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“Design is a solution to a problem. Art is a question to a problem.” – John Maeda

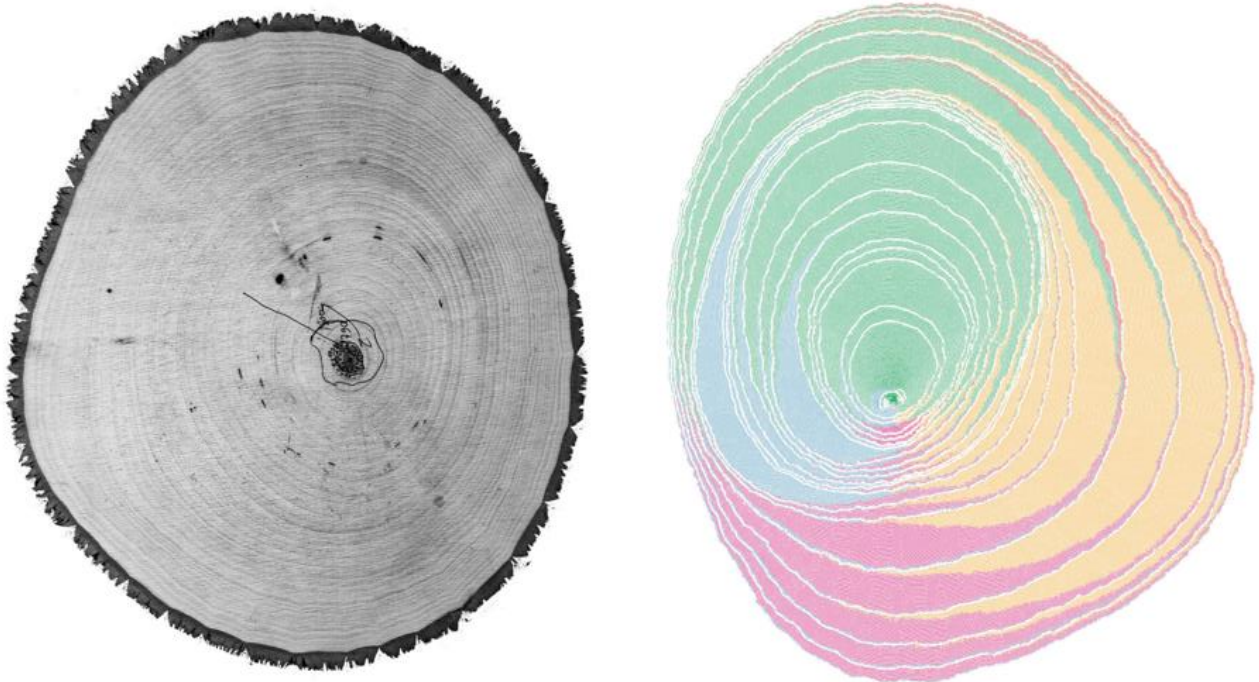
SIMULATED DENDROCHRONOLOGY OF IMMIGRANTS AND NATURAL BORN IN UNITED STATES (1790-2016)

Pedro M. Cruz, Northeastern University.

John Wihbey, Northeastern University.

Avni Ghael, Northeastern University.

Felipe Shibuya, Independent.



“Process of simulating tree rings for immigration in the U.S.”

[Video link: <https://web.northeastern.edu/naturalizing-immigration-dataviz/>]

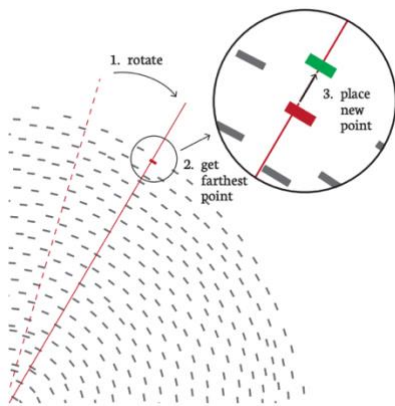
This visualization showcases the growth of populations in the United States, especially the increase in rate of immigration compared to the number of national newborns.

This visualization was created by the visual analysts primarily based at Northeastern University.

