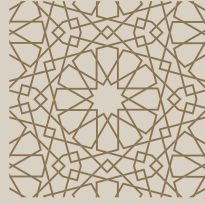


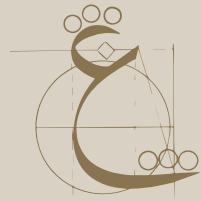
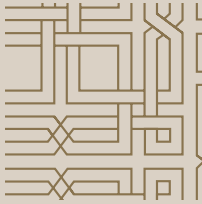


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06



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Mapping the Links: Network Perspectives on Musician Communities of Late Ottoman Istanbul*

BAĞLANTILARI
HARİTALANDIRMAK:
GEÇ DÖNEM OSMANLI
İSTANBUL'UNDA YAŞAYAN
MÜZİSYENLERİN AĞ ANALİZ
YÖNTEMİYLE İNCELENMESİ

ONUR ÖNER**



ABSTRACT

The core idea of this paper is to represent the social networks of musicians, which lived in late Ottoman Istanbul. The networked society, as a social term, aims to depict communities in ongoing interactions and hence gives prominence to ties and connections between members of the society in question. To digitalize those links, there are innovative devices such as Gephi software. Through various algorithms, the program converts the relational database of musicians and digitally visualizes this database in many different forms. The powerful layouts offer compelling evidence of the channels of musical knowledge that were transmitted from masters to disciples as well as between musicians. Moreover, the visual depiction of musician networks would permit us to interpret the influential, isolated musicians and the interactions between the main and the sub-clusters in the whole network. This paper offers an innovative approach to the musician communities of late Ottoman Istanbul.

Keywords: Ottoman/Turkish Music History, Ottoman Urban History, Istanbul, Social Network Analysis (SNA), Digital Humanities.



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ÖZ

Bu çalışma, geç dönem Osmanlı İstanbul'unda yaşamış olan müzisyenlerin sosyal ağları üzerine yoğunlaşmaktadır. "Ağ toplumu" kavramı toplumları süregelen ilişkiler ve etkileşimler içerisinde tanımlarken, bireyler arasındaki sosyal bağ ve bağlantıları önelemektedir. İlişki ağlarını görselleştirmek için geliştirilen programlardan birisi de Gephi'dir. Gephi, farklı algoritmalar eşliğinde müzisyen ağlarının farklı biçimlerde görselleştirilmesine olanak sağlamaktadır. Bu makale, müziğe dair bilginin hocadan öğrenciyeye iletimine ve müzisyenler arasında nasıl dolaştığına dair etkili görsel tasarımlar geliştirmektedir. Bununla birlikte, ağ içerisinde bulunan etkin ve izole durumdaki müzisyenler ile oluşan alt kümelerin birbirleriyle olan etkileşimlerine dair yeni argümanlara da kapı aralamaktadır. Bu çalışma, geç dönem Osmanlı İstanbul'unda yaşayan müzisyenler hakkında yeni bir bakış açısı önermektedir.

Anahtar Kelimeler: Osmanlı/Türk Müziği Çalışmaları, Osmanlı Şehir Tarihi, İstanbul, Sosyal Ağ Analizleri, Dijital Beşerî Bilimler.

* I presented an earlier version of this paper at an online International Conference, namely as Intercommunal Musical Geographies of Late Ottoman Istanbul, which is organized by Ethnomusicology and Cultural Anthropology Laboratory, Department of Music Studies, School of Philosophy, National and Kapodistrian University of Athens (NKUA) in October 29, 2021. I want to thank the scholars that participated in the lecture, whose comments and critiques were significant for the final version of this study. I also thank the anonymous reviewers whose comments improved significantly this study.

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INTRODUCTION

Emin Efendi (Yazıcı, d. 1945) first learnt Mevlevî rite in the *Rast* mode from certain Haşim Efendi (d.?). *Kudümzenbaşı* Raif Dede (d. 1903) of Galata Mevlevî lodge and Ahmed Celaleddin Dede (d. 1946) of the Sheikh of Üsküdar Mevlevî lodge, were other sources of knowledge regarding the Mevlevî rites. Hobçuzade Ahmed [Gavsi] Efendi (d. 1908), the *zakirbaşı* of Kadiri lodge at Tophane, trained him on *miraciye*. After his demise, he continued to study with his brother Hobçuzade Rıza Efendi (d. 1924). Bolahenk Nuri Bey (d. 1911) taught him two Mevlevî rites composed by himself, on the modes of *Buselik* and *Karçıgar*. Rauf Yekta Bey (d. 1935) helped him to be familiar with *hamparsum* notation and theoretical issues in music, while Şevket Gavsi (d. 1954) trained him on the Western notation. Moreover, Sheikh Cemaledin Efendi (d. 1937) further enriched his repertoire particularly on the religious forms.¹

It is highly probable to come across many passages similar to the one that I have quoted above amid innumerable musician biographies recorded by Ergun. On the one hand, it indicates how immensely deep and diversified the Ottoman music culture was, on the other hand, it shows how comprehensive one had to be musically. Apart from the points one could derive from the quotation, it quite simply emphasizes the interactions between musicians. In other words, it is about the social milieu of musicians in the city. Generally speaking, a multitude of names that were behind the musical cultivation of Emin Efendi was not unique to him and, likely, that it is not the completed list of people that contributed to his musical improvement. Reading musician biographies one after another, one accumulates thousands of names that interacted with each other directly or indirectly. Yet, as the number of people increases, it becomes harder to assess the relative importance of such connections among musicians.

