

Hellenic Complex Systems Laboratory

# Network of Musical Instruments for Rhythm Accompaniment

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WOLFRAM Demonstrations Project

# Network of Musical Instruments for Rhythm Accompaniment

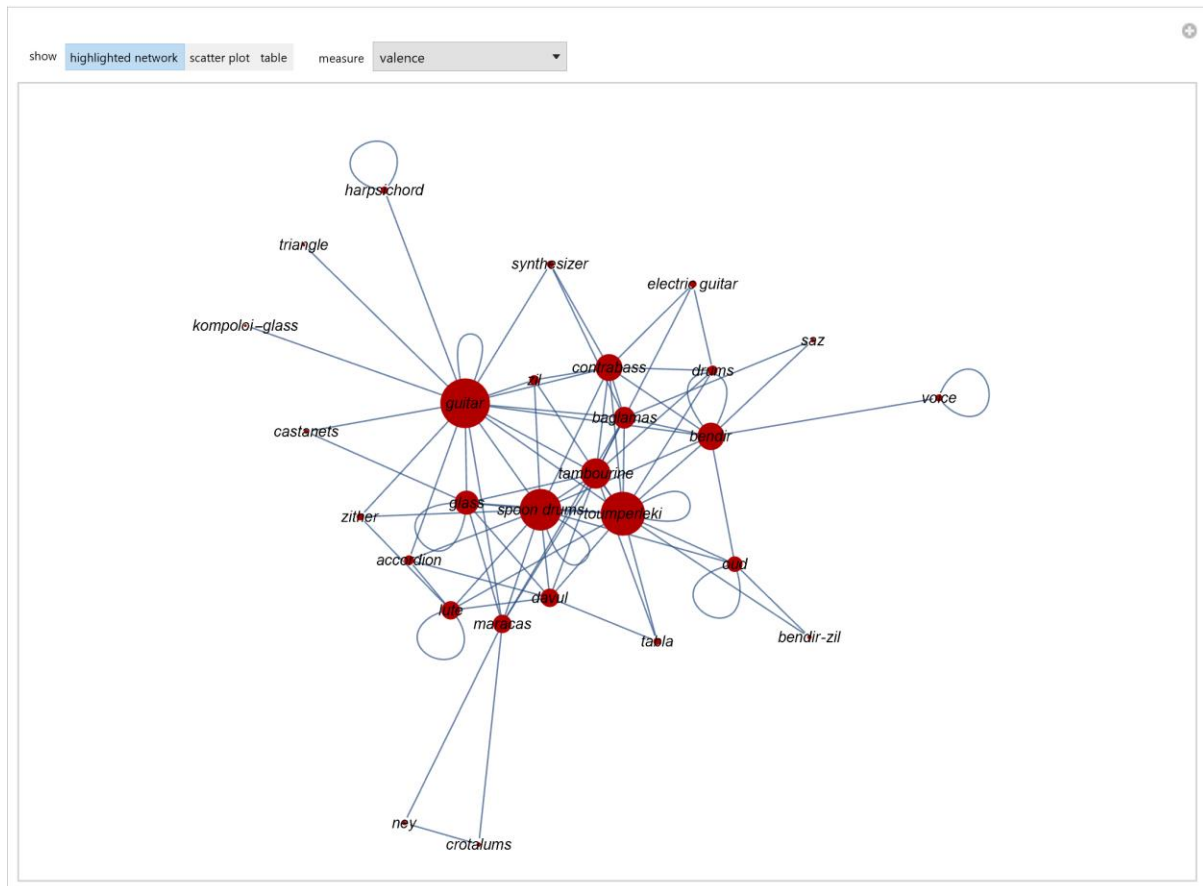
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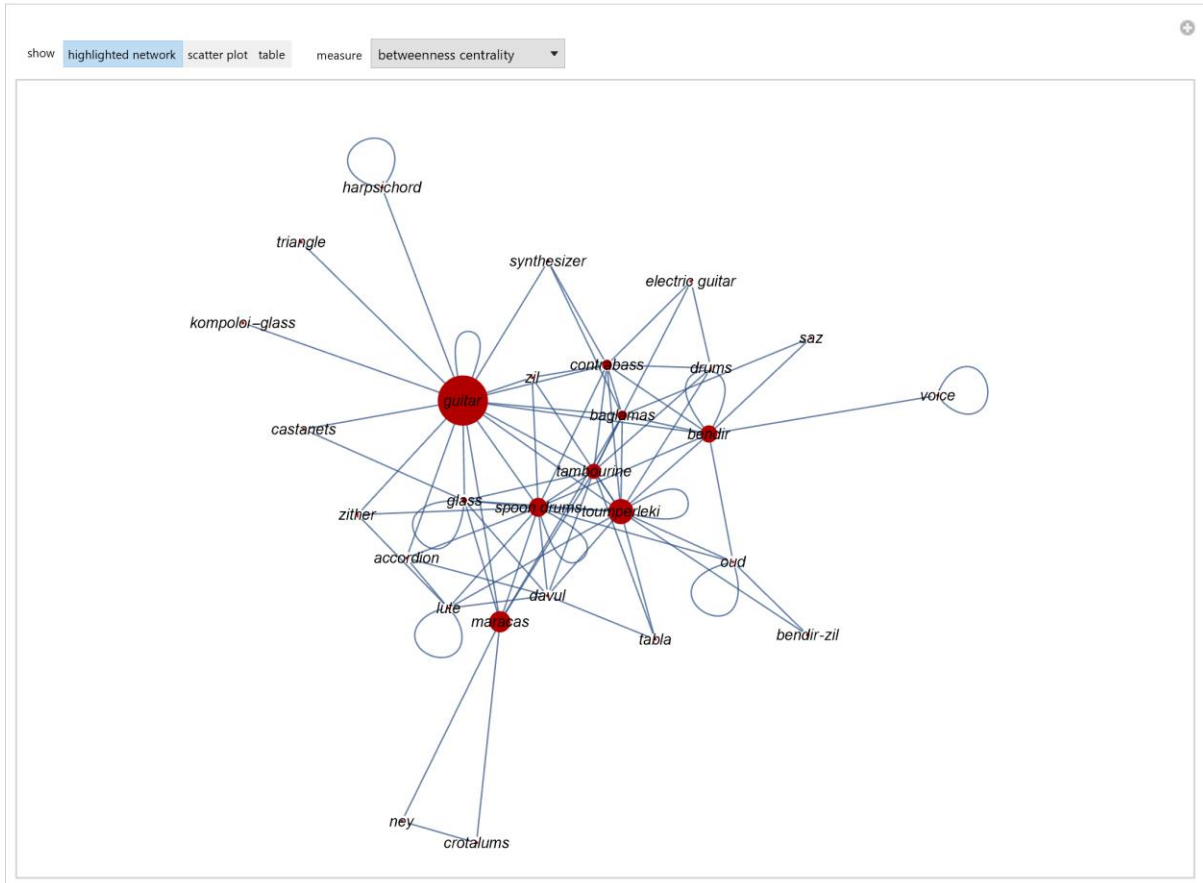
**Search Terms:** network, graph, music, popular songs of Smyrna, musical instruments, rhythm accompaniment instruments, recordings

