Understanding COPD patients in the hospital system via administrative data

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Abstract

This work presents an analysis of how patients with chronic obstructive pulmonary disorder (COPD) interact with the hospital system in South Wales.

1 Introduction

This introduction will briefly summarise the literature review for studying a patient corpus via clustering. Following this, a condensed data analysis is presented highlighting the main conclusions of the clustering and the overall benefits compared with traditional condition-treatment segmentation.

2 Estimating queuing parameters

Reiterate the objective of the paper — to model a COPD ward within a hospital — and draw attention to lack of fine-grain data. Lead into how this can be overcome with the Wasserstein distance (a lot of this has been written up in `nbs/wasserstein.ipynb`). A brief summary of how the parameter set is chosen and a nice image of the queue we are building. Close out the section with best and worst case parameter set plots.

3 Adjusting the queuing model

With the queuing model established and validated in Section **??**, an investigation into the parameters of the model can be conducted. This section is comprised of several 'what-if' scenarios — a classic component of healthcare operational research — under this novel parameterisation. The outcomes of interest in this work are server (resource) utilisation and system times as these capture the both the driving forces of cost and

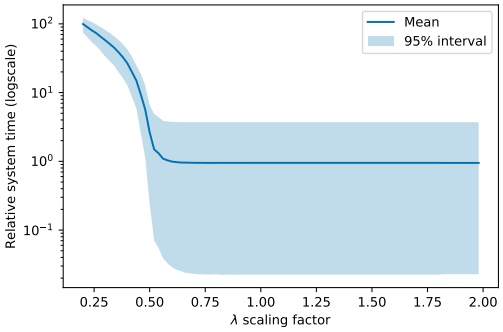

Figure 1: A plot of λ scaling factor against mean relative system time

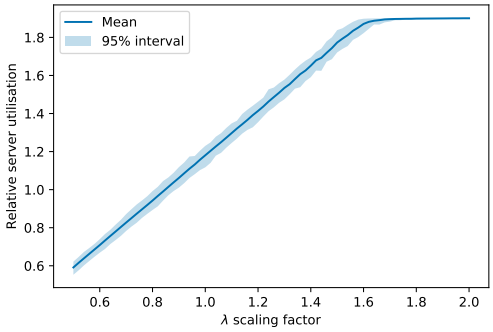

Figure 2: A plot of λ scaling factor against mean relative server utilisation

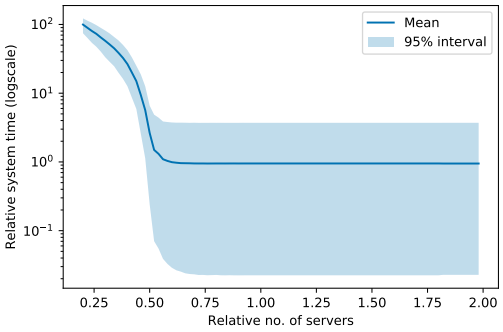

Figure 3: A plot of the number of servers, c, against mean relative system time

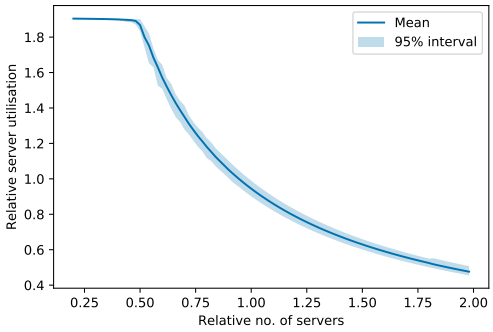

Figure 4: A plot of the number of servers, c, against mean relative server utilisation

the overall state of the system. Specifically, the objective of these experiments is to address the following questions:

- How would the system be affected by a change in overall patient arrivals?
- How is the system affected by a change in resource availability (i.e. a change in c)?
- How is the system affected by patients moving between clusters?

