DESTINATIONS

The Journal of the Society for One-Place Studies

June 2024

Some of the articles in this issue:

Where family history and local history unite

Using GEPHI to Create a Surname Connection Graph

by Wesley Johnston

A One-Place Study's most fundamental element of its people is a marriage that connects two families. It is the building block for the structure of the community. Visualizing the complex connections between families gives insight into that structure.

This article shows how to create a graph, like Figure 1, of the surnames from the community's marriages so that we can see how the different families connect to each other. Here is an example of what that might look like, from my Chicago Grand Crossing Czech Community One-Place Study.

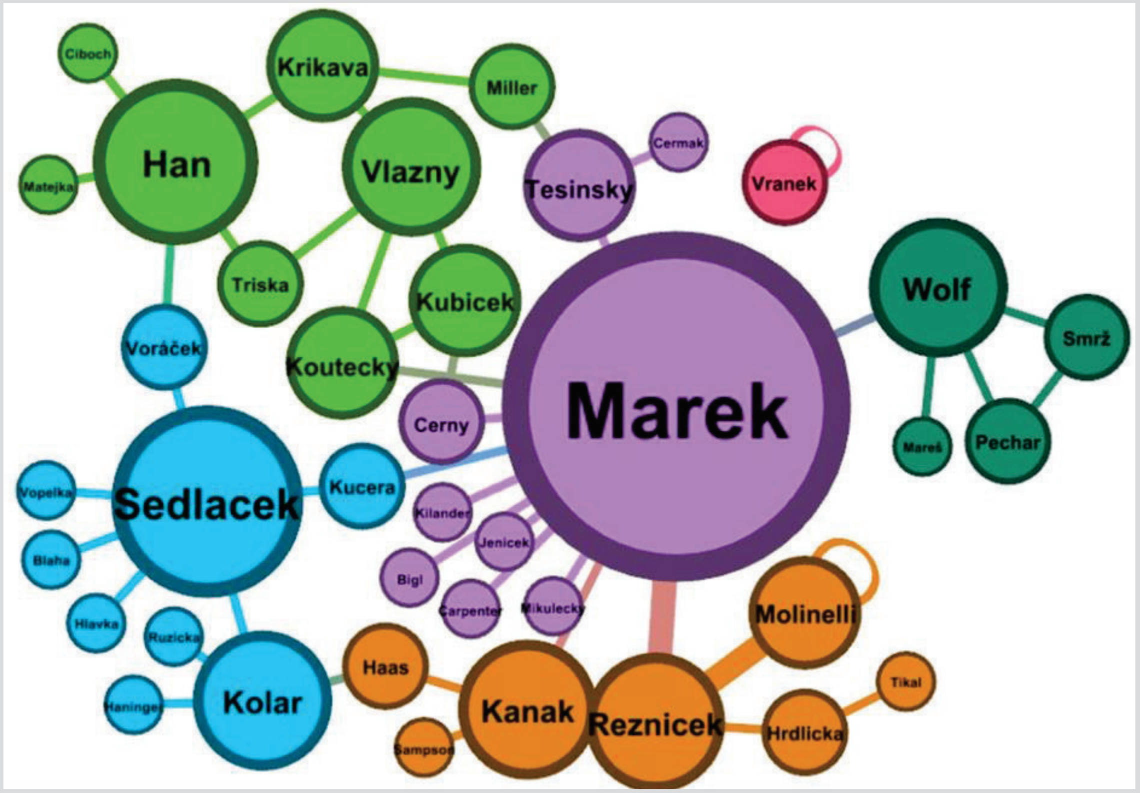


Figure 1

Since these are all long-deceased people, I will use their actual names to show the steps by which I generate a surname connection graph.

GEPHI Download and Install

You can freely download GEPHI from the gephi.org website. Installation is simple.

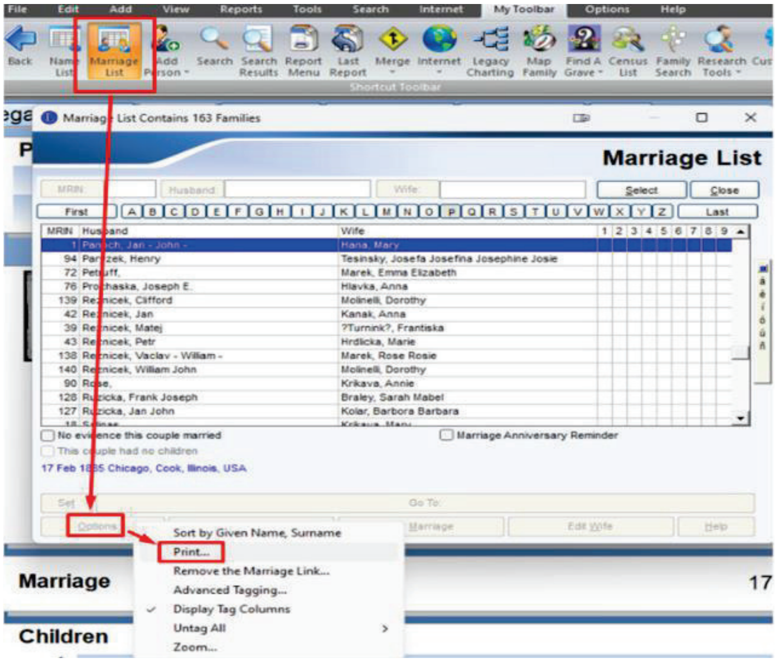
The Input File

The input file is simply a list of the pairs of surnames for every marriage. However, this takes a good deal of data preparation to give the best result. The data preparation has these steps:

1) I download the master marriage list from my database on Legacy Family Tree into an Excel spreadsheet.
2) I first use Excel formulas to create columns of only the surnames of the husband and wife.
3) I then “clean up” the data by removing the marriages for which one or both surnames are not known.
4) I also standardize the spelling of the surnames so that the same families show in the same node of the graph and also so that I eliminate any diacritical marks of the Czech surnames.
5) I then duplicate the list with the names of the husband and wife switched so that both lists have all the surnames.
6) I then save the file with the first worksheet being my input to GEPHI.