## Short Description of the Demonstration

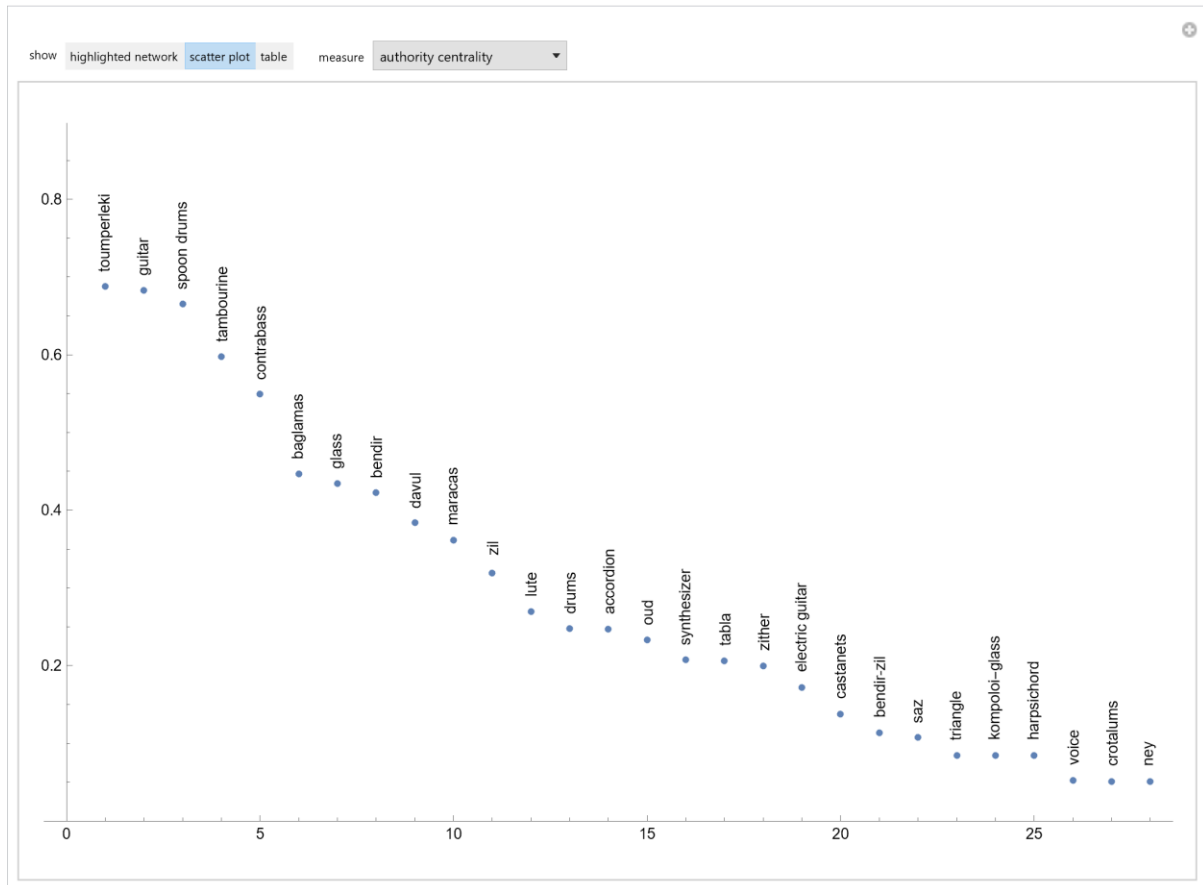
This Demonstration plots a network encoding musical instruments used for rhythm accompaniment. The data consists of 100 recordings of 21 popular songs of Smyrna in nine-beat rhythms. You can choose various measures. The results are also presented in tables and scatter plots.



