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## 1. Introduction

In history, artists and composers have been enormously influenced by contemporary and previous generations of artists. For instance, it has been proven that Ludwig van Beethoven (1770-1827) was influenced by Wolfgang Amadeus Mozart (1751-1791) in numerous different ways such using a quotation from *Don Giovanni of Mozart* as the basis in the 22nd of the *Diabelli Variations* (Davison, 2018). Even though their meeting is still subject to debate, the influence of Mozart on Beethoven is not.

In our network, the nodes will represent the composers and the links between these composers are the influence network. For instance, if there is a link between node A and node B, that means that node A has influenced node B. The relation between two nodes is a directed one since the influence relation may only go in one direction. Additionally, to the directed network, a unique aspect of this kind of network is that our influence edges can only move forward and time and not backwards. In other words, Handel (1685-1759) from the Baroque period could not have been influenced by Mozart (1751-1791) from the classical period or by Brahms (1833-1897) from the Romantic period even though both artists were influenced by Handel.

This leads us to these following research questions

- 1) Who is the most influential composer of the Baroque, Classical, and Romantic periods?
- 2) Which composer(s) facilitates the transition of musical periods?
- 3) Whether the correlation exists between the number of notable works a composer created and the extent of that composer's influence?
- 4) Whether composers with a large number of notable works congregate in certain places?
- 5) Which places are representative of the Baroque, Classical, and Romantic periods?
- 6) Does a composer's age relate to the number of notable works created?
- 7) Does a composer's age relate to the extent of his or her influence?

To answer these problems, we are first going to analyze the context in which composers wrote their music, then describe our methodology for analyzing our composer network, later discuss our finding and finally our limitations.

## 2. Literature Review

Musical output by composers will depend on the historical context and constraints that were put in place during that period. Indeed, a quote from (Orth et al., 2017) illustrates this, “constraints define the space within which the movement system can act, placing boundaries on the movement solutions available”. Meaning that creativity depends as much on the single composer as the cultural, social, and historical environment (Orth et al., 2017, and Schiavio & Benedek, 2020). Furthermore, In the classical music industry, usually only the composer's name is associated with

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a score of music. However, music composer's social networks and interactions played an important role in the creation and influence of their work. McAndrew & Everett, 2014 analyzed the British network of composers and their success at Proms, and concluded that creative work will depend on one's interactions and environment. Further, periods and locations might favor the creation of hotspots of artistic work. Additionally, the accumulation of formal and tacit knowledge comes from peers and teachers (McAndrew & Everett, 2014). Social networks analysis adds value to understanding the position of each artist and their influence and that centrality and success have a correlation in determining success of the composers (McAndrew & Everett, 2014). Smith & Georges (2014) found that common or distinct sources of influence between composers increases or decreases their proximity in musical styles. On the other hand, this study only looked at musical influences in the first degree and has not analyzed the impact of additional attributes that might affect similarities between composers such as place of birth and quantity of notable works. Finally, "fluid integration of Persons (creators), Processes (thoughts and actions), Products (artifacts), and Press (cultural contingencies) in the creative musical moment" (Rhodes, 1961, and Schiavio & Benedek, 2020).

### 3. Musical History of the Baroque, Classical, and Romantic Periods

To be able to interpret and understand accurately the results, understanding musical history and context is key in analyzing influence and social networks of music composers. we had to go more into the history of this music. The history from these three periods allows us to understand why Beethoven is the most influential artist, or that Mozart influenced many other composers. Each of these was characterized by different tonality, sounds or instruments. The historical period also influenced what kind of music it was. The Baroque period (1600-1750) followed the Renaissance and therefore some of its characteristics are answers from what happened in the period previously. Compared to previously, the Baroque period had bigger ensemble sizes and new, non sacred, instruments were starting to be accepted such as the improved violin of Antonio Stradivari. Artists from the Baroque period were usually patronned and thus composed usually on demand. Compared to the Renaissance, a greater emphasis was put on player skill, this means that compositions were usually technically demanding. Additionally, the Baroque period was influenced by Italian music, Italian tempo and dynamics and many practices are still standard today such as Concertos, Sonata, and the Opera. One of the main elements that disappeared in the Baroque and were still present in the Renaissance were choirs, which evolved into orchestras. This period is mainly represented by J.S. Bach, Antonino Vivaldi, George Fredrick Handel, Arcangello Corelli, Claudio Montererdi and Henry Purcell (Law, 2011 and Liberty Park Music et al., 2019).

