Visualizing the Population Modelling Map Network Visualization

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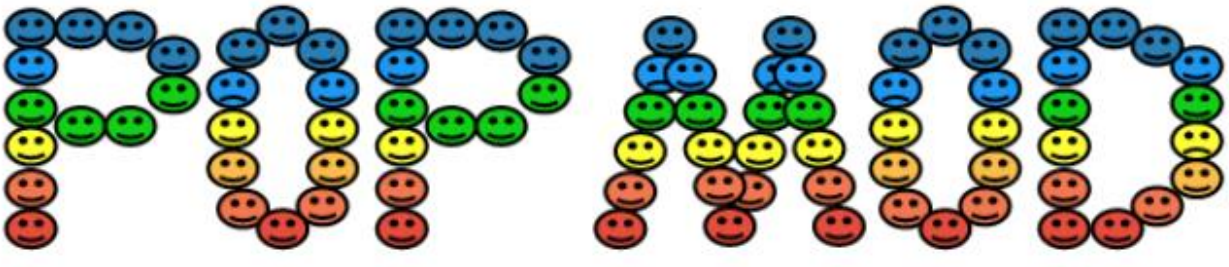

Fig. 1. POP MOD - Population Modeling from SimTk portal.

Abstract— The field of population modeling is composed of many researchers that model populations of different types with overlapping methods. Recently, the population modeling working group started mapping the field to help researchers locate similar work and potentially reuse work done by other researchers in parallel fields. We have visualized the data into various maps in this article, and we've gained some key insights from them.

Introduction

Population models are mechanistic models that relate individual-level responses to changes in population density and structure. When extrapolating from ecotoxicological observations to relevant ecological impacts, population modeling helps improve ecological risk assessment by lowering uncertainty [1].

Population modeling encompasses a wide range of topics and methods. Modeling a group of things with varying degrees of heterogeneity. New technologies give a burgeoning field cutting-edge opportunities [2]. Many researchers work on the topic of population modeling, modeling populations of various types using overlapping methodologies. The population modeling working group recently began mapping the field to assist researchers in locating similar work and maybe repurposing work done by other academics in related domains. SimTk portal was created [3] with a mailing list [4] and it invited contributors to describe their work. So, to check for overlaps in techniques, we compiled a list of all the work done by various individuals in various domains. As a result, we use this information to create a visualization.

1 Client Requirement

The Stakeholder Requirement is to display terms related to population modeling, scaled according to how popular they are, and to visualize the network between the writers based on their field of study.

2 Visualization Goal

Many researchers work in the domain of population modeling, and they use similar methodologies to model populations of various types. The population modeling working group has recently begun mapping the field to assist researchers in locating similar work and potentially reusing work done by other researchers in related domains.

So, our main goal is to find the methodologies of population modeling, as well as the people who have worked on those methodologies. To determine how the authors are linked based on their methodologies.

In Figure 1 and Figure 2 we have manually sketched the Stakeholder Requirement.

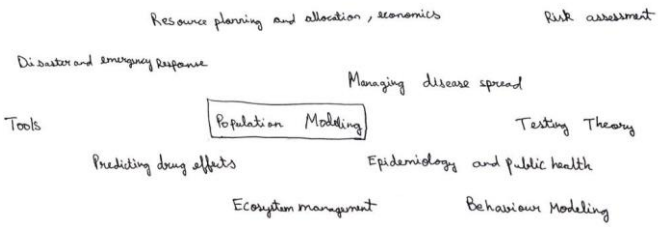

Fig. 1. Manual Sketch of a Word Cloud Visualization.