Pedra Cruz is an assistant professor at Northwestern University whose work focuses on information visualization techniques that connect design with technology. He wanted to

“celebrate immigration” where he wanted to model his visualization “after a living organism, something that’s alive and still growing.” (Callahan, 2020). John Wihbey is an associate professor of media innovation and technology at Northeastern focusing on emerging media technologies. Avni Ghael was a graduate student working mainly as a data analyst and visual engineer on the project. Lastly, Phillipe Shibuya is an ecologist and artist, masterfully calling himself a “scientist-artist” where he explores the visual aspects of his research beyond the purely scientific perspective.

The dataset consists of millions of samples of questionnaires from the U.S. Census. The data is cleaned, fed, and queried in their algorithm where the overarching idea is to simulate how a tree grows. Sets of dots are placed spatially, where each data point shows n number of people. The dots can push against each other to create more space since no two dots can overlap. They utilize a ray which is rotated from the center to certain angle, and a new dot is placed just beyond the farthest dot it intersects with another dot.

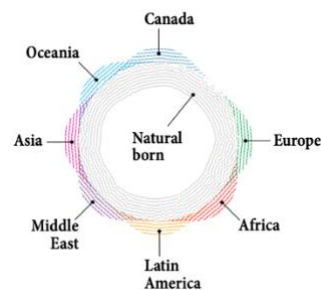


“Process of simulating tree rings for immigration in the U.S.”

The angles of the ray are decided randomly based on a probability model. Each ring showcases the people during a single decade and Gaussian distributions are used to position the dots a few layers below the outer layers of the ring, mimicking the actual growth of the tree and causing the visualization to expand organically.

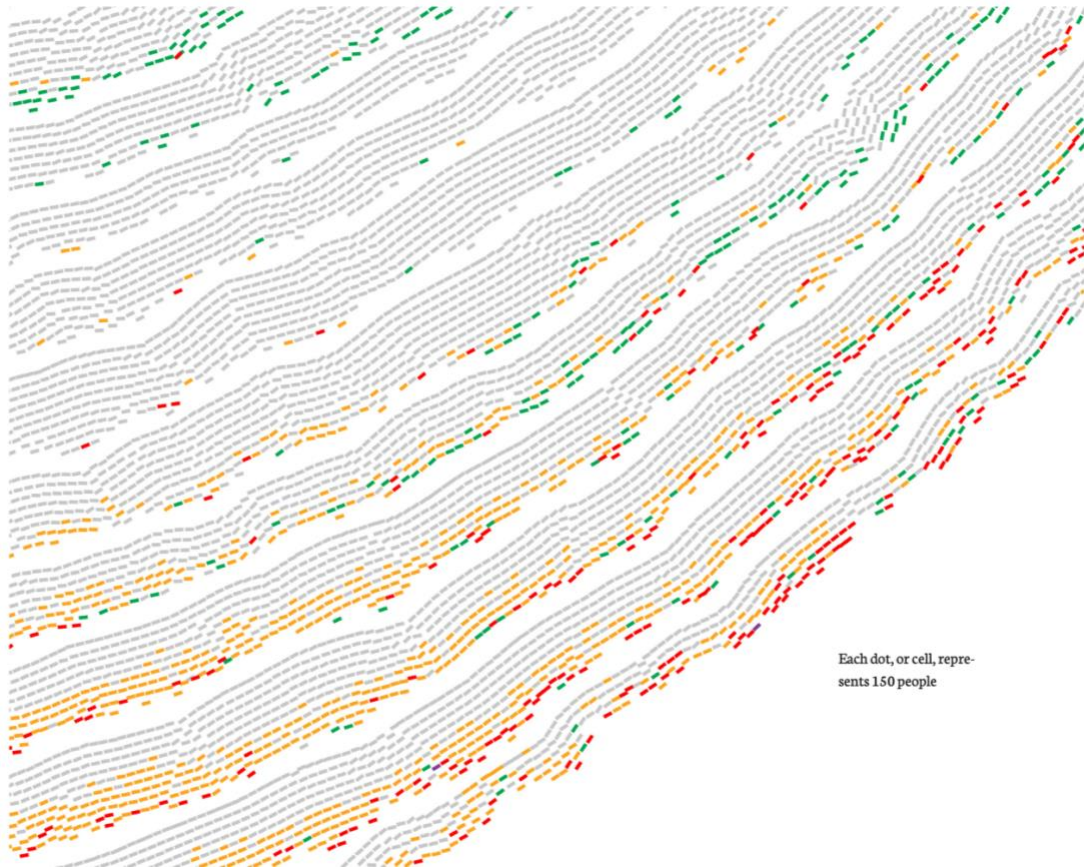
The next aspect of the visualization was showcasing the immigrants. Since U.S. immigrants come from several geographical directions, it was shown in the visualization by “growing” the tree more in that direction.