Classical music (1750-1830) was a reaction to the Baroque period's trend. While Baroque was complicated and emotions were a key part, music from the Classical period had singable melodies and emotions were secondary to form. From the middle of the 18th century to about a quarter of the 19th century, music was made mainly for the nobility and families with higher social status. Classical music was characterized by being much lighter and calmer as it was composed for

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wealthy families. It was also the emergence of public concerts and this increased the popularity of music. Furthermore, traditional practices of the Baroque period were codified and many rules in music were established. This period saw the emergence of groundbreaking composers such as Mozart and Schubert. At this point we are introduced to the most influential composer among these three periods, Ludwig van Beethoven, who ended the Classical era and moved into the Romantic era (Liberty Park Music et al., 2020a).

The Romantic period (1830-1900) was distinguishable by its highly expressive nature and its sensibility of emotions. Composers wanted to express what they felt through their works. Compositions usually broke the rules of form (classical), expanded instrumentation and it was tabou to recycle parts of scores as did Bach or Mozart. This also means that the number of works made by Romantic artists decreased compared to the other periods as they had to be original since emotions of a person were unique. Compositions during Romanticism became even more dramatic and usually ended tragically. The popularity of concerts increased and thus musical popularity followed. The industrial revolution made incomes higher and thus music in homes was more common than in the past. The Romantic period was also during numerous political revolutions which thought out to give more rights to individuals such as French revolution (1789), the revolutions of 1848, and the abolition of slavery (1865). Many impactful artists whose compositions are well known today emerged at that time. Artists such as Bizet, Chopin, Schumann, Wagner (Law, 2011, and Liberty Park Music et al., 2020b).

Having a preview of the history of these three periods we can see that each epoch introduced something new and unique to music. In each period music had a different purpose, context, environment, and audience. In addition to this, later artists influenced their music from previous periods. Each era brought great changes and were each characterized in an unique way, thus influence from one artist to another can be analyzed.

## 4. Methodology

### 4.1 Descriptive statistics

To attempt to find a solution we collected data from The *Classical Music Navigator* (Charles H. Smith, n.d). This dataset is a selection of the most important music composers of each period. We focused our attention on the three periods as mentioned above and collected data of 202 music composers to analyze. However, our network will be composed of more than 472 nodes, this is more than our original dataset because composers between the 17th and the 19th century have influenced artists from other periods that are not relevant to our research issue. Further, we compiled only the relevant variables and information to our final dataset. In this dataset, there are 8 variables: composer's name, origin, has been influenced by, has influenced, Period, Notable Works, Age (years lived) and Out-degree (the number of artists influenced). The influence

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variables of the whole website are based on a total of 20 000 opinions such as examination of biographical, analytical, and references sources (Version 1) but also further investigation of reference works, online dissertations, album liner notes and concert notes, and reviews (Version 2). The selection of the composers is also based on an objective selection process by combining 11 unweighted criteria by the creators of the dataset which can be found on the *Classical Music Navigator* website.

Because our study focuses on composers from three musical periods, namely Baroque, Classical, and Romantic periods, we compiled only the relevant composers to our final dataset. An edge list - a two column list of the two nodes that are connected in a network - is created first based on the influence relationships between composers in those three periods, with the first column being “From” (influencers) and the second column being “To” (influencees). Furthermore, the musical influence network is a directed network, which suggests that if composer  $i$  and composer  $j$  influence each other, there should be two rows in the edge list representing their influence relationships, namely from  $i$  to  $j$ , from  $j$  to  $i$ . If only composer  $j$  influences composer  $i$ , there should be only one row in the edge list, from  $j$  to  $i$ . When creating a vector of composers’ names after importing the edge list into R, R generates a completely new list of names, in a different order compared to the edge list. In order to add attributes of each composer later on in R, we compiled our attribute dataset based on the order in this vector list, which contains five variables, Name, Origin, Period, Notable Works, and Age (years lived).

The attribute Origin represents the place where the composer has lived for a majority of their life. Table (1) shows the frequency of each origin and the corresponding percentage.

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**Table (1):** Origin Frequency Summary

Origin	Frequency	Percentage (%)
American	6	3%
Austria	18	8.9%
Belgium	1	0.5%
Bohemian	6	3.0%
British	1	0.5%
Czech Republic	1	0.5%
Denmark	3	1.5%
English	7	3.5%
Finland	1	0.5%
France	42	20.8%
Germany	42	20.8%
Great Britain	5	2.5%
Hungary	1	0.5%
Ireland	1	0.5%
Italy	39	19.3%
Norway	1	0.5%
Poland	2	1%
Romania	1	0.5%
Russia	18	8.9%

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<b>Spain</b>	3	1.5%
<b>Sweden</b>	3	1.5%
<b>Total</b>	202	

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The attribute Period characterizes the time-period in which the composer has written his scores. Furthermore, the period of a musician also corresponds to the style of the music written. It is well known that each period has distinct styles and that the music from these periods represent the rules, innovations, and “star names” (BBC Music Magazine, n.d.). Table (2) reports the number of composers from each period and the corresponding percentage.