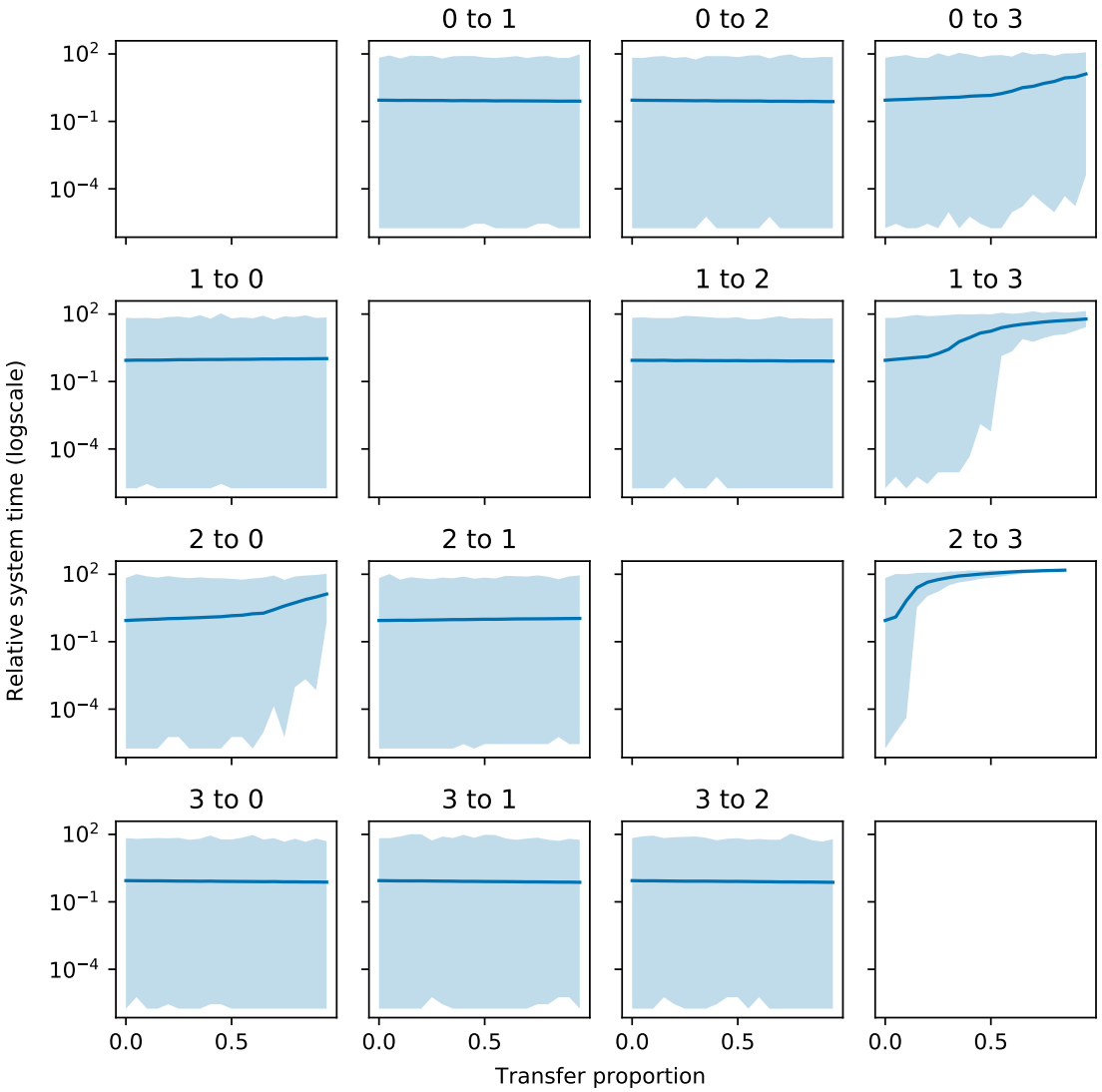

Figure 5: Plots showing the effect of proportions of each cluster moving to another on the mean relative system time