It is precisely where this study stands out from other research initiatives with its unconventional way of approaching musician biographies. It aims to make those immense interactions manageable and indeed intelligible by digitally mapping and visualizing the social networks (henceforth, SNA) of musicians. However, SNA has been applied very limitedly in the field of history, with the steady advancement of Digital Humanities in social sciences, historical studies that particularly seek to analyze social structure by stressing the patterns, interactions, and relations between individuals, employing the set of SNA techniques that have great potential.²

1 Sadettin Nüzhet Ergun, *Türk Musikisi Antolojisi: Dinî Eserler*, 2 Vol. (İstanbul: İstanbul Üniversitesi Edebiyat Fakültesi Yayınları, 1943), 669.

2 For a summary of historiographical debates on social network studies and some insights on how digital technology changes the field structurally, see Hannah Knox, Mike Savage, and Penny Harvey, "Social Networks and the Study of Relation: Networks as Method, Metaphor and Form", *Economy and Society* 35/1 (2006), 113-140; For a more recent literature review in the field of archaeology, that reconsiders the networks rather as sources of power, competition and conflict, see Francesca Mazzili, "A Decade of Network Studies on Religion in the Pre-Roman and Roman Periods", *Networks as Resources for Ancient Communities*, eds. Raffaella Da Vela, Mariachiara Franceschini & Francesca Mazzilli (Tübingen: Tübingen University Press, 2023), 165-183; Martin Grandjean's study explores and visualizes the networks of 3,200 people (overwhelmingly scientists, such as Albert Einstein, Marie Curie and George Hale) in order to understand the internal organization of *International Committee on Intellectual Cooperation* (ICIC) between 1922-1927 founded by the League of Nations, "Archives Distant Reading: Mapping the Activity of the League of Nations' Intellectual Cooperation", *Digital Humanities 2016*, Conference organized by Jagiellonian University and Pedagogical University, conference proceedings: 531-534. Ruth Ahnert and Sebastian E. Ahnert focused on 289 letters that were written either by or to Protestants residing in England during Mary's reign. The source

Regarding the background of my affiliation to the network analysis of historical communities, I should go back to 2019. That year I submitted my doctoral dissertation, which was a prosopography study on musicians of Istanbul from the late Ottoman to the early Republican years.³ Being open to computational methods, the quantitative analysis via IBM SPSS Statistics 23.0 (SPSS) formed the backbone of the dissertation. In brief, the thesis addressed the social aspects of musicians, from family background to their education patterns, from occupational continuity to the financial difficulties they have faced. Regarding the relationship between music and geography, the study analyzed Istanbul by focusing on the frequency of musical activities and the distribution of musicians among the neighborhoods as well. Since the period that I prepared the dissertation, I have just begun to explore historical network studies, the study only hesitantly dealt with the networks of musicians, particularly via software. In only seven pages, by using the least attributes of the system, I attempted to show the most popular teachers of music some of whom went unnoticed by the historiography.⁴ Although this paper would overwhelmingly rely on the data collected for my dissertation research, it would heavily draw upon more recent developments in the field. Hence all the network layouts are original and generated exclusively for this research article.

1. Sources

Although this study will be based on a great range of secondary sources that provide biographical material on the musicians of late Ottoman Istanbul, particular credit should be given to two biographical dictionaries. Ergun's two-volumes study, *Türk Musikisi Antolojisi*, might easily be considered a song-text collection as a genre since the study contains a very large number of examples of religious repertoire, which is still considered to be an authoritative source for the Ottoman religious music repertoire. Nevertheless, the significance of the book for my research topic lies elsewhere. It provides innumerable biographies of musicians particularly belonging to the Sufi circles of Istanbul. The author's profound knowledge of the subject matter was largely due to the fact that he himself was a Sufi sheikh of the *Sadî* order. In the Sufi musicians' life narratives, Ergun particularly put emphasis on their social milieu by focusing on the master-disciple relationships and various lodges they frequented. Critically speaking, the domination of musician biographies from the Sufi circles of the city might be considered as the major drawback of the book since it fails to embrace other musician groups, including non-Muslim, women and non-Sufis of late Ottoman Istanbul.

İbnülemin's biographical dictionary is another chief source that would expand the limits of the study by opening more space to those "excluded" groups.⁵ To construct musician biogra-

material contains a network of 377 individuals and 795 edges. These letters provide crucial evidence for the social organization of the Protestant community in England at that time, "Protestant Letter Networks in the Reign of Mary I: A Quantitative Approach", *ELH* 82/1 (Spring 2015), 1-33. For a number of social network studies in history that employed computer-based technologies, see *Vizualizing Historical Networks*, Centre for History and Economics, Harvard University, <http://histecon.fas.harvard.edu/visualizing/index.html> (accessed on 4 May 2023); *Mapping the Republic of Letters*, Stanford Humanities Centre, Stanford University, <http://republicofletters.stanford.edu/casestudies/voltairepub.html> (accessed on 10 April 2023).

3 Onur Öner, *A Collective Biography Study of Musicians: Patterns, Networks and Music as a 'Profession' in the Late Ottoman Era and the Early Republican Years in Istanbul* (İstanbul: Şehir University, Graduate School of Social Sciences, PhD dissertation, 2019).

4 Öner, *A Collective Biography Study of Musicians*, 221-227.

