

# Computing Distances between Locations

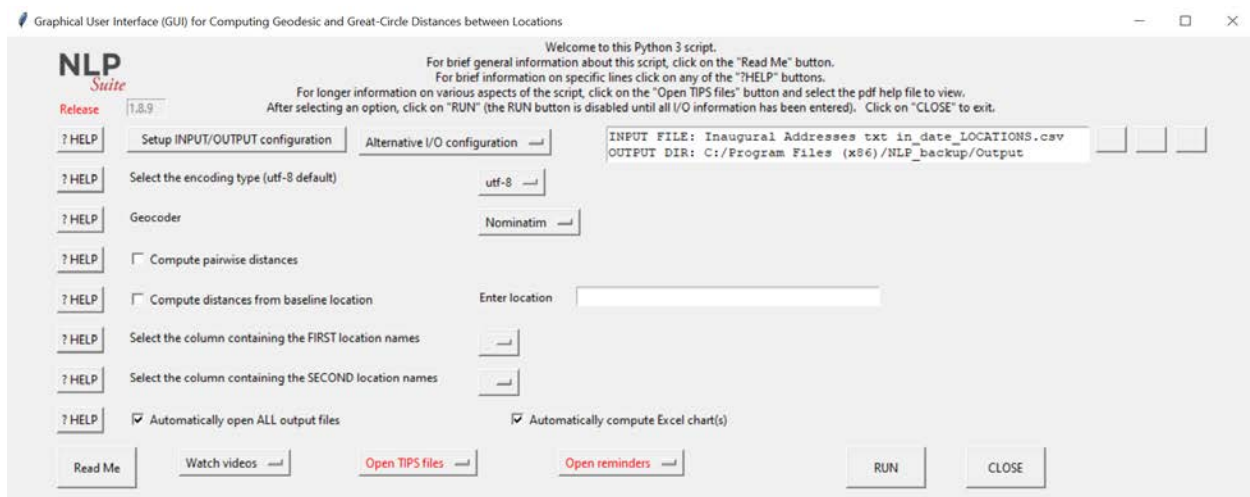
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## Computing Distances

The GIS\_distance\_main GUI allows you to compute distances between locations.

Distances can be computed from a list of two sets of geocoded locations in a csv file, computing the distance between each pair of geocoded locations.

Distances can also be computed from a fixed location (e.g., the distance from Paris of all locations listed in a csv file).



## Why computing distances?

The two types of distance computed by the GIS distance algorithms provide answers to different questions.

### *Pairwise distances*

In a project on marriages celebrated in the city of Turin, in Northern Italy, in the second half of the 19<sup>th</sup> century, knowing brides' and grooms' locations of residence would allow you to answer such question as: were bride and groom coming from the same villages? How far apart did they

come from? Similarly, knowing the location of birth and current residence, would allow to answer questions about an individual's geographical mobility.

A	B	C	D	E	F	G	H	I
ID	groom_name	bride_name	groom_residence	groom_latitude	groom_longitude	bride_residence	bride_latitude	bride_longitude
1	Filippo Pietro Dasso	Gioanna Maria Paolina	Chivasso, Italy	45.1900384	7.888952	Torino, Italy	45.0703393	7.686864
2	Carlo Lodovico Gioachin	Angela Giuseppa Maria	Torino, Italy	45.0703393	7.686864	Torino, Italy	45.0703393	7.686864
3	Gioanni Bait Achille Calv	Cristina Amalia Giusepp	Torino, Italy	45.0703393	7.686864	Torino, Italy	45.0703393	7.686864
4	Francesco Maria Ganglic	Angela Göff	Termo, Italy	44.1150882	9.8663264	Torino, Italy	45.0703393	7.686864
5	Lorenzo Tobia Gallina	Emilia Cesarina Cathela	Torino, Italy	45.0703393	7.686864	Alessandria d'Eg	31.2000924	29.9187387
6	Giovanni Giacinto Savar	Maria Ross	Torino, Italy	45.0703393	7.686864	San Gillio, Italy	45.141051	7.5221345
7	Alessandro Strana	Giacinta Petronilla Fasci	Torino, Italy	45.0703393	7.686864	Torino, Italy	45.0703393	7.686864
8	Giovanni Debole	Giuseppa Fiocch	Torino, Italy	45.0703393	7.686864	Torino, Italy	45.0703393	7.686864
9	Felice Luigi Stefano Cass	Teresa Cavigli	Torino, Italy	45.0703393	7.686864	Torino, Italy	45.0703393	7.686864
10	Giovanni Battista Merlo	Elisabetta Demari	Torino, Italy	45.0703393	7.686864	Torino, Italy	45.0703393	7.686864
11	Giovanni Domenico Ival	Lucia Maria Beltram	Torino, Italy	45.0703393	7.686864	Torino, Italy	45.0703393	7.686864