**Table (2):** Period Frequency Summary

Period	Number of composers	Percentage (%)
<b>Baroque</b>	56	27.7%
<b>Classical</b>	16	7.9%
<b>Romantic</b>	130	64.4%
<b>Other</b>	370	/

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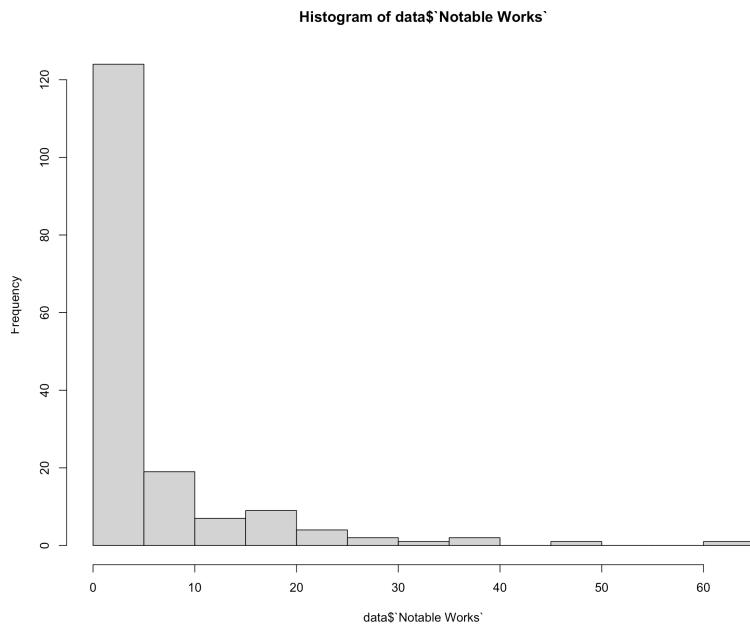
The attribute Notable Works corresponds to the works that are characterized as outstanding in the musical sense by the Charles H. Smith (n.d.) dataset. This would correspond to the “most famous” works by a composer. The basic descriptive statistics of Notable Works are reports in table (3) and figure (1).

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**Table (3):** Notable Works Statistics Summary

Notable Works	
<b>Mean</b>	6.094
<b>Standard deviation</b>	8.828
<b>Maximum</b>	63
<b>Minimum</b>	1

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**Fig. (1):** Histogram of Notable Works in the Composer Network

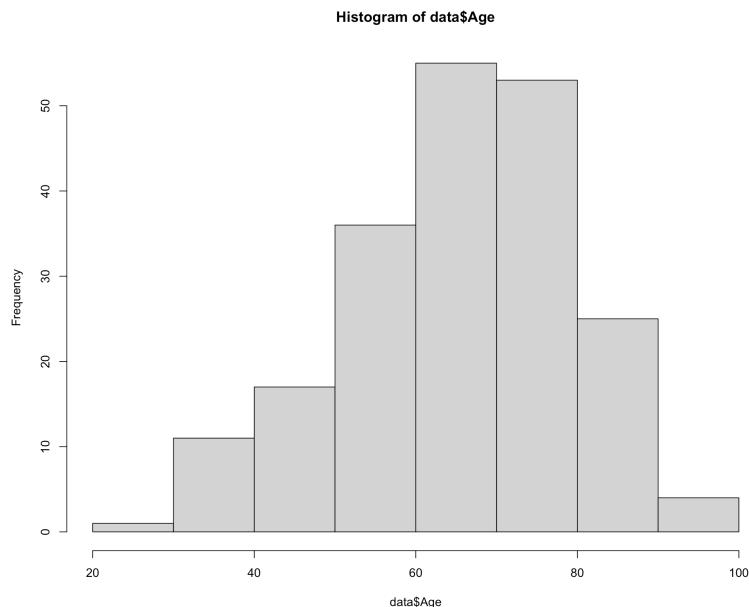
The attribute Age designates the number of years lived by each composer. The basic descriptive statistics of Age are reported in table (4) and figure (2).

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**Table (4):** Age Statistics Summary

Age	
Mean	55.698
Standard deviation	14.030
Maximum	96
Minimum	25

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**Fig. (2):** Histogram of Age in the Composer Network

## 4.2 Analysis plan

Our analysis plan will focus on two components, the network structure and characteristics, and the statistical analyses of attributes.

### 4.2.1 Analysis Plan for Network Structure and Characteristics

Identifying what the type of our composer-to-composer influence network is, will help us to have a general understanding of network characteristics. Specifically, we are interested in whether the network is small-world or scale-free. Followed by the network type, quantitative measures of the

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network remain significant in revealing further information about the network structure and key composers that may not be extracted from the initial edge list dataset.