The Input File - Step 1a & Step 1b: Download Master Marriage List

Presumably, other genealogical database software programs allow viewing and downloading a list of all the marriages in the database. I used Legacy Family Tree to do it. (If you don’t have Legacy and want to use it for this, you can download it free at legacyfamilytree.com/DownloadLegacy.asp and import your GEDCOM into it.) {1a} Click on “Marriage List”. Then click “Options” and “Print …”. {1b} In the new window that pops up, click the check circle for “CSV file” and then “Create” to save the marriage list to a CSV file with whatever name you want in whatever folder you want.



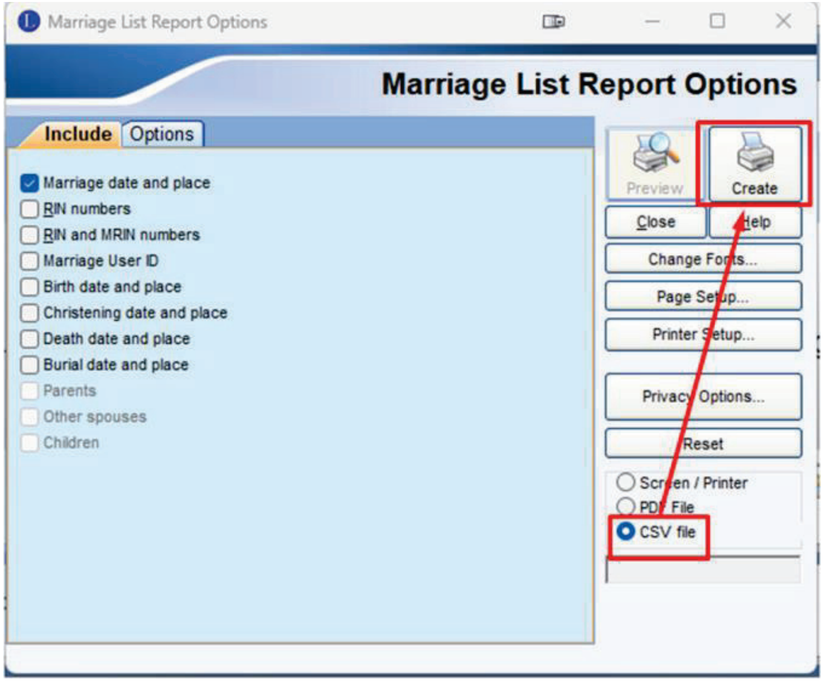
Marriag List Contains 163 Families

MRIN	Husband	Wife	1	2	3	4	5	6	7	8	9
1	Pan ch, Jan - John -	Hana, Mary									
94	Par zek, Henry	Tesinsky, Josefa Josefina Josephine Josie									
72	Pet uff,	Marek, Emma Elizabeth									
76	Pro haska, Joseph E.	Hlavka, Anna									
139	Re nicek, Clifford	Molinelli, Dorothy									
42	Re nicek, Jan	Kanak, Anna									
39	Re nicek, Matej	?Turnink?, Frantiska									
43	Re nicek, Petr	Hrdlicka, Marie									
138	Re nicek, Vaclav - William -	Marek, Rose Rosie									
140	Re nicek, William John	Molinelli, Dorothy									
90	Ro se,	Krikava, Annie									
128	Ru zicka, Frank Joseph	Braley, Sarah Mabel									
127	Ru zicka, Jan John	Kolar, Barbora Barbara									
18	Salinas	Krikava, Mary									

□ No evi ence this couple married
□ This c uple had no children
□ Marriage Anniversary Reminder

17 Feb 18 5 Chicago, Cook, Illinois, USA

Figure 2 - Step 1a: Master Marriage List



Marriage List Report Options

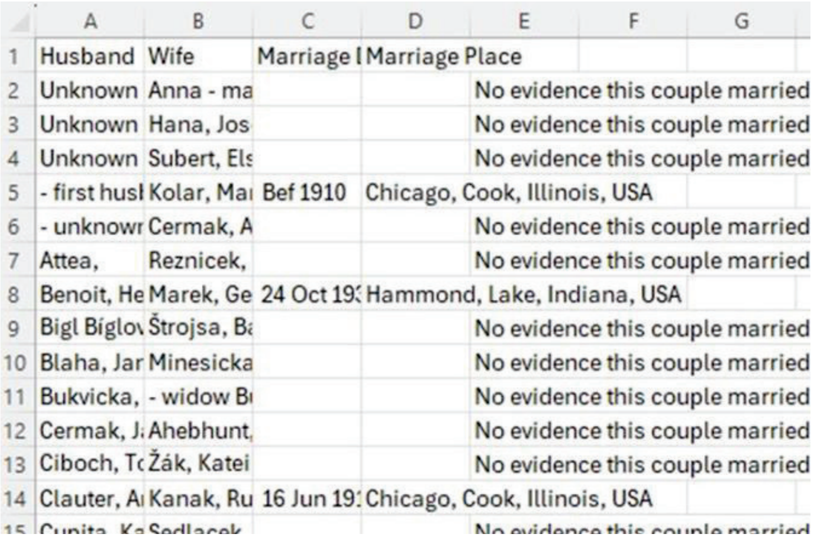
☑ Marriage date and place
□ RIN numbers
□ RIN and MRIN numbers
□ Marriage User ID
□ Birth date and place
□ Christening date and place
□ Death date and place
□ Burial date and place
□ Parents
□ Other spouses
□ Children

○ Screen / Printer
○ PDF File
● CSV file

Figure 3 - Step 1b: Master Marriage List

The Input File - Step 2: Create columns with just the surnames

Open the downloaded file in Excel. It will look like this ➔:



	A	B	C	D	E	F	G
1	Husband	Wife	Marriage I	Marriage Place			
2	Unknown	Anna - ma			No evidence this couple married		
3	Unknown	Hana, Jos			No evidence this couple married		
4	Unknown	Subert, Els			No evidence this couple married		
5	- first husl	Kolar, Mai	Bef 1910	Chicago, Cook, Illinois, USA			
6	- unknowr	Cermak, A			No evidence this couple married		
7	Attea,	Reznicek,			No evidence this couple married		
8	Benoit, He	Marek, Ge	24 Oct 19:	Hammond, Lake, Indiana, USA			
9	Bigl Bíglov	Štrojsa, Ba			No evidence this couple married		
10	Blaha, Jar	Minesicka			No evidence this couple married		
11	Bukvicka,	- widow Bu			No evidence this couple married		
12	Cermak, J:	Ahebhunt,			No evidence this couple married		
13	Ciboch, Tc	Žák, Katei			No evidence this couple married		
14	Clauter, Ai	Kanak, Ru	16 Jun 19:	Chicago, Cook, Illinois, USA			
15	Cupita, Ka	Sedlacek			No evidence this couple married		

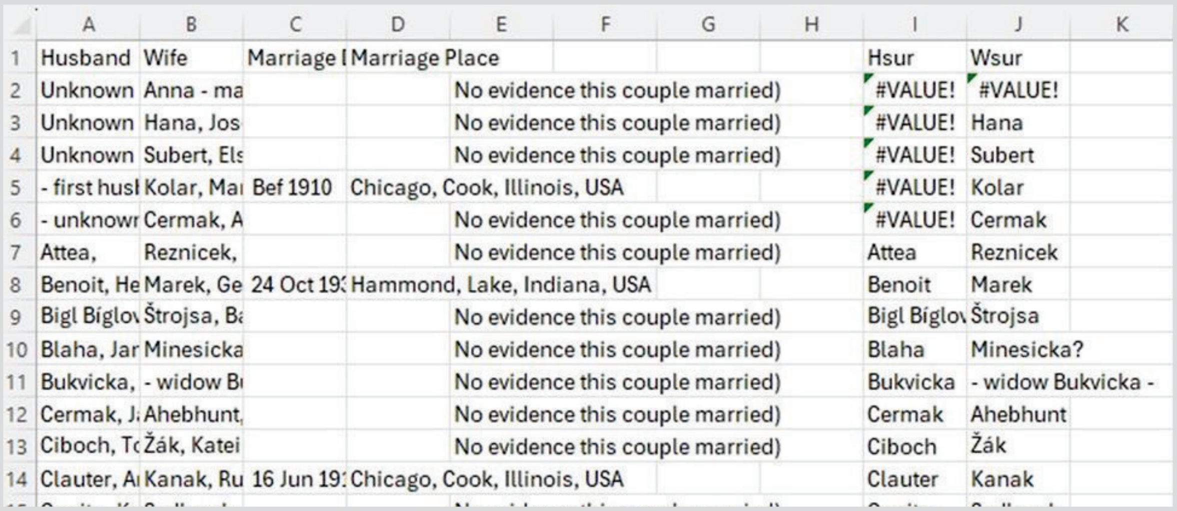
Figure 4 - Step 2: Create columns with just the surnames

In two adjacent blank columns to the right (I title them "Hsur" and "Wsur" for Husband and Wife surnames), in the second row, enter this formula for the Hsur column:

=LEFT(A2,FIND(",",A2)-1) which finds the location from the left of the first comma in the husband's name field and then sets the surname to the text to the left of the comma. Then enter this formula for the Wsur column:

=LEFT(B2,FIND(",",B2)-1) which finds the location from the left of the first comma in the wife's name field and then sets the surname to the text to the left of the comma.

Then copy those formulas all the way down for every row. And what you see for the results looks like this:



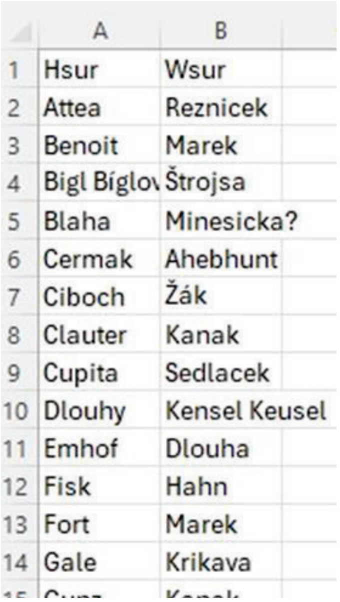
	A	B	C	D	E	F	G	H	I	J	K
1	Husband	Wife	Marriage I	Marriage Place					Hsur	Wsur	
2	Unknown	Anna - ma			No evidence this couple married)				#VALUE!	#VALUE!	
3	Unknown	Hana, Jos			No evidence this couple married)				#VALUE!	Hana	
4	Unknown	Subert, Els			No evidence this couple married)				#VALUE!	Subert	
5	- first husl	Kolar, Mai	Bef 1910	Chicago, Cook, Illinois, USA					#VALUE!	Kolar	
6	- unknowr	Cermak, A			No evidence this couple married)				#VALUE!	Cermak	
7	Attea,	Reznicek,			No evidence this couple married)				Attea	Reznicek	
8	Benoit, He	Marek, Ge	24 Oct 19:	Hammond, Lake, Indiana, USA					Benoit	Marek	
9	Bigl Bíglov	Štrojsa, Ba			No evidence this couple married)				Bigl Bíglov	Štrojsa	
10	Blaha, Jar	Minesicka			No evidence this couple married)				Blaha	Minesicka?	
11	Bukvicka,	- widow Bu			No evidence this couple married)				Bukvicka	- widow Bukvicka -	
12	Cermak, J:	Ahebhunt,			No evidence this couple married)				Cermak	Ahebhunt	
13	Ciboch, Tc	Žák, Katei			No evidence this couple married)				Ciboch	Žák	
14	Clauter, Ai	Kanak, Ru	16 Jun 19:	Chicago, Cook, Illinois, USA					Clauter	Kanak	

Figure 5

The Input File - Step 3: Remove marriages for which one or both surnames are unknown.