5 İbnülemin Mahmut Kemal İnal, *Hoş Sadâ: Son Asır Türk Musikînasları* (İstanbul: Türkiye İş Bankası Kültür Yayınları, 1958).

phies, the author made use of a great degree of contemporary sources.⁶ He resorted to journals, daily papers and books by giving full reference to author, date and number, etc. Official documents, such as salnames, and the personnel registers of civil officials (sicill-i ahvâl) were frequently referred to. Another frequently used technique to collect biographical material was to ask musicians to write their life stories in their own words.

Above all, the originality of this research lies in its evaluation of available sources that contain innumerable musician biographies and a large amount of network data. In other words, viewing sources from the point of social network analysis is motivating on the ground that they offer a rich biographical material that is full of interconnections between musicians.

2. Methodology

A source supplying thousands of individuals (nodes) and displaying multiple connections (edges) – acting in directed and undirected ways – within a defined period is the optimum starting point for an SNA approach. However, it is crucial to define selection criteria for people whose biographies are in question. People need to share a certain degree of common ground, which might vary on a range of issues from opinions to interests and from social background to the profession. Having lived through the same socio-historical context with shared cultural experiences and knowledge is another criterion. It should be stated that the overwhelming majority of people the study would focus on meet the selection criteria. The group is composed of amateur and/or professional musicians that included composers, singers, and instrumentalists alike. Regarding the period, the great majority underwent the long and complex sociopolitical changes from the late nineteenth century to the Early Republican years. Last but not least, comparing the musician biographies of earlier periods in terms of social milieu, late Ottoman musician biographies are generally far more prolific.

To fully explore the channels in which musical knowledge was transmitted from one to another, I constructed a relational database. In other words, an index of individuals that included the names of people from whom they received music education, to whom they taught music, and the sources in which their names were mentioned. The recurring presence of the same individuals in the database either due to having more than one student or due to being trained by more than one instructor is recorded carefully since the reappearances are vital to reveal the frequency/intensity of the interconnections. Following that, to transform the data into a visual layout I benefited from software Gephi, which is an open platform that visualizes social networks. It uncovers multilayered structures in networks through its different metric systems and can present them in specific layout algorithms.⁷

6 The principal ones were Rauf Yekta, *Esatiz-i Elhân: Hoca Zekai Dede Efendi* (İstanbul: Mahmud Bey Matbaası, 1318); *Dede Efendi* (İstanbul: Evkaf-ı İslamiye Matbaası, 1340); Doktor Suphi Ezgi, *Nazarî ve Amelî Türk Musikisi*, 5 Vol. (İstanbul: İstanbul Konservatuarı Yayını, 1933-1953); Mustafa Rona, *50 Yıllık Türk Musikisi: Bestekârları, Besteleri Güftelerile* (İstanbul: Türkiye Yayınevi, 1960).

7 *Gephi* (Accessed June 6, 2023).

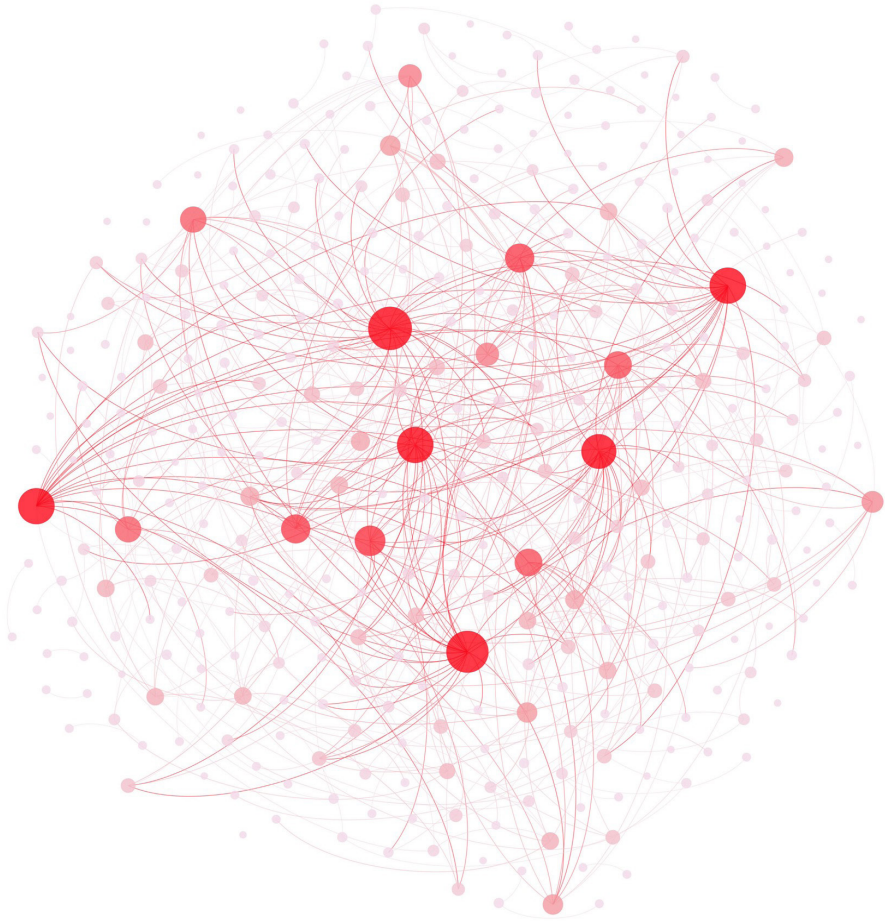


Figure 1: Mapping the transmission of musical knowledge among musicians by Gephi

Figure 1 illustrates the network structure of 358 musicians (nodes) that were linked to each other by 492 edges. More technically, the program calculated the degree centrality through the Force Atlas layout algorithm which is one of the ways Gephi offers to display the network structure. The node sizes are set between minimum 0.6 and maximum 3.5. I set the tones of red according to the number of appearances of the actors in the relational database.