From the centrality measures perspective, degree centrality measures the number of links a node has, here we emphasized the out-degree particularly. In our directed network context, out-degree measures the number of composers that a specific composer influenced, which can represent the extent of that composer's influence. Conversely, In-degree measures the number of composers that influenced a specific composer. On top of Degree Centrality, Eigenvector Centrality measures the importance of a node based not only on the number of links it has with other nodes, but also on the quality of these connections, and the number of links its connections have (Disney, 2020). Instead of looking at the direct relationships a composer has solely, a composer's extended connections help us to determine the extent of his or her influence on the network as a whole. Next, Betweenness measures the number of times that a node lies on the shortest path between other nodes, giving us a sense of which composers act as bridges in the network. Betweenness is extremely useful in finding out which composer facilitates the transition of musical periods. Another useful measurement would be Closeness, which calculates the average shortest path length between one node to other nodes. Closeness allows us to quickly find the composers who are the most influential in the entire network.

From the network structure perspective, the first measure taken is Network Density, which measures how closely knit the network is and is calculated by the ratio of actual edges to all possible edges. Given that the network is directed, we may also be interested in the Density of Reciprocity. The Reciprocity is calculated by the ratio of edges pointing in both directions to the total number of edges. To better understand to what extent that the composers tend to cluster together, global clustering coefficient gives an overall indication of the clustering in a network. Next, measuring the average path length gives us the most intuitive sense of the average distance of two random composers in the network. In addition, the Geodesic Path measures the shortest path between two specific composers in case there are composers of particular interest, such as JS Bach.

#### 4.2.2 Analysis Plan for Statistical Analyses of Attributes

Statistical analyses of attributes are intended as a tool to answer our attribute-related research questions in section 1. Furthermore, additional hypotheses derived from research questions (RQ) are tested along the analysis process.

In terms of RQ3, whether the correlation exists between the number of notable works a composer created and the extent of that composer's influence, a correlation analysis is performed. In terms of RQ4, whether composers with a large number of notable works congregate in certain places, the derived hypothesis that origin has an impact on the number of notable works is of interest. To compare the means of notable works among 21 origins, a One-Way ANOVA analysis is performed. In case some of the origin means are different, a multiple pairwise-comparison allows us to find

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out which pair of origins have different means. In terms of RQ5, which places are representative of the Baroque, Classical, and Romantic periods, by finding out which origin accounts for the largest share in each period separately, the distributions of origin will give an adequate answer to this question. In terms of RQ6, does a composer's age relate to the number of notable works created, a correlation analysis is performed. To test the derived hypothesis that a composer's age has an effect on the number of notable works, a single regression is performed. In terms of RQ7, does a composer's age relate to the extent of his or her influence, a correlation analysis is performed.

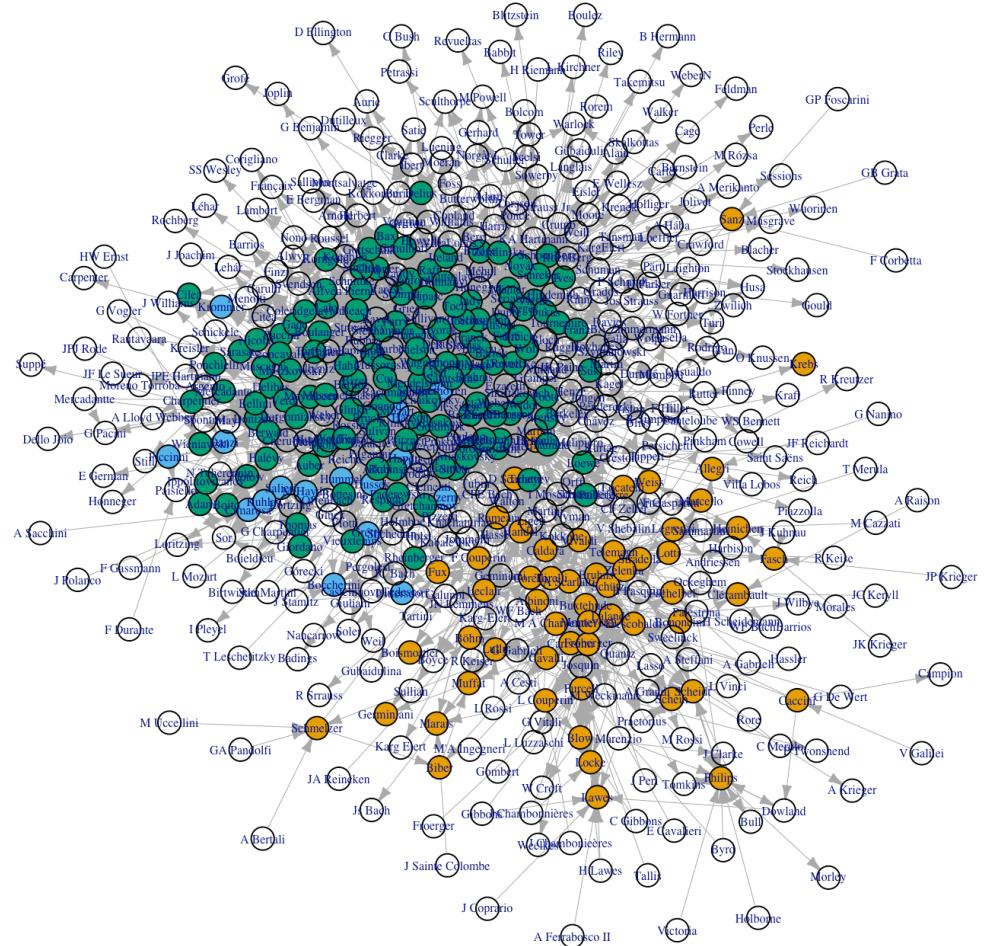
Two hypotheses are derived from RQ3 and RQ7, which are whether the number of notable works/a composer's age have an effect on the extent of his or her influence. However, considering the serious collinearity problem between the extent of influence and the number of notable works, we decided to run a multiple regression instead of two separate single regressions, with notable works, age, and origin as independent variables and out-degree as dependent variable, to mitigate the collinearity problem.

