

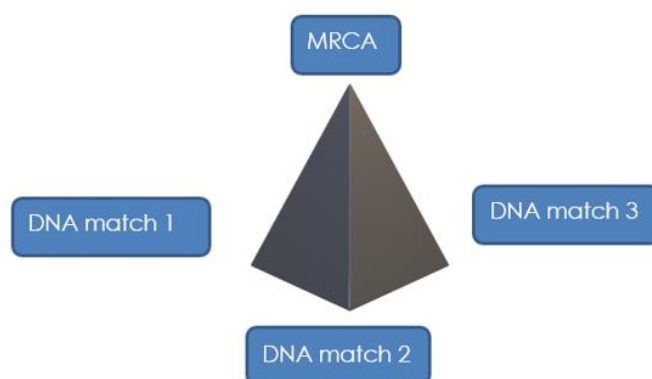
Pedigree Triangulation: A Key Methodology For Genetic Genealogy

Diana Elder AG®
Family Locket.com



What Is Pedigree Triangulation?

Pedigree triangulation identifies the common ancestor among at least three shared DNA matches by comparing family trees. Picture a pyramid with a DNA match at each base point and the MRCA (most recent common ancestor or ancestral couple) at the top.



Pedigree Triangulation as a Methodology

Focusing on a specific research objective yields the best results in genetic genealogy, just as in documentary research. The goal drives the project and gives focus to choosing methodology and tools. Creating genetic networks and doing pedigree triangulation may determine the MRCA between the DNA test-taker and DNA matches. Further analysis can then confirm genetic relationships or find previously unknown ancestors.

Creating Genetic Networks

DNA matches that share a common ancestor form a genetic network or cluster. DNA testing companies provide tools such as "shared matches" or "in common with" to identify genetic networks. Utilize either manual or automated methods to create a cluster of DNA matches that share DNA with the test-taker and each other. Pedigree triangulation can then find the MRCA of that cluster.

Manual Methods of Grouping DNA Matches into Genetic Networks

Manually grouping DNA matches into genetic networks helps the researcher understand the logic of the process. Grouping also helps one become familiar with the DNA matches. Organize the groups in a spreadsheet or database-spreadsheet hybrid like Airtable. Some methods of manually grouping DNA matches follow.

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Pedigree Triangulation

- Use the tool at each DNA testing company to identify matches that share DNA with the test-taker and other people
 - 23andme: "Relatives in Common."
 - Ancestry: "Shared Matches"
 - Family Tree DNA: "In Common With" [ICW]
 - Living DNA: "Shared Matches"
 - MyHeritage: "Shared DNA Matches"
 - GEDmatch: "People who match both kits, or 1 of 2 kits."
- Manually separate DNA matches into clusters using a spreadsheet and the Leeds Method. <https://www.danaleeds.com/the-leeds-method/>
- Use the colored dots at Ancestry DNA, MyHeritage, or Living DNA in conjunction with the Leeds method to create genetic groups. <https://www.danaleeds.com/the-leeds-method-with-dots/>

Automated Methods of Grouping DNA Matches into Genetic Networks

Various tools can arrange the DNA match data into colored clusters for groups of related people. The analysis can then determine the common ancestor for each colored group. Here are some tools for generating DNA match clusters automatically.

- **Genetic Affairs** offers the AutoCluster tool for use with 23andMe and FTDNA and the AutoFast Cluster tool for manual input of match and shared match data. <https://geneticaffairs.com>.
- **GEDmatch** autoclustering works as a collaborative effort between GEDmatch and Genetic Affairs. <https://www.gedmatch.com> – Tier 1 level [\$15 for one month].
- **My Heritage** also partners with Genetic Affairs to autocluster DNA matches on that website. <https://myheritage.com>
- **DNAGedcom** supports the DNA Gedcom Client app. The app can download DNA data from various company websites and then use the Collins-Leeds method to cluster DNA matches. <https://www.dnagedcom.com>
- **DNA2Tree** accesses Ancestry DNA data and groups DNA matches into colored clusters. Download this iOS app for iPhone or iPad from the Apple App Store.
- **RootsFinder** is a family tree building and DNA analysis website. The triangulation (Cluster) view shows matches in a network graph. <https://www.rootsfinder.com/>
- **NodeXL** clusters DNA matches into a network graph. See the article by Shelly Crawford for instructions. <http://twigsofyore.blogspot.com/2017/07/visualising-ancestry-dna-matchesindex.html>
- **Gephi** is an open-source program for creating network graphs manually. See Nicole Dyer's series for instructions. <https://familylocket.com/creating-gephi-network-graphs-part-1-gather-matches-and-prepare-spreadsheets/>

Steps To Achieve Pedigree Triangulation

Once the researcher clusters the DNA matches, pedigree triangulation can begin. Work with one cluster at a time to discover the MRCA. Use the following steps for each genetic network.