3. Visualization of Social Networks and Data Analysis

This section will apply a number of metrics in Gephi, including degree centrality, betweenness centrality, and eigenvector centrality. Because each measurement has distinctive projections upon the same relational database and hence visualize it accordingly, I will provide brief explanations on the technical terms in particular and the features of the system in general for more advanced visual analysis.

3.1. Degree centrality

The degree centrality measurement is based on the total number of ties (edges) a node possesses. It emphasizes on the most central actors based on the number of connections it has in a given network structure. To better understand the directions of interactions, degree centrality offers two variations: In-coming edges are measured by in-degree metric, whereas the number of out-going ones is measured by out-degree metric. Out-degree centrality measures the expansiveness of an actor in a given structure but not the popularity, which is rather displayed through in-degree centrality that counts the number of edges a node in question receives.⁸

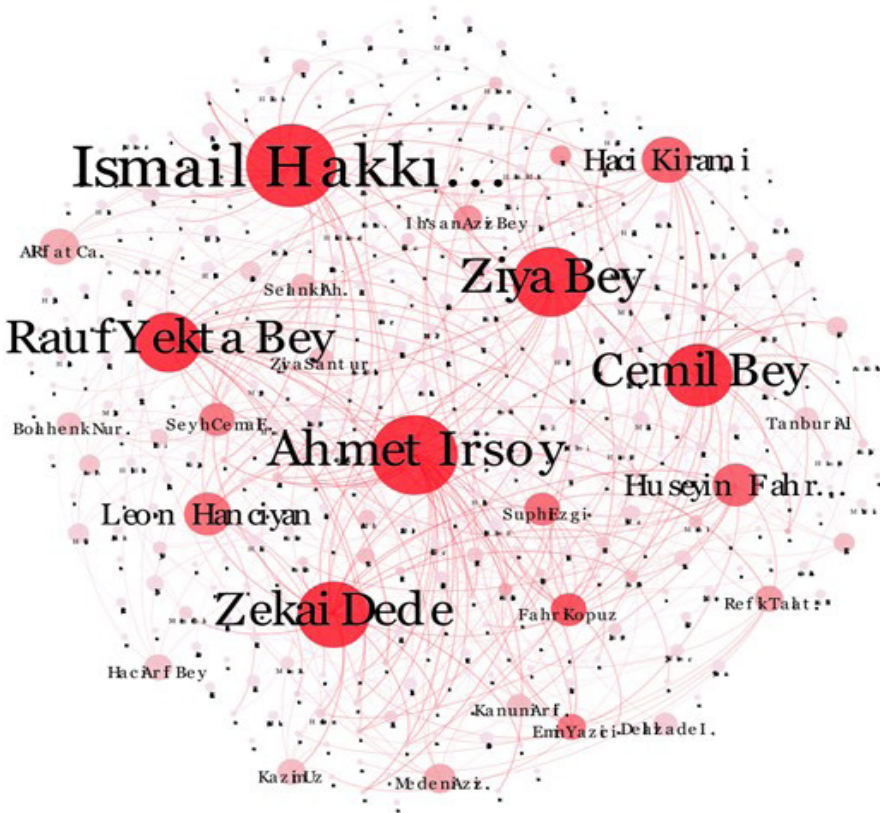


Figure 2: Out-degree by Force Atlas layout algorithm shows 358 musicians (nodes) that were linked to each other by 492 edges.

Figure 2 indicates that musical information and knowledge emanated more frequently from Zekâî Dede (d. 1897), Ahmet İrsoy (d. 1943), İsmail Hakkı Bey (1927), Ziya Bey (d. 1927), Rauf Yekta Bey (d. 1935), and Cemil Bey (d. 1916). Nevertheless, there seems a great range of differences between these names in terms of disseminating information. The case of Zekâî

8 Christina Prell, *Social Network Analysis: History, Theory & Methodology* (London: SAGE Publications, 2012), 96-99.

Dede requires a separate discussion since he passed away before the rest of the musicians in the group. The emphasis upon the date of his demise is meaningful on the ground that music schools, either private or state-sponsored, began to operate after 1909 brought a fundamental shift to music education.⁹ Without witnessing the change, Zekâi Dede taught music in a state school, *Darüşşafaka*, more than ten years in the latter part of his life.¹⁰ It might be said that he was an upholder of the conventional way of music training based on the master-disciple relationship. His son, Ahmet Irsoy, would succeed his father in *Darüşşafaka*, where he maintained the position for over forty years. Moreover, he was employed in the first state-run art school, *Darülbedayi*, in 1914, and another state-sponsored music school, *Darülelhan*, in 1917. The latter, however, did not remain in function regularly. In 1926, *Darülelhan* supported the policy for the advancement of Western music education, whose underlying causes are not the subject matter of this study; Department for Ottoman music thereby came to an end. Ahmet Irsoy's position was eventually transformed into being a committee member, namely the Committee on Classification and Evaluation [of Historical "Turkish" Music], (*Tasnif ve Tesbit Heyeti*). He contributed to the Committee's studies prior to his death.¹¹