## 5. Findings and Discussion

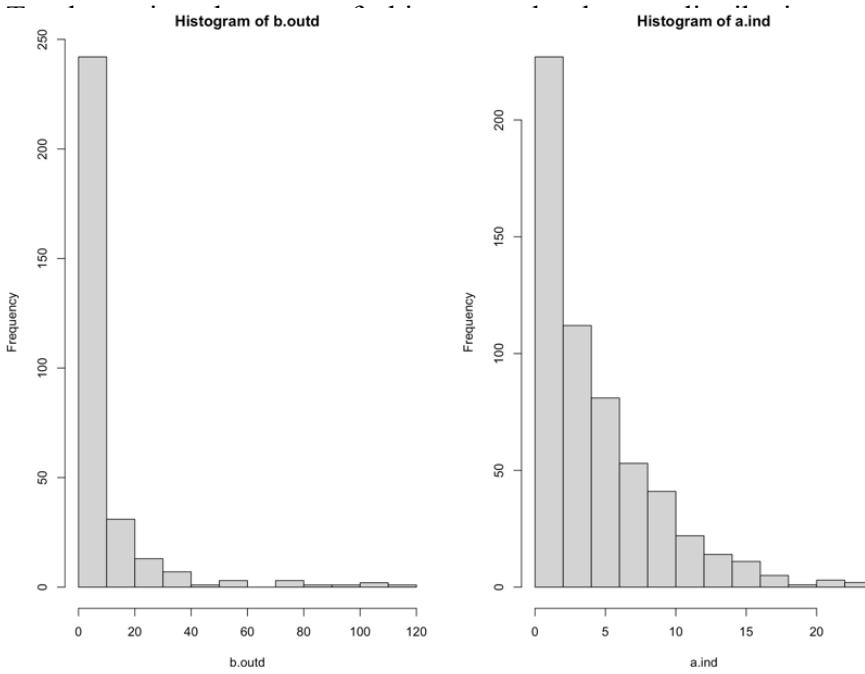
In this section we will discuss the results that came along with our study. Referring to history, we will also delve into and interpret the results to fully understand them.

### 5.1 Network Structure and Characteristics

Figure 3 shows the composer-to-composer influence network with node color based on period. Other networks with different notations are presented in Appendix.