Copy the worksheet to a new worksheet to the left of the original worksheet. Then, in the new worksheet, copy the two calculated columns and paste them back on top of themselves using "Paste Special" and checking the circle for "Values". This locks in the surnames so that they are not dependent on the formulas. This allows you to then delete all the columns to the left of the two surname columns.

Now go row by row through this worksheet and delete any row where one or both the husband and wife do not have a surname. For example, I would delete all rows that have "#VALUE!". (If you have a lot of marriages, you can sort by the surnames to group the changes to make them easier to deal with.) Now your worksheet will look like Figure 6.



	A	B
1	Hsur	Wsur
2	Attea	Reznicek
3	Benoit	Marek
4	Bigl Bíglov	Štrojsa
5	Blaha	Minesicka?
6	Cermak	Ahebhunt
7	Ciboch	Žák
8	Clauter	Kanak
9	Cupita	Sedlacek
10	Dlouhy	Kensel Keusel
11	Emhof	Dlouha
12	Fisk	Hahn
13	Fort	Marek
14	Gale	Krikava

Figure 6
The Input File - Step 3

The Input File - Step 4: Standardize the surnames, including removing diacritical marks.

The spelling determines the nodes in the graph. In order for the same family to be considered the correct number of times, their surname has to be the same spelling in every marriage. Some examples: (a) standardize Hahn, Hana and Hann to just one of these spellings (b) Dlouhy and female Dlouha standardize to Dlouhy (a Slavic language convention).

I also remove the diacritical marks and any other punctuation as part of this process. The result is the final list of all the standardized surnames for every marriage that has surnames for both the husband and wife.

The Input File - Step 5: Duplicate the list with the names of the husband and wife switched so that both lists have all the surnames.

The columns we have been calling husband and wife will not be separately included as surname nodes. So, if there are three marriages with wives named Tesinsky, GEPHI will not include the surname Tesinsky if there is no husband with that name. And even if there is a male with the surname, GEPHI will not count the instances of wives in determining how many marriages have the surname Tesinsky as either husband or wife. To remedy this, we copy all the husband surnames and paste them at the end of the wives' surnames list and vice versa.

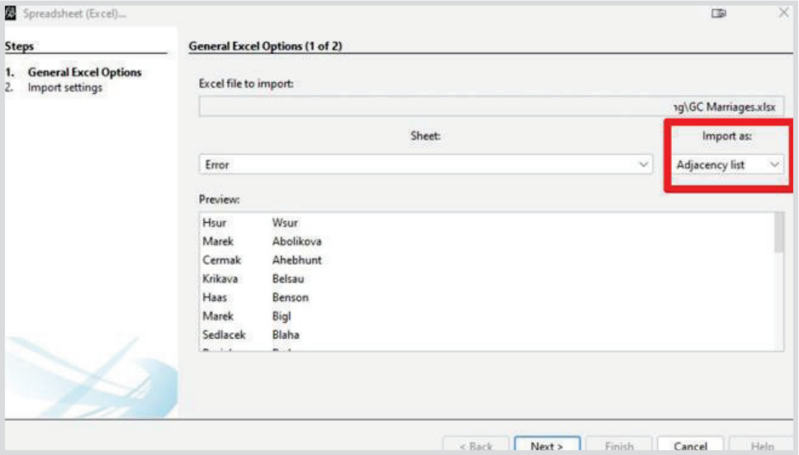
The Input File - Step 6: Save the file with the first worksheet the one with just the doubled list of surnames.

Save the file as an Excel file and not a CSV file. In step 3 above, we copied the surname-only worksheet to be the first (left-most) worksheet in the spreadsheet. Make sure that is where it is when doing the save since GEPHI will look at the first worksheet for the data. You are now ready to begin working with GEPHI.

GEPHI Input

Start GEPHI and select "New Project". Then click on "File" and "Open" and select the spreadsheet file you created with the GEPHI input of the Generations Matrix. (Note that GEPHI detects that the spreadsheet is an adjacency list and sets the "Import as:" option to "Adjacency list".)

Click "Next". Then on the next popup window, click "Finish". This will open the "Import report" popup window. In this window, change the "Graph Type" to "Undirected" and the "Edges merge strategy" to "Sum". Then click "OK".



Excel file to import: ıg\GC Marriages.xlsx

Sheet: Error

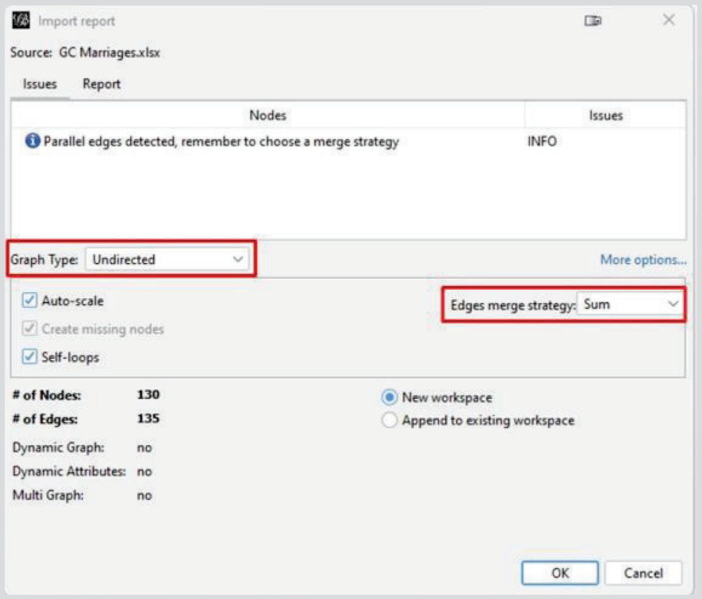
Import as: Adjacency list

Preview:

Hsur	Wsur
Marek	Abolikova
Cermak	Ahebhunt
Krikava	Belsau
Haas	Benson
Marek	Bigl
Sedlacek	Blaha

Figire 7 - Importing to GEPHI

The graph is undirected because we are simply wanting to show which surnames



Import report

Source: GC Marriages.xlsx

Nodes	Issues
Parallel edges detected, remember to choose a merge strategy	INFO

Graph Type: Undirected

Edges merge strategy: Sum

☑ Auto-scale
☑ Create missing nodes
☑ Self-loops

● New workspace
○ Append to existing workspace

# of Nodes:	130
# of Edges:	135
Dynamic Graph:	no
Dynamic Attributes:	no
Multi Graph:	no

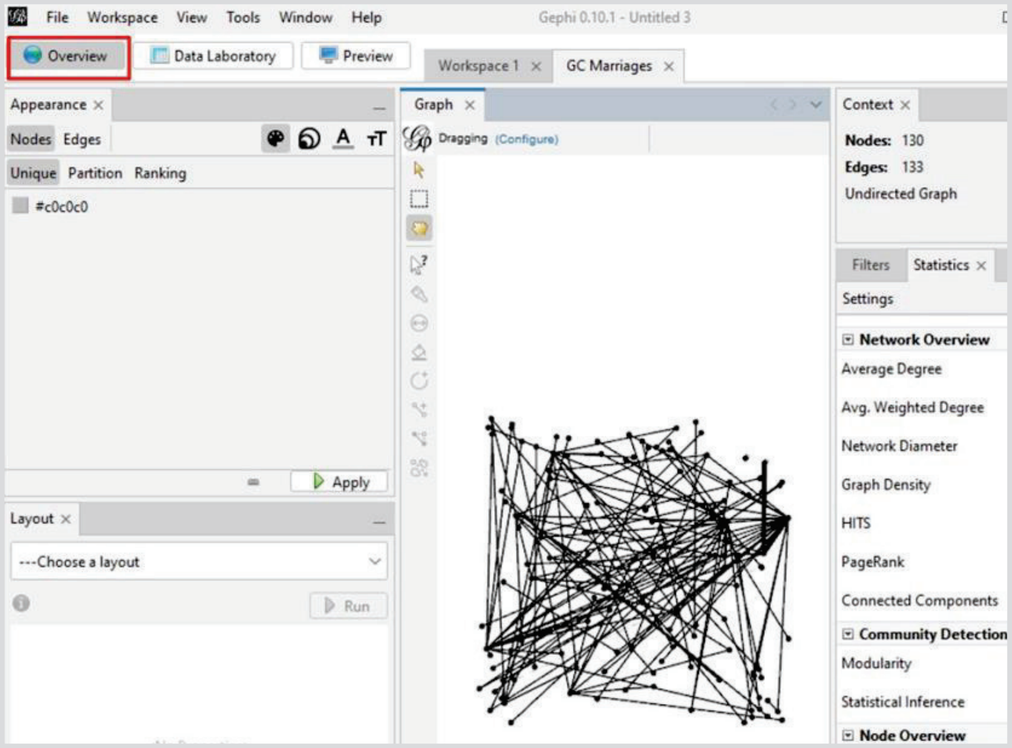
Figure 8 - Completing the Import to GEPHI

connect with each other. The "Sum" will result in thicker lines connecting two different surnames if they have more connections.

This completes the import and opens your GEPHI dashboard. If it does not show the graph, click on the "Overview" tab at top left to see it.

Working with the Graph

The graph includes many surnames that appear only once in the marriages. We need to reduce the dimensionality to include only surnames that are in at least two marriages so that the



Nodes: 130
Edges: 133
Undirected Graph

Figure 9 - The Graph

graph is less cluttered. And we need to label the nodes so that you know what you are seeing and also change the size of the nodes so that the surnames that appear most in the marriages are the largest nodes. Then we can also color the nodes based on how they cluster together.

