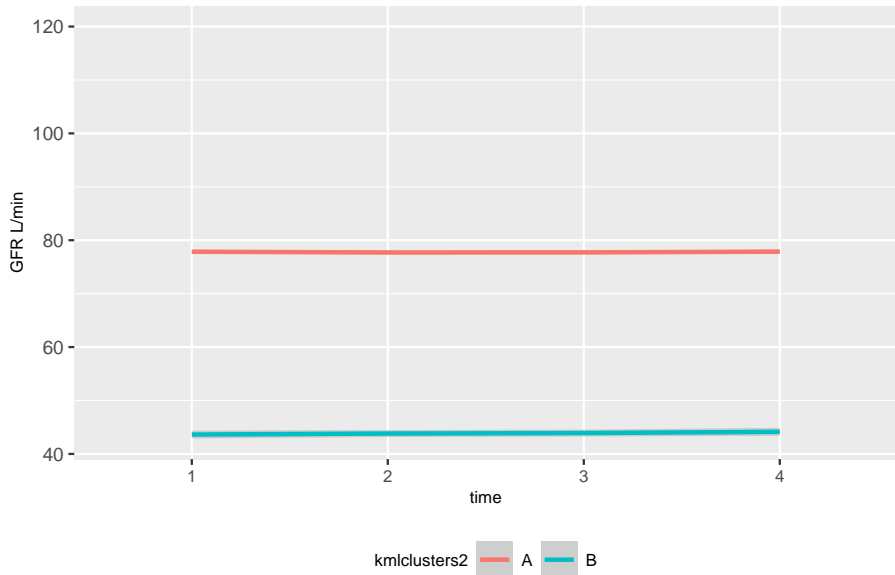
GFR path



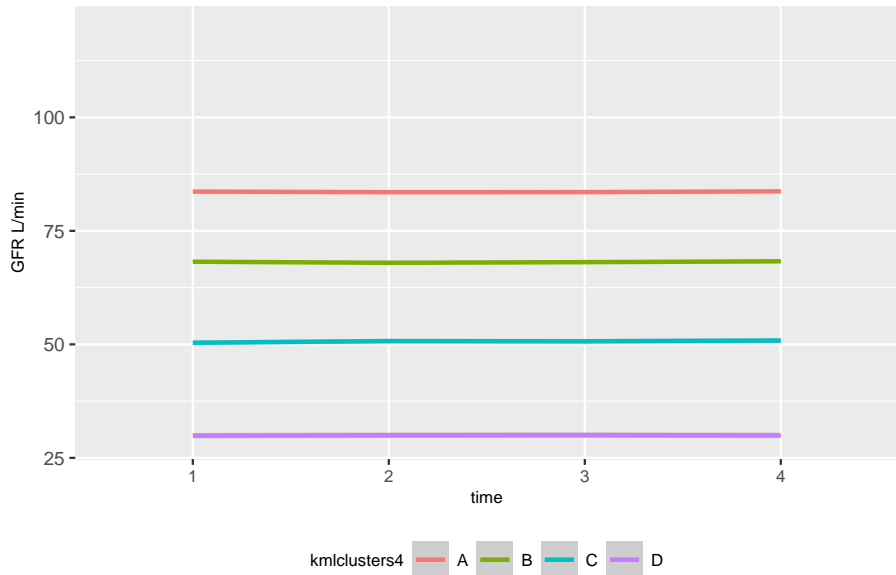
MAP path



Clustered Data in 2 partitions



Clustered Data in 4 partitions



Conclusions

- Within group differences can be accounted for using clustering techniques, this would be modeled as random effects
- Effects of other variables are fixed effects
- Mixed model regression can be used to account for both

References

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