İsmail Hakkı Bey (d. 1927), another critical musician according to out-degree centrality computation, played a pivotal role in the establishment of the first private music school in Istanbul in 1908.¹² Generally speaking, his life story should be considered within the broader sociopolitical transformations. As an official functionary, the reorganization of the Ottoman bureaucracy in 1909 would have far-reaching implications in his personal history. In a narrower perspective, he was a dismissed official, whose aim was to organize a private music school, which was in fact an attempt to deal with his financial uncertainty. From a broader perspective, his willingness to adapt to change in music was notable particularly in a transitional and unstable period of time that the more conventional ways of support in music were gradually subsiding into insignificance.

Ziya Bey (d. 1927) is also a central figure in the network structure whose life story resembles that of İsmail Hakkı Bey in many ways. Both actors were subject to historical change. Two years after he retired from the Ministry of Military Affairs in 1916, Ziya Bey was employed in the Şark Musikî Cemiyeti, which was a private school established in Kadıköy in 1918 by a collective effort of several musicians, some of whom included Ali Rifat Bey (d. 1935), Leon Hancıyan (d. 1947), Sami Bey (d. 1939), Ziya Bey (d. 1927), İhsan Aziz Bey (d. 1935).¹³ In the latter part of his life, he was even invited to Mersin, a city in the southern part of Turkey, to establish a music school, where he died in 1927.¹⁴

9 For an alternative interpretation of private music schools in Late Ottoman Istanbul that pays particular attention to the professionalization of musicians, identity formation, and increased visibility of women musicians, see my article, "Music in Early Twentieth Century Istanbul: Reconsidering the Role of Private Music Schools", *Archiv Orientalní* (ArOr) 89/1 (2021), 63-84.

10 İnal, *Hoş Sadâ*, 286-300.

11 Cem Behar, *Musikiden Müziğe: Osmanlı/Türk Müziği: Gelenek ve Modernlik* (İstanbul: Yapı Kredi Yayınları, 2008), 83-116.

12 Nuri Güçtekin, "İsmail Hakkı Bey ve Osmanlı Devleti'nde İlk Özel Müsiki Okulu: Müsiki-i Osmani Mektebi (1910-1920)", *Rast Müzikoloji Dergisi* 2/2 (2014), 4.

13 Gültekin Oransay, "Cumhuriyetin İlk Elli Yılında Geleneksel Sanat Musikimiz", *Ankara Üniversitesi İlahiyat Fakültesi Yayınları* 117 (1973), 248.

14 Rona, *50 Yıllık Türk Musikisi*, 142-143; İnal, *Hoş Sadâ*, 302-303.

3.2. Betweenness Centrality

Another computation I applied to my relational data is betweenness centrality, which operates in a more sophisticated model than degree centrality. It counts a node's role within the whole network structure and pays particular attention to whether it interconnects with other clusters. The node(s) frequently found on the shortest paths will come forward with a high degree of betweenness centrality. A high betweenness centrality brings to the forefront the node(s) that connect various parts of the network. They are the brokers in a given network whose absence would cut off the interaction or the flow of information. Therefore, their existence, as well as the strategic position they have, is critically important in a network structure.¹⁵

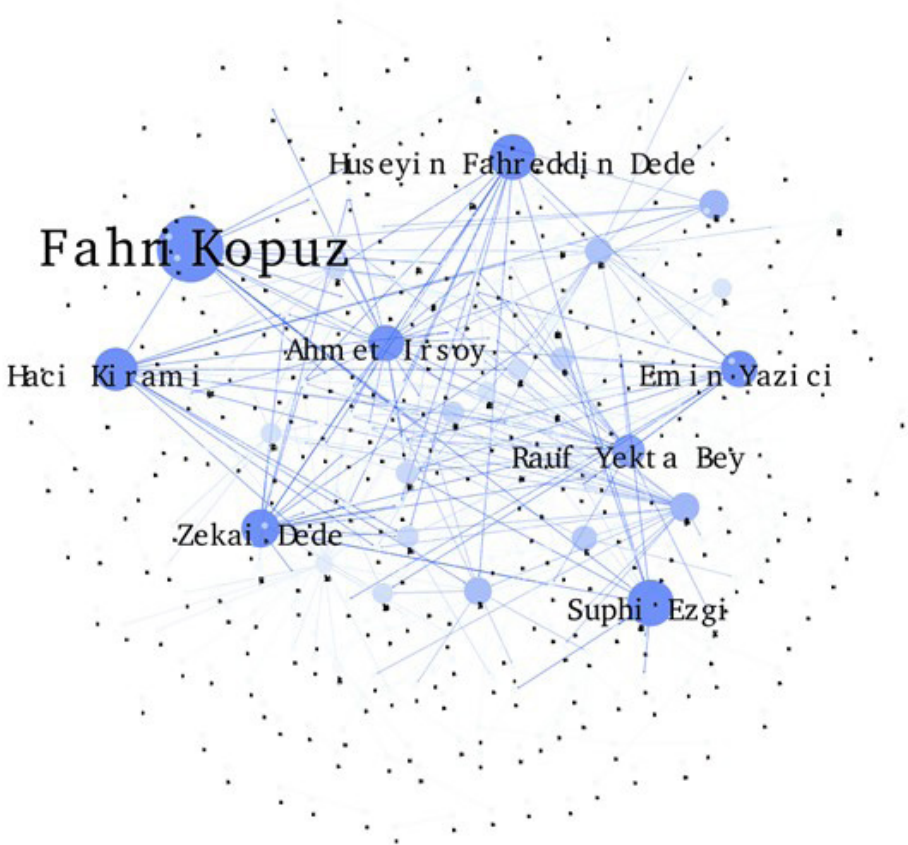


Figure 3: Betweenness centrality by Fruchterman Reingold layout algorithm shows 358 musicians (nodes) that were linked to each other by 492 edges.