Reduce the Dimensionality

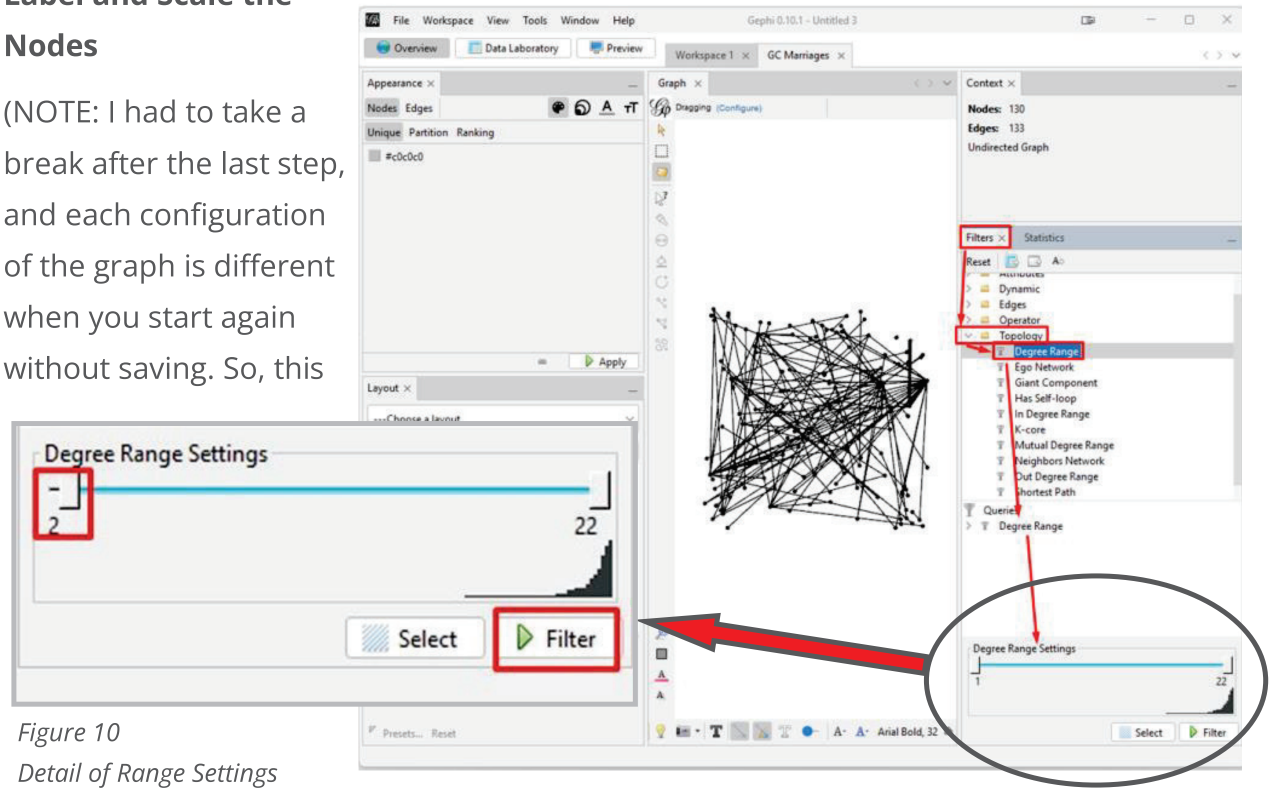
Each node is a unique surname. The “degree” of each node is how many marriages that surname is in. In my data, 54 of the surnames only appear once. So, to reduce clutter in the graph, I want to focus only on the surnames that appear in at least two marriages. On the right side, click on “Filters”. Then double-click on “Topology” to see the options where you can double click on “Degree Range”. This will put Degree Range in the Queries box and show the degree range in a compressed chart at the bottom.

Then, slide the left end of the range to 2, and click the “Filter” button.

And the filter reduces the clutter in the graph.

Label and Scale the Nodes

(NOTE: I had to take a break after the last step, and each configuration of the graph is different when you start again without saving. So, this



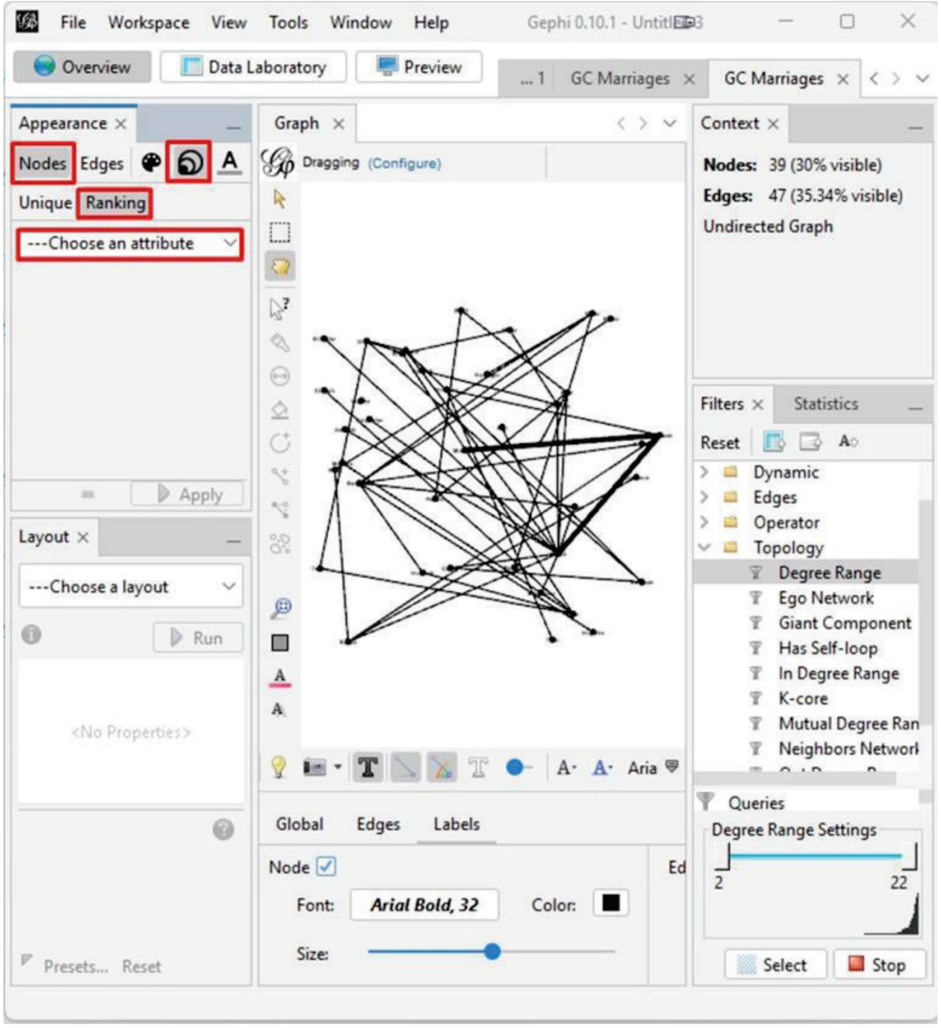
Nodes: 130
Edges: 133
Undirected Graph

Figure 10
Detail of Range Settings

graph looks a bit different from the one in the prior step but is still the same graph.)

Start by clicking on the small up arrow at the bottom right of the center pane. This will reveal the controls at the bottom. Click the "Labels" tab name. Then check the "Nodes" box. Then set the "Size" to "Node Size". You won't see that take effect yet since we have not altered the node sizes.

