

Overall, I found this to be a very clearly written and well documented methodological study with some quite useful new techniques. The dataset regarding doorways, buildings, paths, and fountains in Pompeii is truly awesome and there is so much potential here for urban network analyses. The approach to connecting neighborhoods/clusters in a network sense with neighborhoods in an archaeological urban environment is well developed and I particularly appreciate the nuanced discussion of nested areas around houses in terms of time and specific activities structuring mobility and social interactions at various scales. The general argument is very nicely illustrated with specific visual examples that work quite well.

I have very little to add to this paper as I thought it was very clear. The author is correct that the modularity based methods for defining network communities have rarely dug into the parameters involved in calculating modularity or the stability of solutions across different runs. I was only generally familiar with the CHAMP method prior to reading this piece and this shows a lot of potential. The reasoning behind selecting a range of modularity that produces stable community definitions actually makes more sense than simply maximizing modularity in many ways and I could see this approach being useful for a range of archaeological questions.

I really appreciate that this article presents this approach not as the sole solution to defining "correct" modularity ranges for defining communities but instead presents a set of heuristics to guide a researcher in the selection of an appropriate solution. For example, I appreciated that multiple solutions were investigated and compared to see how they related to each other but also that archaeological insights of the case at hand was used to inform the interpretation of the results (for example noting the problems with singleton neighborhoods and the close proximity among network communities in relation to specific features of the urban landscape like the forum). This is top notch exploratory data analysis which presents tools for developing an understanding of the underlying data rather than relying on strict rules and guidelines.

The study is well documented in terms of code and data. I downloaded the data compendium and was able to reproduce the analyses on my own using the R code and Jupyter Notebook provided. The only hiccup was that parallel Leiden community detection doesn't work in a Windows environment apparently but the code proceeded to run in serial. I just had to wait a bit longer. I had to make some slight modifications in my own Python environment to run the code but the instructions were thorough so it wasn't difficult. The code notebook is well documented and the figures are for the most part quite readable (a little more on that below).

I have just a few minor suggestions. First, the specific nature of how the travel time/path network used here was created and defined would be good. I would suggest adding a few sentences to describe the data and how they were converted into network objects and/or digitized. Further, I'd be interested to know how exactly paths between locations were determined in relation to buildings/entrances/presumed paths, etc. This is a minor thing but the current version doesn't really provide any detail.

The last little quibble that I have is with regard to the colors used in figures 4, 6, and 8. The red and green together there are difficult for my particular color vision deficiency. I would recommend that you change the color palette of that figure. There is a useful colorblind color

palette in the Seaborn package that works well for categorical data or color selection in complex figures.

Beyond this, I can think of a bunch of things I'd like to see happen with these data and the analyses presented here. For example, I think comparing specific partition overlaps using something like the Rand Index would be interesting to see which particular clusters are stable across different modularity definitions and in relation to stochastic processes. I would guess that the "belonging" measure used here would be closely related to these results and it would be exciting to see. I'd also love to hear more about the content of neighborhoods defined using different techniques and whether other kinds of infrastructure tends to fall along the same lines. This is, of course, well beyond the scope of this paper, but I'm excited to see what's next for these data.

Thanks,

Matt Peeples