15 For a study that employs the algorithms briefly explained above, see Dimitrios Kydros - Anastasios Anastasiadis, "Social Network Analysis in Literature: The Case of The Great Easterns", proceedings of the 5th European Congress of Modern Greek Studies of the European Society of Modern Greek Studies 4 (2015), 681-702.

The converted version of the relational data through betweenness centrality has made İsmail Hakkı Bey and Ziya Bey less significant, and both musicians were highly critical in the degree centrality measurement. Nevertheless, Zekâi Dede, Rauf Yekta Bey, and Ahmet Irsoy remain in their leading position, which means that they are among the actors that held strategic positions between sub-networks for the circulation of knowledge. Moreover, the computation introduces new people to leading positions with limited importance in terms of expansiveness counted previously by out-degree centrality (see Figure 2). They are Hüseyin Fahreddin Dede (d. 1911), Hacı Kirami (d. 1909), and Fahri Kopuz (d. 1968).

Hüseyin Fahreddin Dede seemed to never engage with a music school either as a performer or as a teacher. His base was a Sufi lodge as he was the Sheikh of Bahariye Mevlevî lodge in the Eyüp neighborhood until his death in 1911.¹⁶ Even though his degree centrality score is not really high, what made him more special was his interconnection with other clusters in the network structure. He was in touch with influential actors of other clusters whose scores in three different models of computation are displayed in Table 1. He was taught by Zekâi Dede and contributed to the musical advancement of his son, Ahmet Irsoy. Among many musicians he trained, İhsan Aziz Bey (d. 1935), Emin Efendi (d. 1945) and Suphi Bey (d. 1962) should be emphasized whose degree centrality scores were high-level. Moreover, they were among the ones that provided alternative paths to other sub-clusters.

Fahri Bey (Kopuz) entered the office of the Council of State (Şûrâ-yı Devlet) in 1903. After serving only six months, he was transferred to the office in the Ministry of Military Affairs (*Bâb-ı Seraskeri*, which was transformed into the *Harbiye Nezâreti* on 22 July 1908). There, he served until the end of World War I. How he acted as a bridge and hence connected many clusters in the network so successfully is related primarily to his music teachers, many of whom had pivotal roles in the network structure. Hacı Kirami, Ahmet Irsoy, Ziya Bey, Cemil Bey, and Suphi Ezgi were the sources of his music education. His active participation in music schools should also be counted. He was on the teaching staff of *Mûsikî-i Osmanî*, founded in 1909, and only three years later, he was among the founders of a new one, *Dârü't-Talîm-i Mûsikî*, which operated in the Şehzadebaşı neighborhood at the Fatih district.¹⁷

The degree and the betweenness centrality algorithms reveal that there is an all-embracing Sufi network, whose adherents were not only among the principal sources by which knowledge emanated but also their strategic positions in the broader structure facilitated the dissemination of knowledge between main clusters in a broader sense. Zekâi Dede, his son Ahmet Irsoy, Hüseyin Fahreddin Dede, and Rauf Yekta Bey were the members of the Mevlevî order.

16 Rauf Yekta Bey vd., *Mevlevî Ayinleri XXXII* (İstanbul: İstanbul Konservatuvarı Neşriyatı, 1934), 836; İnal, *Hoş Sadâ*, 192-204; İbnülemin Mahmud Kemal İnal, *Son Asır Türk Şairleri*, 1 Vol., ed. Müjgan Cunbur (Ankara: Atatürk Kültür Merkezi Başkanlığı Yayınları, 1999), 526-530; Sezai Küçük, *Mevlevîlîğin Son Yüzyılı* (İstanbul: Simurg, 2003), 152-162.

17 Rona, *50 Yıllık Türk Musikisi*, 200-205; İnal, *Hoş Sadâ*, 180.



Table 1: Applied algorithms and nine musicians in top rankings

DEGREE CENTRALITY		BETWEENNESS CENTRALITY	
İsmail Hakkı Bey	25	Ahmet Irsoy	188.866667
Ahmet Irsoy	24	Fahri Kopuz	181.566667
Rauf Yekta Bey	20	H. Fahreddin Dede	172.833333
Zekai Dede	20	Hacı Kirami	159
Ziya Bey	20	Rauf Yekta Bey	143.166667
Cemil Bey	19	Zekai Dede	136.433333
Fahri Kopuz	16	Cemil Bey	98.833333
Hacı Kirami	15	Ziya Bey	84.566667
H. Fahreddin Dede	15	İhsan Aziz Bey	83