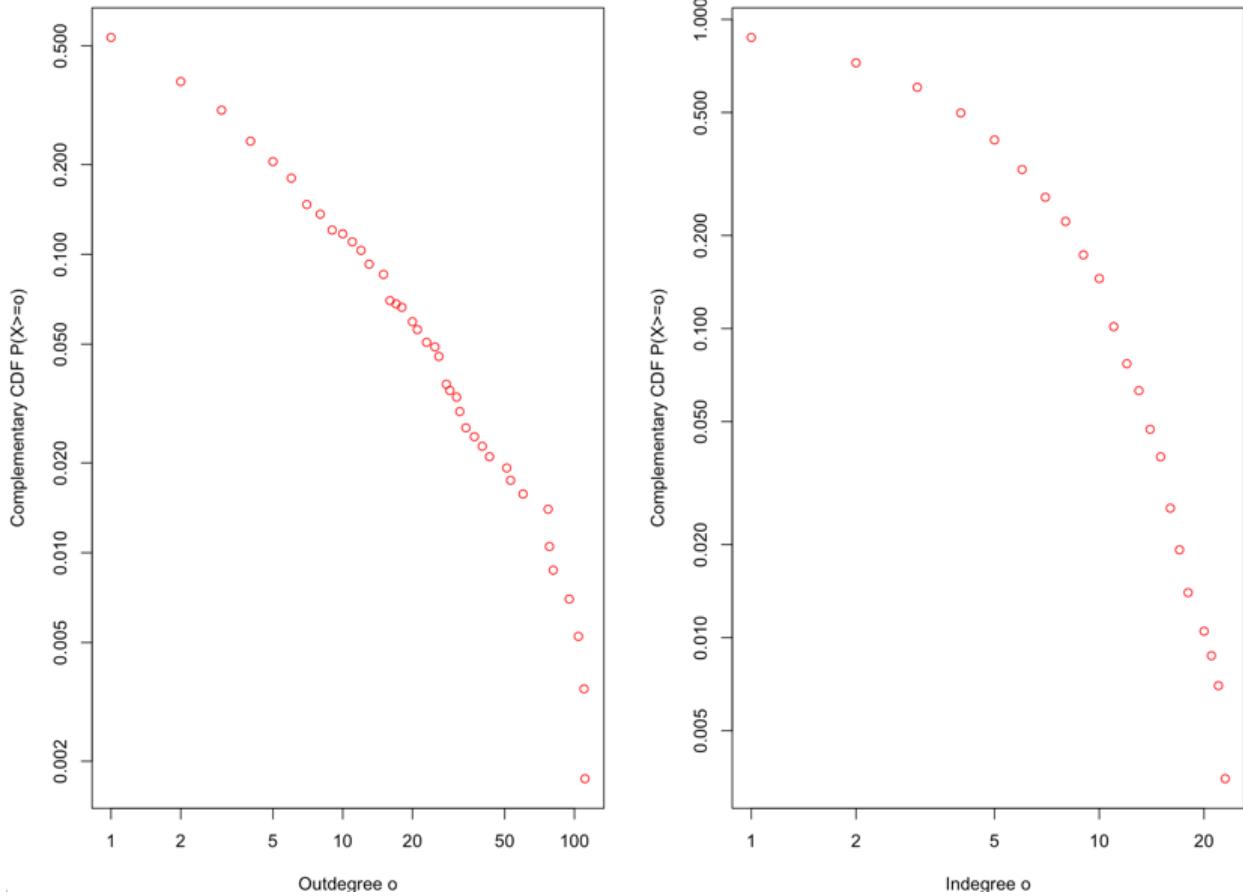
**Fig. (3):** Network of Composers with Node Color Based on Period (Orange=Baroque, Blue=Classical, Green=Romantic, No Color=Other)



**Fig. (4)** Out-degree Distribution and In-degree Distribution

The distributions of both Out-degree and In-degree of our network are highly skewed to the right, indicating that a considerable number of composers have a few influence relationships with other composers, while only a small number of composers have more edges with others. This leads to our first assumption about the type of network— scale-free. To further verify this assumption, complementary cumulative distributions allow us to make a better judgment.

des valuable information.



**Fig. (5)** Complementary Cumulative Distributions of Out-degree and In-degree

By plotting the probability of observing a certain degree level that is larger than the particular degree level  $o$ , we can find out how often a random composer has a degree level above this particular one. Most importantly, with the downward sloping long tails in both distributions, we may conclude that the out-degree and in-degree distributions follow a power law.

Starting with centrality measures, firstly, we consider out and in-degree. Here we focus mainly on Out-degree, which shows us the number of composers that a musician has influenced. Given the results, we can observe that J.S. Bach has influenced the largest number of composers with 111. Knowing already that our network is directed, we can observe that from the Baroque period J.S. Bach had the most influence on other musicians, in the Classical period it was Beethoven, and in the Romantic it was Wagner who influenced the greatest number of composers. All three of these artists are world renown today, thus this might not be surprising. However, what is interesting is that Bach was able to be the most influential artist when in fact most of his work was re-discovered by Mendelssohn after his death in the 18th century.