1. Estimate relationships between the test-taker and DNA matches.
2. Build and compare family trees between the test-taker and DNA matches.
3. Diagram the hypothesized genetic connection between the test-taker and DNA matches.
4. Analyze and test the hypothesized relationships using WATO (What Are the Odds tool) at DNA Painter.com – for cases where most matches share about 40 cM.

Step 1. Estimate Relationships Between DNA Matches

- Use the DNA match lists on each DNA company's website to discover the amount of shared DNA between the test-taker and the match.
 - 23andMe "DNA Relatives"
 - Ancestry DNA "View All DNA Matches"
 - FTDNA "Matches"
 - Living DNA "DNA Relatives"
 - MyHeritage DNA "DNA Matches"
 - GEDmatch (third-party tool) "One to Many DNA Comparison"
- Enter the amount of shared DNA into the Shared cM tool at dnapainter.com/tool/sharedcmv4.
- Note the possible relationships between the test-taker and the DNA match in the research log or notes.

Step 2. Build and Compare Family Trees

To start finding the MRCA of a genetic cluster, view the DNA matches' family trees on the DNA testing company websites seeking a common ancestral connection. Look for common locations or surnames – clues to a common ancestor. Contact DNA matches with no family tree associated with their DNA match profile and ask for more information about their family. Use collaborative online trees like the FamilySearch Family Tree or WikiTree to expand a small tree.

If the DNA match is not responsive and has no tree, you can build a quick tree for the match. Use public record databases, obituaries, newspapers, social media, Google searches, etc., to look for clues about a DNA match's parents or grandparents. Some tools can provide clues to jumpstart a tree.

- 23andMe "Your Family Tree"
- AncestryDNA "ThruLines"
- MyHeritage "Theory of Family Relativity"
- Genetic Affairs AutoTree <http://www.geneticaffairs.com/features-autotree.html>
- Genetic Affairs AutoPedigree <http://www.geneticaffairs.com/features-autopedigree.html>

Step 3. Diagram and Analyze the Hypothesized Genetic Connection

After identifying the MRCA for the DNA matches in a cluster through family tree analysis, a diagram can help you visualize the genetic connections between the test-taker and the matches.

- Use a program like Lucidchart or Diagrams.net to show the direct line from the hypothesized MRCA to each DNA match in a genetic cluster.
- Calculate the relationship between the test-taker and the DNA match: 2C (second cousin), 3C1R (third cousin once removed).
- Note the relationship on the chart and the amount of shared DNA in cM.
- Check the amount of shared DNA and the hypothesized relationship with the shared cM tool at DNA Painter.
- Note any discrepancies. If the cM amount is too low or too high for the relationship, review the generational links in the tree. A discrepancy could point out an incorrect link.

Step 4. Test the Hypothesis

Use WATO (What Are The Odds?) at DNAPainter.com to test hypotheses or explore possible relationships. From the WATO FAQs: "The Ancestry simulations on which this is based only go to 9th degree relatives, meaning 4C, 3C2R, 2C4R, half-3C1R, etc., and down to 40 cM. That is the limit of relationships and sharing that it will work well for. Beyond that we have made some approximations. The analysis will not be accurate unless the majority of relationships are closer than 9th degree and the majority of matches are over 40 cM. "

Resources

Dyer, Nicole, Diana Elder, and Robin Wirthlin. "RLP 69: DNA Tools Part 1: Clustering, Pedigree Triangulation, WATO. Podcast. *FamilyLocket*. Posted 4 November 2019. <https://familylocket.com/rlp-69-dna-tools-part-1-clustering-pedigree-triangulation-wato/>

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Dyer, Nicole. "Creating Gephi Network Graphs Part 1: Gather Matches and Prepare spreadsheets. *FamilyLocket*. Posted 9 September 2022. <https://familylocket.com/creating-gephi-network-graphs-part-1-gather-matches-and-prepare-spreadsheets/>

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