**Figure 1:** A network encoding musical instruments used for rhythm accompaniment in 100 recordings of 21 popular songs of Smyrna in nine-beat rhythms. The surface of each highlighted vertex is proportional to its valence.



**Figure 2:** A network encoding musical instruments used for rhythm accompaniment in 100 recordings of 21 popular songs of Smyrna in nine-beat rhythms. The surface of each highlighted vertex is proportional to its degree centrality.



**Figure 3:** A scatterplot of the closeness centralities of a network encoding musical instruments used for rhythm accompaniment in 100 recordings of 21 popular songs of Smyrna in nine-beat rhythms.

show highlighted network scatter plot **table** measure status centrality

guitar	0.0061
harpichord	0.0006
baglamas	0.0035
toumperleki	0.0057
spoon drums	0.0054
bendir	0.0034
kompoloi-glass	0.0006
zither	0.0015
oud	0.0018
glass	0.0033
saz	0.0009
zil	0.0022
accordion	0.0019
lute	0.0021
davul	0.0030
castanets	0.0010
triangle	0.0006
tambourine	0.0047
maracas	0.0030
contrabass	0.0043
synthesizer	0.0015
drums	0.0018
electric guitar	0.0013
ney	0.0006
crotalums	0.0006
tabla	0.0015
bendir-zil	0.0009
voice	0.0004

**Figure 4:** A table of the status centralities of a network encoding musical instruments used for rhythm accompaniment in 100 recordings of 21 popular songs of Smyrna in nine-beat rhythms.

## Details

The following musical instruments used for rhythm accompaniment were considered: guitar, toumperleki, spoon drums, bendir, baglamas, contrabass, oud, harpsichord, glass, zil, tambourine, lute, maracas, davul, saz, zither, bendir with zil (bendir-zil), drums, castanets, accordion, kompsonoi with a glass (kompsonoi-glass), synthesizer, tabla, crotalums, ney, electric guitar, and triangle, as well as the voice.

The network encodes the use of these musical instruments in the recordings, either alone or in combination. Each vertex of the network represents an instrument. If an instrument was used alone, it is connected to itself with a loop. If it was used in combination with any other instruments, it is connected to each of them with an edge. The network is weighted. The weight of each loop or edge is the frequency of use for each instrument or combination of instruments in the recordings. The surface of each highlighted vertex is proportional to its respective measure. The calculated measures are the valences, the closeness, betweenness, degree, radiality, eccentricity, hub, authority, eigenvector and status centralities, the page ranks, the local clustering coefficients and the mean neighbor degrees .

As far as we know, this Demonstration presents a novel method for studying the characteristics of musical instruments.

## Reference

[1] C. Chatzimichail, "The Popular Songs of Smyrna in Nine Beat Rhythms Before and After the Destruction of Smyrna," thesis, Department of Traditional Music, Technological Educational Institute of Epirus, Greece, 2017. DOI: [10.17605/OSF.IO/WEK3Q](https://doi.org/10.17605/OSF.IO/WEK3Q). Available at: <https://thesiscommons.org/wek3q/>

## Source Code

Programming language: Wolfram Language

Availability: The updated source code is available at:

<https://www.hcsl.com/Tools/Demonstrations/NetworkOfMusicalInstrumentsForRhythmAccompaniment.nb>

## Software Requirements

Operating systems: Microsoft Windows, Linux, Apple iOS

Other software requirements: Wolfram Player®, freely available at: <https://www.wolfram.com/player/> or Wolfram Mathematica®.

## System Requirements

Processor: x86-64 compatible CPU.

System memory (RAM): 4GB+ recommended.

## Permanent Citation:

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