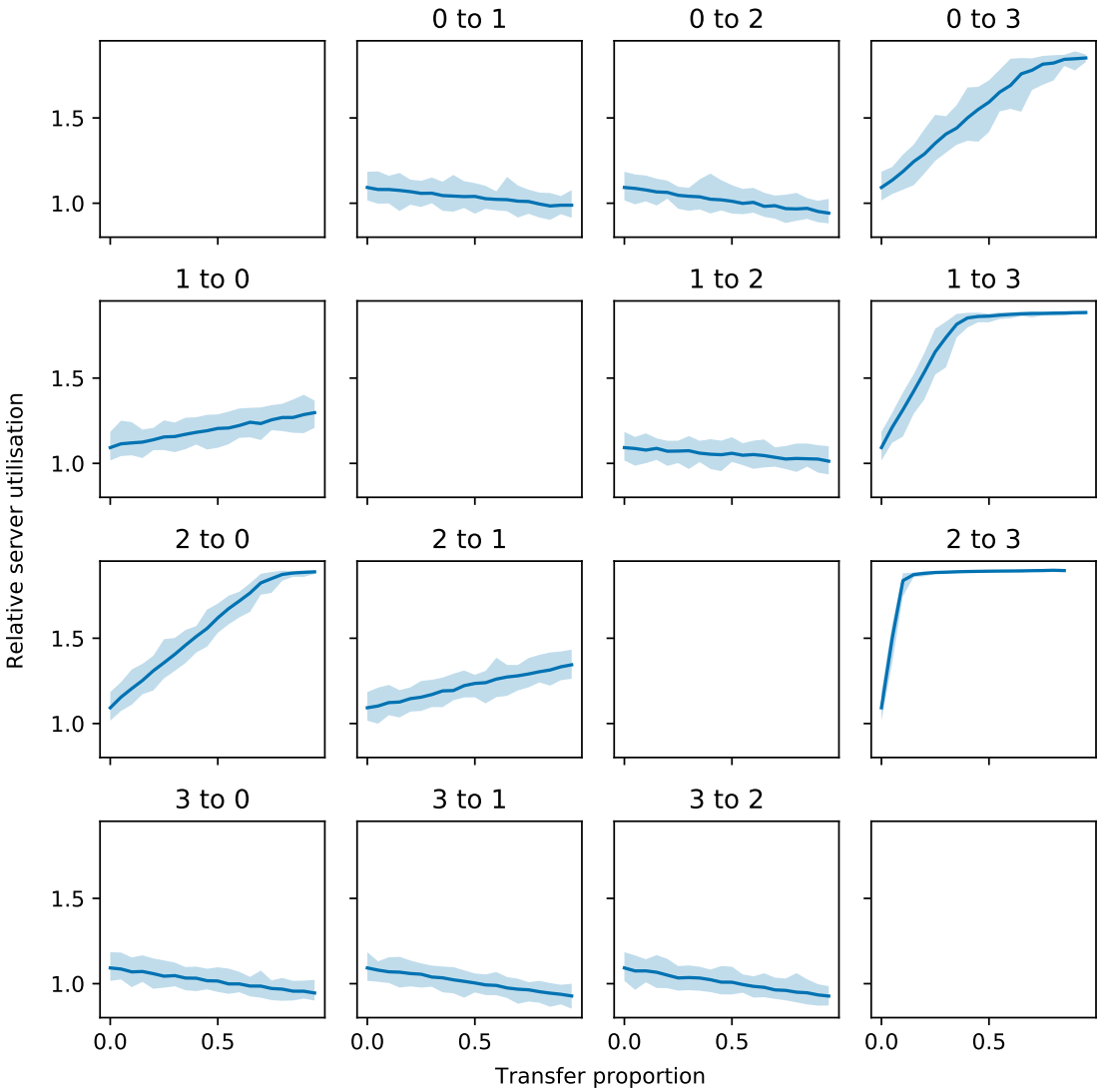

Figure 6: Plots showing the effect of proportions of each cluster moving to another on the mean relative server utilisation

3.1 Changes to overall patient arrivals

3.2 Changes to resource availability

3.3 Moving patients between clusters

4 Conclusion

Summarise the findings and novelty of the paper: sensitivity analysis and queuing models are within reach despite a lack of data. The chosen modelling discipline for service times is very simplistic but can return good results (refer back to best-case parameter plot).

References

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