3.3. Eigenvector Centrality

Although degree and eigenvector centralities measure the edges (ties) a node possesses, their difference from one another is considerable. As stated above, degree centrality essentially focuses on the number of edges, whereas eigenvector centrality weighs the quality of those edges. For example, an actor has six edges (links) but all six are connected to nodes that have lower degree centrality. However, an actor with only two edges might have higher eigenvector centrality if important nodes link those two nodes. Therefore, nodes with higher eigenvector degrees indicate the situation that they were connected to nodes (neighbors) that have larger centrality scores than those connected to non-central nodes.¹⁸

18 M. E. J. Newman, *Networks: An Introduction* (New York: Oxford University Press, 2010), 169-171.

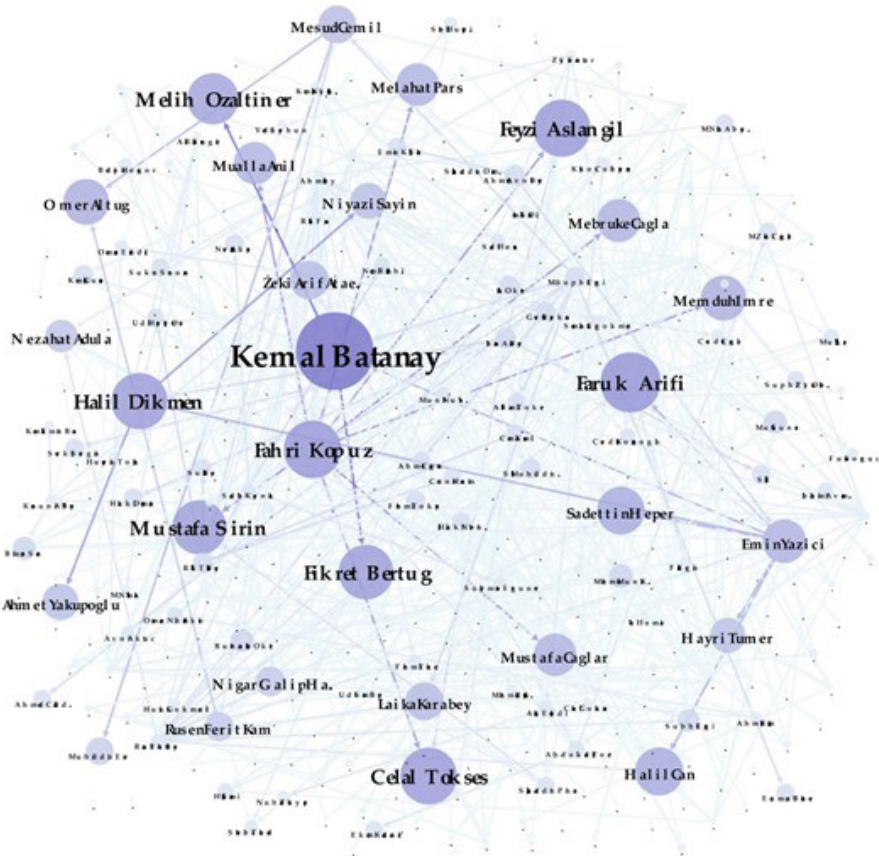


Figure 4: Eigenvector centrality shows 358 musicians (nodes) that were linked to each other by 492 edges.

Actors with more leading roles in the degree centrality, including Cemil Bey, Hüseyin Fahreddin Dede, Zekai Dede, and İsmail Hakkı Bey, are hardly in sight in Figure 4. However, since the algorithm operated on a different mentality that is more sensitive to the quality of the adjacent nodes in the structure, it brings new musicians to prominent positions, including Kemal Batanay (d. 1981), Faruk Arifi (d.?), Sadettin Heper (d. 1980), Fahri Kopuz (d. 1961), Celal Tokses (d. 1964) and Feyzi Aslangil (d. 1965). To elaborate some of those names, the reason why Kemal Batanay becomes a critical node in this layout lies in his relationship to actors many of whom held central positions in the network structure. Figure 5 illustrates that he has received music education from Ahmet Irsoy, Rauf Yekta Bey, Suphi Ezgi, Sheikh Cemaleddin Efendi, and Emin Yazıcı.¹⁹

19 Rona, *50 Yıllık Türk Musikisi*, 251-253; For a well-detailed account of his educational record in music that provides insights about innumerable actors and connections, see Muhittin Serin, *Kemal Batanay* (İstanbul: Kubbealtı Neşriyat, 2006), 18-23.