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**Table (5.1):** Out and In-Degree Statistic Summary

	Statistic	Corresponding node
Average out-degree	4.666084	-
Average in-degree	4.666084	-
Max out-degree	111	JS Bach 72
Max in-degree	23	Multiple

**Table (5.2):** Maximum Out-degree in each period

Max out-degree in each period	Corresponding node	Out-degree
Baroque	JS Bach	111
Classical	Beethoven	104
Romantic	Wagner	110

Returning to the analysis, more data is needed to understand what relationships and influences the composers have on each other. The betweenness allows us to understand which composer facilitates the transition of musical periods. Betweenness also tells us how many times a node (in this case a composer) lay on a given track. From the results, we found that Bach had the highest betweenness, followed by George Frideric Handel and Wolfgang Amadeus Mozart. The great musical achievements of Bach and Handel marked the peak of Baroque music, but also marked the end of the Baroque era. Soon, it was the 18th century. During this time in Europe, humanism and rationalism prevailed, and the Enlightenment movement was in the ascendant. During this period, public concerts are attracting new audiences. The Rococo style and chic style from France gradually replaced the complicated and gorgeous Baroque style. It was not until around 1750 that a new style of music, distinct from the Baroque, was formed, which was dubbed "Classicism" because of its emphasis on form and balance (Music Unbounded, 2019)

**Table (5.3):** Beetweeness Statistic Summary

	Statistic	Corresponding node
Max betweenness	22071.08	J.S. Bach 72
2nd highest	11786.85	Handel 22
3rd highest	11549.18	Mozart 126

By measuring Closeness, we were able to quickly find the most influential composers in our network. The results showed that John Coprario, Alfonso Ferrabosco II and Anthony Halbore were at the top of our network. The top 3 when it comes to Closeness are composers who were still alive

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during the Renaissance and lived into the Baroque era. However, these links do not give us the complete picture. Based on the number of links, we are unable to understand how strong the connections between these composers are and how strong an influence one composer had on another.

**Table (5.4):** Closeness Statistics Summary

	Statistic	Corresponding node
<b>Min Closeness</b>	0.0004418913	J Coprario
<b>2nd highest</b>	0.0004418913	A Ferrabosco II
<b>3rd highest</b>	0.0004428698	Holborne

Eigenvector centrality allows us to understand that it is not only the number of edges that defines a composer as the most influential, but also the quality of these edges. The results show completely different names from previous results. Beethoven appeared in first place. Apart from him, we see such names as Wagner, Liszt, Mozart, Chopin, R Schumann, and J.S. Bach. Although J.S. Bach is considered to be the most influential composer in terms of out-degree, he only has the 7th highest eigenvector value. This means that although Bach has the most edges with other composers, the quality of these edges is inferior. Besides, the number of edges that Bach's connections have is also lower compared to Beethoven, and even lower than the other 5 composers.

**Table (5.5):** Eigenvector Statistics Summary

	Statistic	Corresponding node
<b>Average eigencentrality</b>	0.09441959	
<b>Max eigencentrality</b>	1.0000000000	Beethoven
<b>2nd highest</b>	0.9973582426	Wagner
<b>3rd highest</b>	0.9171866632	Liszt
<b>4th highest</b>	0.8824832207	Mozart
<b>5th highest</b>	0.7919221887	Chopin
<b>6th highest</b>	0.7652035898	R Schumann
<b>7th highest</b>	0.7603954798	JS Bach

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The Network Density is at the extremely lower edge of the (0,1) range of 0.00817, which means that there are only 0.817% of edges that actually exist in our network. This may be due to the missing edges between composers that were influenced by other periods that we investigate. In addition, composers from previous generations can influence future generations, but they cannot impact past generations. These two factors lead to a low level of actual edges in our network compared to all possible links, which in turn led to a low density. The density of reciprocity is 0.0472, which means there are 4.72% of edges pointing in both directions. Thus, we can assume that the influence network between composers is not an exchange but mainly a one-way relationship, since over 90% of influences between composers are singular. However, the problem of missing edges mentioned previously will also play a role in getting a lower density of reciprocity. The global clustering coefficient is 0.1454955, which is calculated as the average of the local clustering coefficient of all composers. Compared to the highest and the lowest local clustering coefficients of 1 and 0 in our network, an average of 0.1454955 is at the lower edge of (0,1) range. We conclude that the composers in our network do not always cluster together. The average path length is 3.311747, which indicates that the average distance between any two composers is 3 or 4. Compared to the famous six degrees of separations, we infer that the average distance between composers is pretty close, composers can reach each other quickly. This number might have been even closer in real time since composers could maybe reach others through other social contacts such as painters, writers, or patrons. Lastly, the geodesic path measures the shortest path between two nodes. In this case, we have J.S Bach as the target because he is the most influential composer in the network with the third highest number of notable works (40) behind Mozart (62) and Beethoven (48) and also the highest number of out-degree (72). Undoubtedly, Bach had one of the biggest influences on music and he had a significant impact on other composers and the history of music, and we are interested in how quickly a composer can reach Bach. For example, the Geodesic path between Bach and Loeffler is 3 (JS Bach-Debussy- Scriabin-Loeffler).