So, now we go to set the node sizes. At the upper left, click on Nodes and then on the node size icon (expanding circle sizes) then on Ranking. Then in the "Choose attribute" box, choose "Degree".



Nodes: 39 (30% visible)
Edges: 47 (35.34% visible)
Undirected Graph

Node ☑
Font: Arial Bold, 32
Color: ■
Size:

Figure 11

Here you need to play around a bit with the "Min size" and "Max size" values to see just what works best for you. Click "Apply" to see the impact of the values on the graph. This how my graph would look now.

These steps and the next steps in configuring the graph are all steps where you may want to come back and change parameters as you see how things are shaping up. You might even want to go back to the filter and increase the bottom limit to reduce the number of surnames. It is all about becoming satisfied with the graph to your needs.

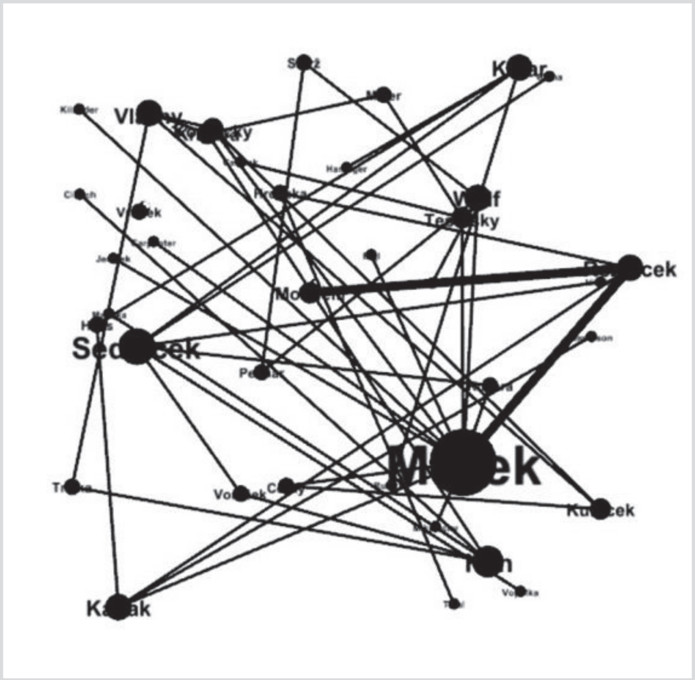


Figure 12 - The result of the adjustments so far

Create and Color Clusters

There may be statistically separable clusters within the surnames. It is very helpful to let the software discover those and then color the nodes and edges accordingly. On the right panel, click the "Statistics" tab, and then click "Run" for "Modularity". This will pop up a window where you just click "OK". And then another window will pop up with a grid, and you can just close that.

Now we apply the modularity clustering to the coloring of the nodes and edges. At the left, click on the palette icon for "Nodes" and then the "Partition" tab. Then select "Modularity Class" as the attribute on which to partition the nodes. Simply click "Apply" to

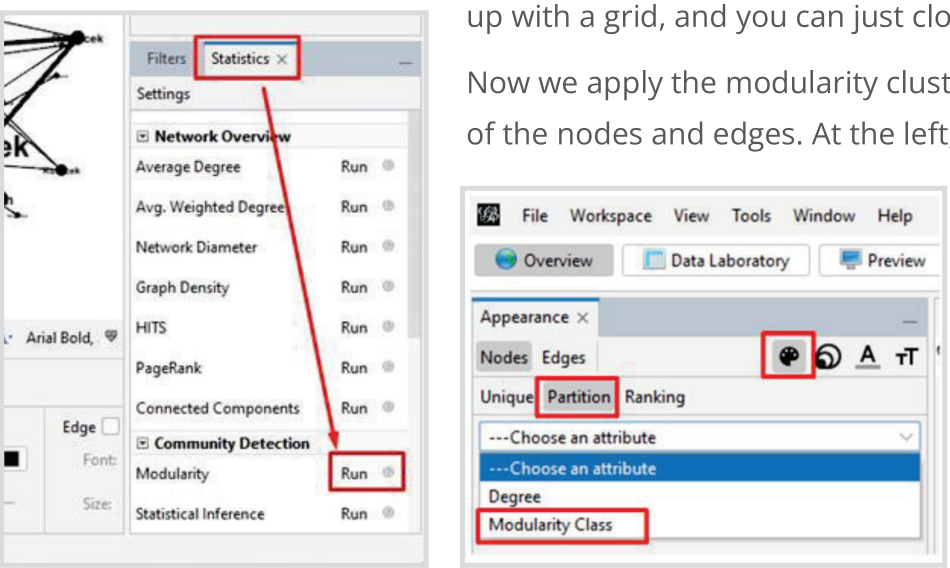


Figure 13 - Modularity Control and Node Coloring Screens

apply the colors.

Spread the Graph

The graph can be made more compact and also more attuned to the clusters. You can try out different layouts in the "Layout" control section on the left. For example, to try the "Fruchterman Reingold" layout, choose it from the list of layouts, and then click "Run". You then click "Stop" after it has converged to a stable configuration. Beware: there is no "Undo". You may want to do saves before you try layouts so that if you want to go back to one that you liked better then you can do that.

Figure 14 shows how the "Fruchterman Reingold" layout looks on the graph. I can already see that I want the "Min size" (which we set above) made larger so that all the surnames are legible. That may lead me to also increase the "Max size".