For example, rings skewed towards the West show that there are more people immigrating from the Asian countries and similarly, rings skewed to the east signify a higher number of European immigrants. The natural US citizens are shown in a grey color while each geographical immigrant group are assigned a distinct color. For each ring, first natural born are placed uniformly, and then the immigration groups are placed, dot by dot.



“Process of simulating tree rings for immigration in the U.S.”

Here is a close-up image of the rings, where the dots are categorized in unique colors and each dot represents 150 people and each ring represents a decade.



“Process of simulating tree rings for immigration in the U.S.”

One of the first, and extremely fascinating things we learn in our middle school science class is how tree rings examined at the cross section can tell us the age of the tree and what the weather was like during each year of the tree's life. We can make judgements about the past hundreds, even thousands, of years just by looking at the cross section, we just merely need to know how to read it. This visualization as described by the researchers, “(is a) representation of history itself, as it shows a sequence of events that have left a mark and shaped the present” (Cruz et al., n.d.).

The immigrants and natural born in the United States have left immutable marks on the history of the country and have contributed to the growth.

Personally, I found this visualization particularly compelling. My first thought was “Wow, its beautiful *and* it makes perfect sense.” And, my second thought was, “Wait a minute, how does the data even conform to this so well.” I find visualizations which show a bird’s eye view very intriguing. I like looking at the big picture with millions of data points and then slowly moving deeper, magnifying, until I can see the individual data points to understand what the analyst is trying to tell me. The visualization uses a metaphor to showcase the specific information very creatively in an organized manner. It does an excellent job of exhibiting high level information about the data in a clear fashion. The tree ring metaphor lends a certain amount of artistic aesthetic to the piece which leads to you gravitating towards the piece, although it never takes away from the true underlying meaning of the visualization. The overarching question of “How do

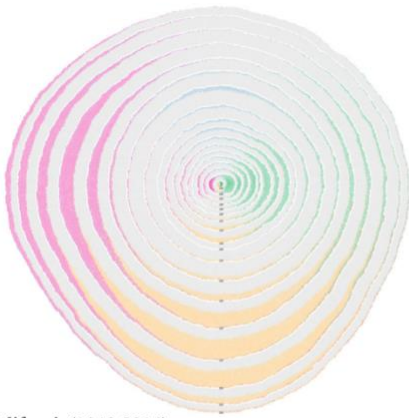
immigrants influence the United States?” is answered using the rationale built utilizing the tree ring metaphor’s own network of concepts.

In “Process of simulating tree rings for immigration in the U.S.”, the analysts express that,

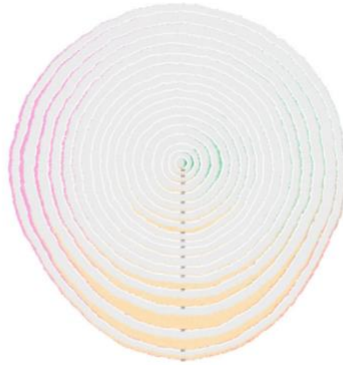
a ring skewed in a certain direction tells where immigration came from; a thicker ring indicates that the growth was higher that decade; counting the number of rings is counting the number of decades; the outer rings correspond to more recent portrayals, while the inner rings correspond to older portrayals; the bigger the tree’s cross section, the greater the number of people who passed through that state. Finally, all people are part of the tree, and all cells contributed to population growth and have left their mark in the tree’s history. (1)

In conclusion the visualization very intelligently portrays the population growth and impact of immigrants on the country over the decades using the rings in a tree as a poetic metaphor. The marks of the past cannot be erased but rather they act as a way of shaping our future.

Here are some of the additional visualizations they created for the individual states in the U.S. showcasing the data as follows:



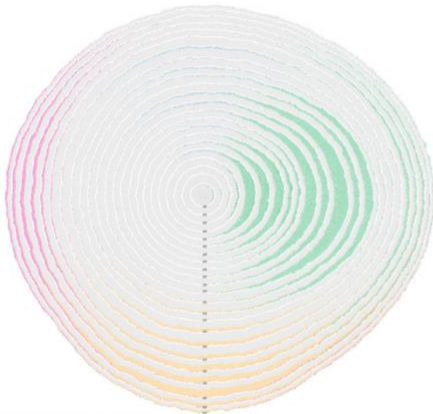
California (1840-2016)