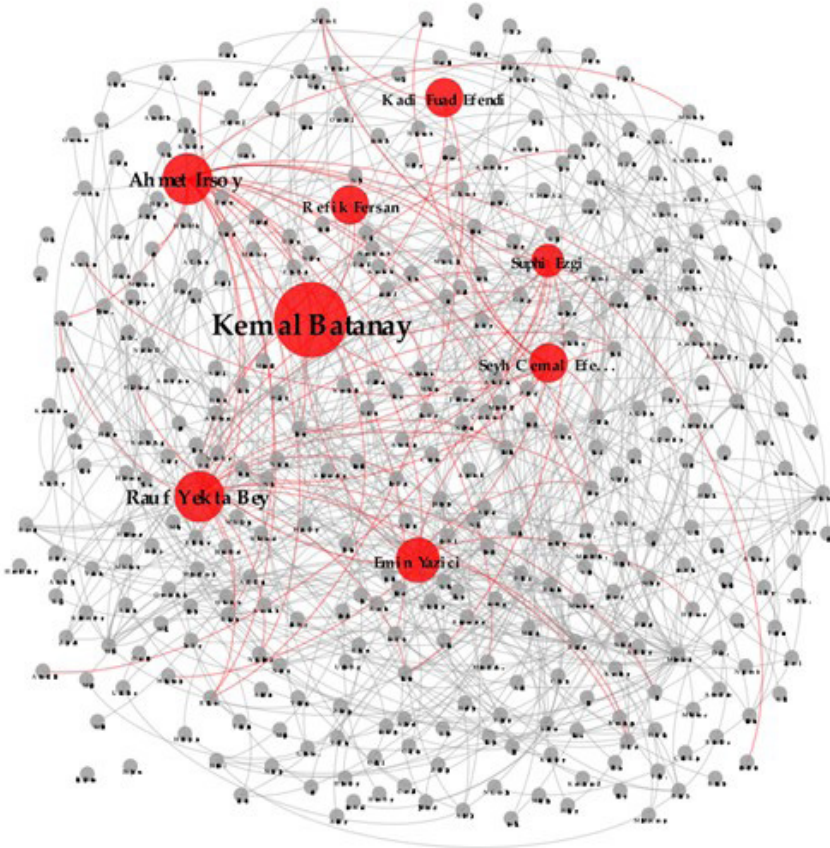


Figure 5: Eigenvector centrality layout for Kemal Batanay.

Similar to the case of Batanay, Faruk Arifi becomes pivotal due to the power of the actors to whom he was connected to. Ahmet Irsoy, İsmail Hakkı Bey, and Rauf Yekta Bey, were some of the names behind the musical refinement of Arifi whose high scores in degree and betweenness centralities are stated in Table 1.

The position of Cemil Bey should be noted as well. Although degree centrality score emphasized his expansiveness on the basis that he was a frequented music teacher, eigenvector centrality brings forward a different image of him. His introvert and self-sufficient personality seemed to be generated by the ways his students were connected to the broader structure. Table 2 reveals that his cluster formed an isolated network with a limited amount of interaction to the neighboring structures in the network. Interestingly, the cluster was one of the densely populated ones, however, many of its actors were in minimal contact with other nodes and structures (see Figure 6).

Table 2: Eigenvector centrality scores for the cluster of Cemil Bey

RANK	NAME	EIGEN. CENTRALITY
13	Fahri Kopuz	0.465663
22	Laika Karabey	0.386016
26	Bimen Şen	0.326604
47	İ. Hakki Nebioğlu	0.189561
61	Bedriye Hoşgör	0.142125
66	Fuat Sorguç	0.133625
69	Refik Fersan	0.126359
71	Mesud Cemil	0.120652
73	Faize Ergin	0.106429
77	Udi Sami Bey	0.092222
82	Şemsettin Ziya Bey	0.084956
88	Dürrü Turan	0.07075
97	Nevres Bey	0.056543
98	Reşat Erer	0.056543
99	Kadı Fuad Efendi	0.056543
110	Hikmet Bey	0.049277
111	Fahire Fersan	0.049277



Figure 6. Cemil Bey (the largest orange-colored node) and his students (orange-colored nodes)

CONCLUSION

Multifarious relation types, including family ties, friendship, education, professional responsibilities, and such phenomena, link people and generate the social system. Nevertheless, interactions should not be limited to actors who know each other. Some people might be in the same network and may be influenced by the same source without encountering or getting to know each other. The algorithm-based approach introduced a model to convert those innumerable past connections into an intelligible form and, hence, to make dynamic network structures researchable. Moreover, visual mapping brought invisible or yet unnoticed networks to the surface.

Focusing particularly on the channels through which musical knowledge was transmitted to one another offered a glimpse of the social milieu of musicians from the late nineteenth to the early twentieth century Istanbul. Digital maps produced via various algorithms Gephi has offered, names such as Zekâi Dede and his son Ahmet Irsoy, Ziya Bey, Rauf Yekta, İsmail Hakkı Bey, and Cemil Bey appeared as central figures in terms of sources of musical knowledge. The betweenness centrality highlighted different names as it searched for those that connected different parts of the network structure. Suphi Ezgi, Hüseyin Fahreddin Dede, Fahri Kopuz, and Emin Yazıcı were the names whose critical positions facilitated the circulation of musical information. Eigenvector measurement that prioritizes the adjacent quality score rather than the number of links a node has, Sadettin Heper, Fahri Kopuz, Feyzi Aslangil, Faruk Arifi, and Celal Tokses came to the forefront within the network structure. Eigenvector centrality also revealed the differences between main clusters as Zekâi Dede, Ahmet Irsoy, and Rauf Yekta Bey's clusters were more closely connected, and it may also be said that the transmission of knowledge between those parts of the network was more fluent. Although the number of links they had was not few and might compete with other populated clusters, Cemil Bey and İsmail Hakkı's clusters were considered to be the more isolated parts. The music education in those clusters seems to be more exclusive to the members. Maybe the reason was that the central figures were more dominant or comprehensive in their way of education. The last point regarding the network structure is that a "Mevlevî effect" has been the most obvious in each layout. Many of the central figures, as well as the musicians that interconnected the sub-clusters, were Mevlevîs.

To conclude, this study introduces the software Gephi and the capacity of its attributes to the Ottoman music historiography. The network thinking supported by the computational approach would reveal the social milieu of musicians as well as the links among them. The decoded multifarious connections of musicians and generated visual layouts might not only influence the studies of Ottoman musicians but could provide alternative perspectives to future digital studies on Ottoman urban society and its cultural networks.

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