### Baseline distances

Knowing the distance from a specific location may help to find answers to questions such as: Did US presidents stay close to home (e.g., DC) in mentioning locations in the earlier days of the republic? When did they start mentioning locations far and wide?

### The Python geopy library

The NLP Suite uses the Python geopy library for computing distances (<https://geopy.readthedocs.io/en/stable/#module-geopy.distance>).

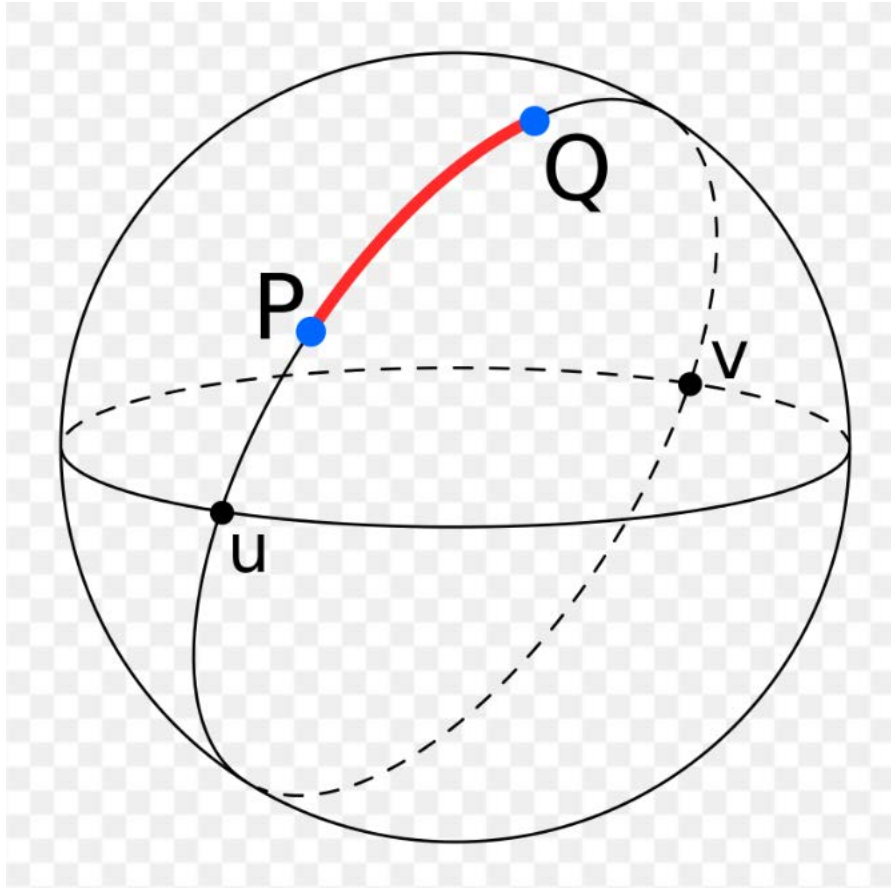
Distances are computed in kilometers and miles along the surface of the earth, by either *geodesic* distance or by *great circle distance*.

The two types of distances – geodesic and great circle – are typically used as synonyms, but geopy keeps them separate.

### Geodesic & great-circle distance in miles & kilometers

Geodesic distance provides the shortest path along the surface of an ellipsoid between two points on the surface.

Great-circle distance uses a spherical model of the earth, using the mean earth radius as defined by the International Union of Geodesy and Geophysics.



Great-circle distance between point P and Q (illustration taken from [https://en.wikipedia.org/wiki/Great-circle\\_distance](https://en.wikipedia.org/wiki/Great-circle_distance)).