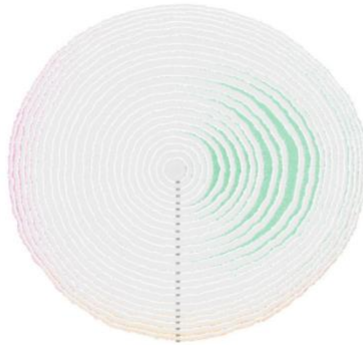
Texas (1840-2016)



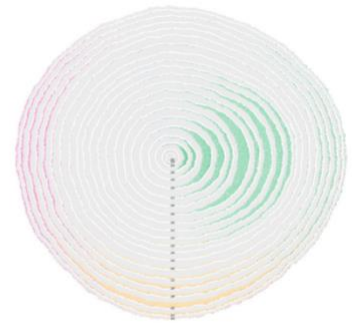
Florida (1820-2016)



New York (1790-2016)



Pennsylvania (1790-2016)

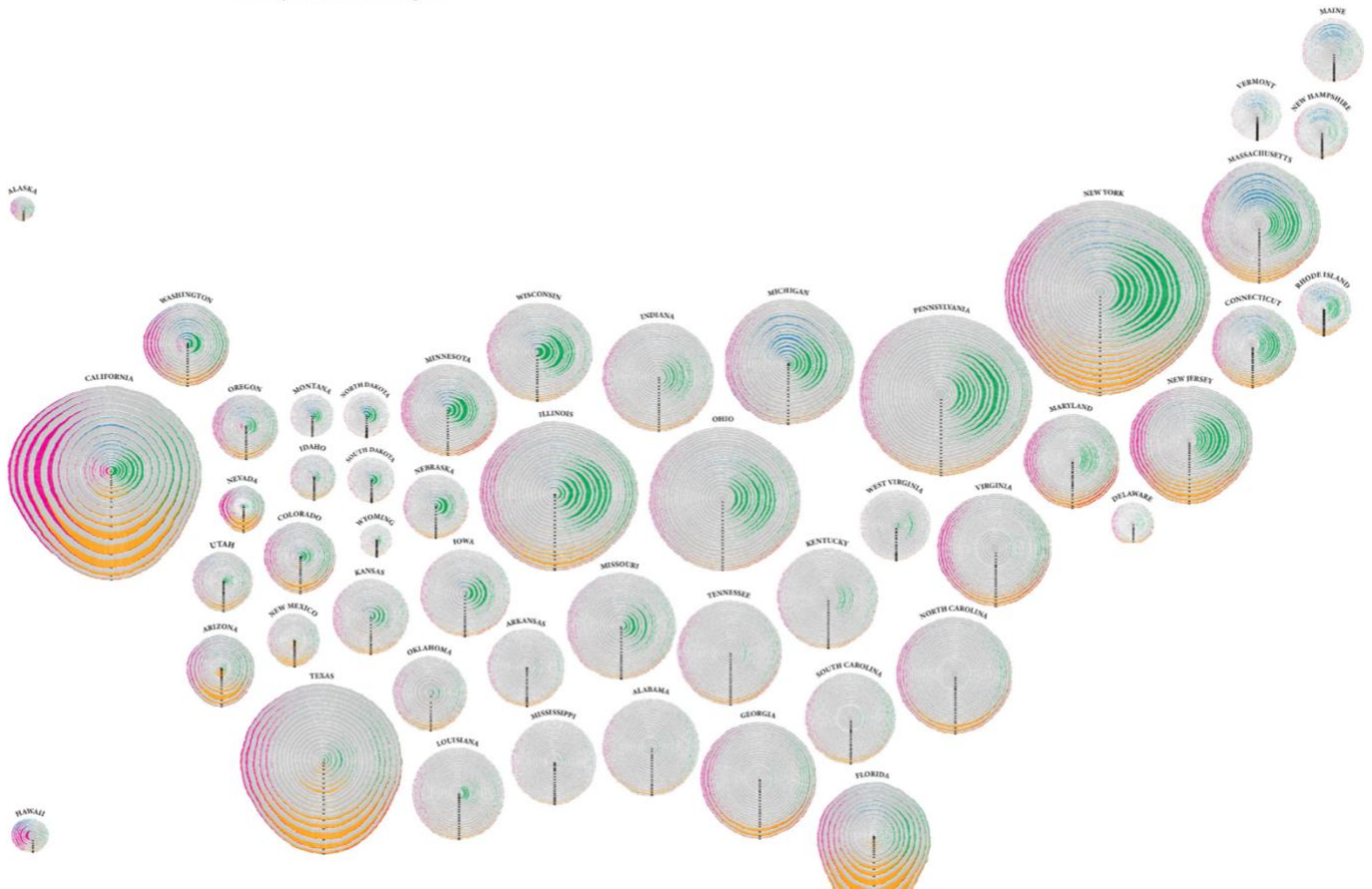


Illinois (1800-2016)