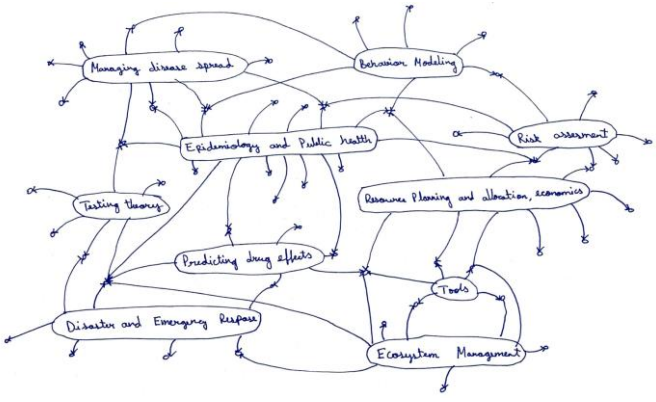

Fig. 2. Manual Sketch of a Network Map Visualization

3 Statistics of the Datasets

The contributors' identities and areas of work in population modeling are included in the dataset. (i.e., column names: Epidemiology and public health, managing disease spread, Resource planning & allocation, economics, predicting drug effects, Risk assessment, Ecosystem management, Disaster and Emergency Response, Testing theory, Behavior modeling, Tools). By reorganizing and combining the data in a dataset into three columns, we were able to construct a second dataset from the previous one for the visualizations (i.e., area of work, Authors, and links). We prepared two datasets for network analysis: one for nodes and one for edges. The nodes dataset consists of Label, ID, and Nodes. The Edges dataset consists of columns such as Source, Target, Type, and Weight. These Nodes and Edges datasets were created using the Python programming [6].

4 Visualizations

Visualizations are used to help people interpret data more effectively. It explains data by identifying trends and patterns in large datasets. Stakeholders may be interested in determining the trends. These prototypes would assist stakeholders in tracking the Hidden insights out of large datasets. We created a Bubble chart, Word cloud, TreeMap, Stacked Bar Chart, and a network map is used to visualize the data.

4.1 Prototype One

We created a bubble chart using Tableau, to visualize the various areas of population modeling research. The various colors above indicate the various types of population modeling approaches. The size of the circle denotes the number of people who worked in that specific area of work.

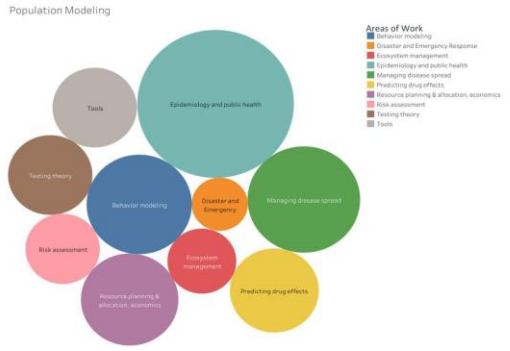

Fig. 3. Bubble Chart.

4.2 Prototype Two

We created a word cloud using Tableau to visualize the data and determine the number of contributions for that specific field of population modeling study. The color shift indicates the number of people who worked in that field. As the number of contributors increase, the text color and Size intensifies.

Fig. 4. Word Cloud.

4.3 Prototype Three

With the help of Tableau, we created a treemap. The treemap depicts the numerous authors and their individual areas of study, as well as the link of their studies and a summary of the method. Different hues reflect different fields of study. We've added a tooltip that shows the author's name, the field of study, the study link, and a summary of the method.

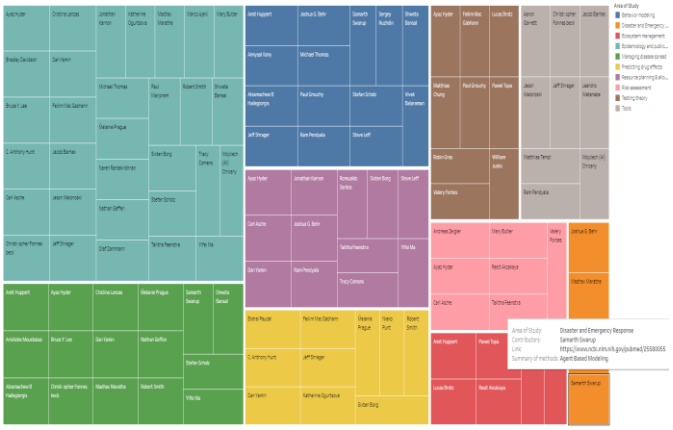

Fig. 5. TreeMap.

4.4 Prototype four

Using Tableau, we created a stacked bar chart to show various authors and their fields of work. Various study regions are represented by different colored bars. The number of distinct studies by a specific author is represented on the X-axis, while the Contributor names are represented on the Y-axis.