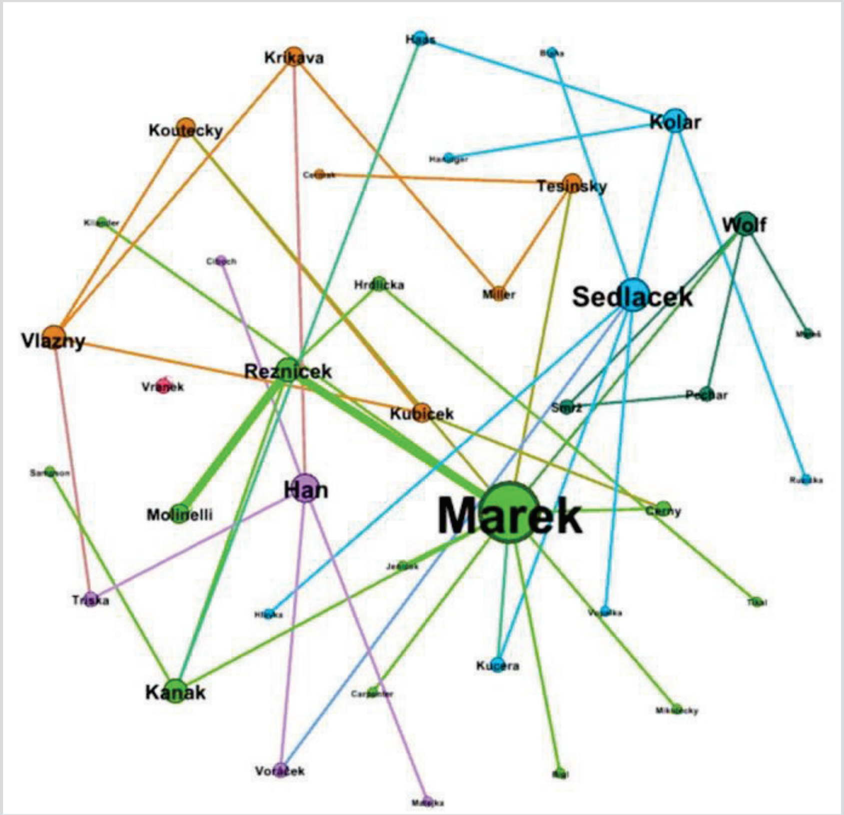


Figure 14 - Fruchterman Reingold layout

Additional Controls

It is useful to know about some additional controls (shown in Figure 15). These are all on the left side of the center pane, two at the top and one near the bottom.

- The yellow arrow allows you to click on a node and see all the nodes to which it connects.
- The yellow hand allows you to click on a

node and drag it to a different place on the graph.

- The magnifying glass with a square in it allows you to recenter the graph and zoom it to fit within the pane.

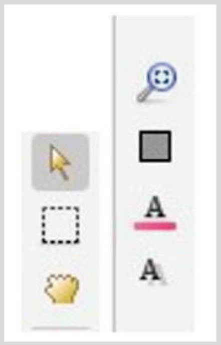


Figure 15
More controls

The Final Graph

After tweaking parameters and moving nodes around, Figure 16 is the final graph. It very nicely shows how the different clusters connect and which surnames connected the most. I see that I did not remove all the diacritical marks. But those names that had them were consistently spelled so that it is okay to include them. I also see that a Kolar widow with the maiden name Sedlacek who married a Hlavka is showing only with her maiden name on the marriage Sedlacek-Hlavka. That is the standard that I use.

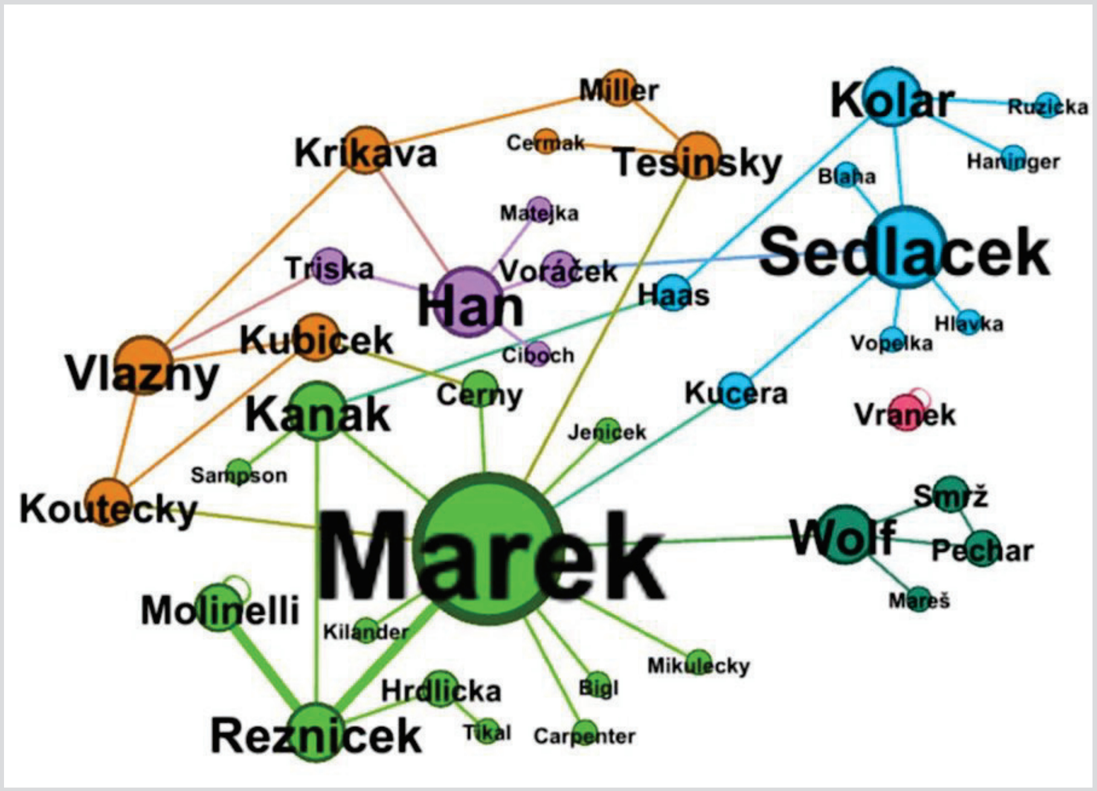


Figure 16