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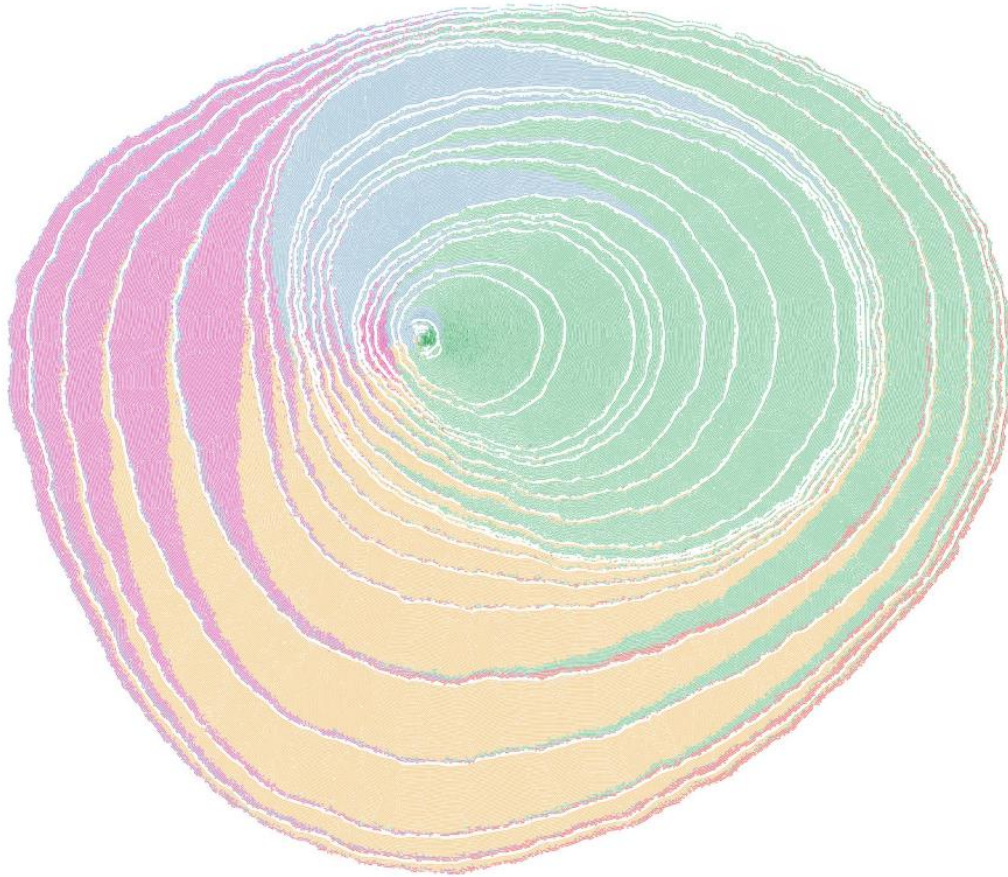
Here are all fifty states depicted as a cartogram:

All fifty states as a cartogram



“Process of simulating tree rings for immigration in the U.S.”

Here is the visualization for the entirety of the United States where the tree is shown with only immigrants:



“Process of simulating tree rings for immigration in the U.S.”

References

- Callahan, M. (2020, April 23). *The United States isn't quite a melting pot, this data visualization artist says. It's more like a tree.* News @ Northeastern. Retrieved August 31, 2022, from <https://news.northeastern.edu/2018/12/12/the-united-states-isnt-quite-a-melting-pot-this-data-visualization-artist-says-its-a-tree/>
- Cruz, P. M., Costa, S., Wihby, J., R.C., Ghael, A., & Shibuya, F. (n.d.). *Process of simulating tree rings for immigration in the U.S.* Northeastern University. <https://web.northeastern.edu/naturalizing-immigration-dataviz/download/portfolio-camera-ready.pdf>