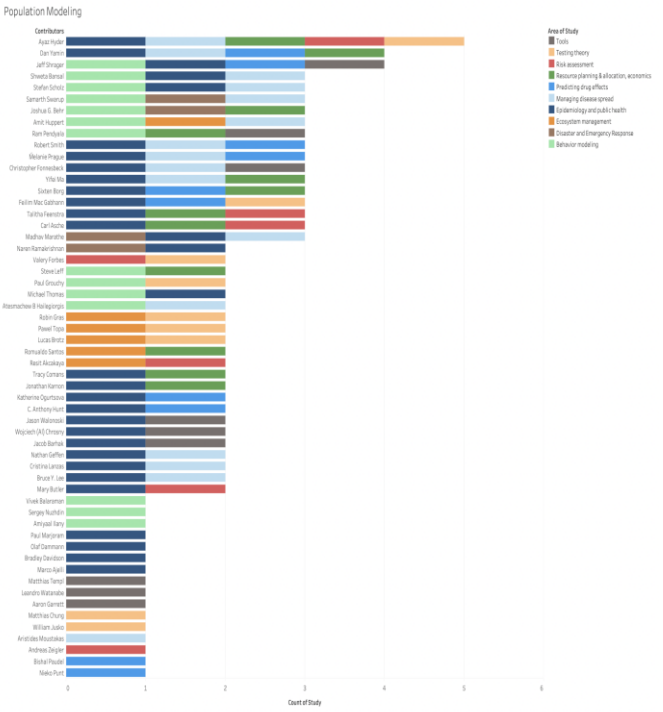

Fig. 6. Stacked Bar Chart.

4.5 Prototype Five

We designed a curved network visualization in Gephi to illustrate different authors and their fields of work, as well as their networks. Authors are represented by a grey node, and different methodologies are represented by various colors. Nodes that represent methodologies are connected to the researchers via edges, and these edges are colored according to their respective mythologies.

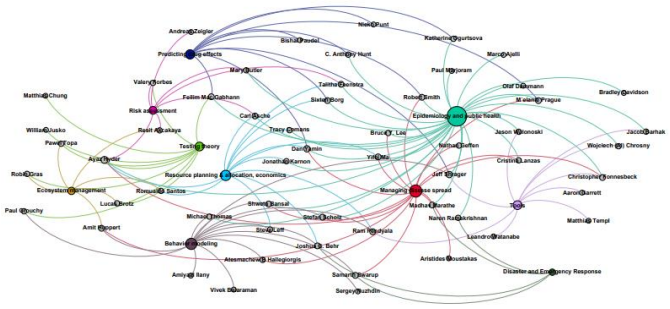

Fig. 5. Network map.

5 Insights

In Figure 3, we can see that population modeling encompasses a wide range of studies, including epidemiology and public health, disease management, resource planning and allocation, economics, drug effects prediction, risk assessment, ecosystem management, disaster and emergency response, testing theory, behavior modeling, and tools. Figure 4 - visualizations reflect the number of people who contributed to that particular study. Epidemiology and public health have the most contributors overall followed by Managing disease spread and behavior modeling. The 'Disaster and Emergency Response' study, on the other hand, contains fewer participants when compared to other studies. Around 55% of people have contributed to epidemiology and public health study. From tree map we can examine all of the study's information, such as who contributed by looking at the author's name. We've noticed that a number of authors have repeated themselves across multiple research, For Example Ayaz Hyder who has worked in Various studies (i.e., Epidemiology and public health, managing disease spread, resource planning and allocation, economics, risk assessment, testing theory). From the stacked bar chart, we can say that Ayaz Hyder encompasses a wide range of studies (i.e., Epidemiology and public health, managing disease spread, resource planning and allocation, economics, risk assessment, testing theory). We can see that few authors completely work in the same fields of study. (For Example Nathan Geffen, Bruce Y.Lee, Cristina Lanzas). So previously in tree map we have seen a clear overview of a particular study and who have contributed to that study and in stacked bar chart we have seen a clear overview of authors and there contributions. We can observe the network between the writers based on their field of study using network visualization.

6 Conclusion

Upon analysing and visualizing the datasets, these were the key insights that we gained.

Acknowledgments

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