**Table (6):** Network Structure Statistics Summary

Network Density	Reciprocity	Transitivity	Average Path Length	Longest Path Length
0.008171776	0.04720869	0.1454955	3.311747	11

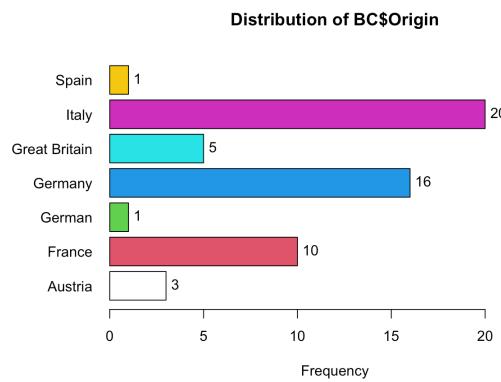
## 5.2 Statistical Analyses of Attributes

The correlation between Notable Works and Out-degree is significantly positive at 0.792, which means that these two variables move in one direction. In other words, to answer RQ3, when Notable Works increases, Out-degree will tend to increase as well.

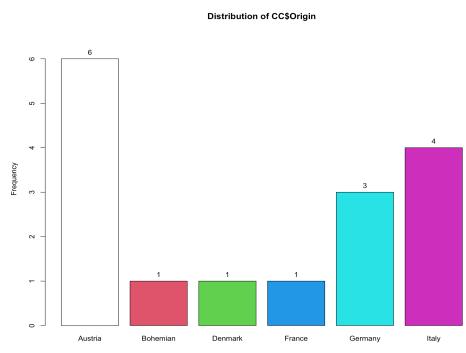
One-way ANOVA is performed to compare the means of Notable Works among 21 Origins. A very high p-value of 0.515 suggests that we fail to reject the null hypothesis that the means of

Notable Works in 21 Origins are the same, this allows us to answer RQ4 that there is no sign in which composers with a large number of notable works will congregate in certain places.

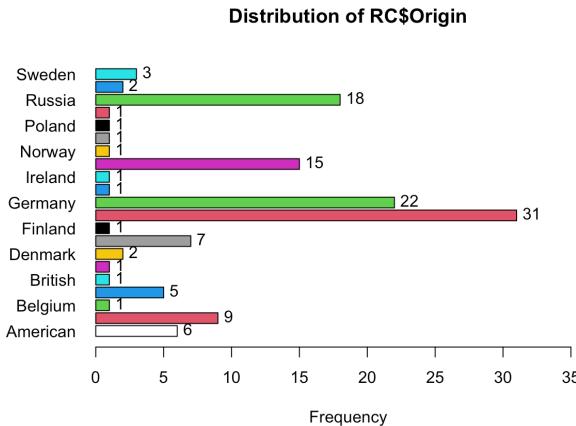
As we might infer, France is the representative country in the Romantic period, the Period may also interact with Origin. In our dataset, the representative Origins in each period are different. In the Baroque period, 35.7% came from Italy, 28.6% from Germany, and 17.9% from France. This makes sense since most of the musical influence of the Baroque period came from Italy and its Opera culture (Liberty Park Music et al., 2019). Compared to 37.5% of Austrians, 25% from Italy, and 18.8% from Germany in the Classical period. In the Romantic period however, France took over as the dominant nation and had 23.8% of the most important composers, Germany had just below 27%, and in third comes Russia with 13.8% of the most important composers in the Romantic period.



**Fig. (6.1)** Distribution of Origin in the Baroque Period



**Fig. (6.2)** Distribution of Origin in the Classical Period



**Fig. (6.3)** Distribution of Origin in the Romantic Period

The correlation between Notable Works and Age is insignificant at -0.124. This suggests that there is no significant correlation between Notable Works and Ages, and even if there is, these two variables are moving in different directions. The simple regression results yield an age-coefficient of -0.07708, with a p-value equals 0.10669. We conclude that age does not have a significant effect on the number of notable works. Besides, the correlation between Out-degree and Age is insignificant either.

For convenience, a summary table of correlation analyses is reported below.

**Table (7):** Summary of Correlation Analyses

	Correlation	p-value
<b>Notable Works &amp; Out-degree</b>	0.7922108	< 2.2e-16
<b>Notable Works &amp; Age</b>	-0.1241673	0.1067
<b>Out-degree &amp; Age</b>	-0.06145359	0.3849

To test the remaining hypotheses, a final multiple regression is performed with Out-degree against Notable Works, Age, and Origin. Origin = Baroque is taken as the baseline, and two dummy variables are conducted: *dummyC* and *dummyR*, which indicates the Classical period and the Romantic period respectively. The coefficients table from SPSS is presented below.

Model	Coefficients <sup>a</sup>					
	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1	(Constant)	.426	4.168		.102	.919
	dummyC	-5.232	3.411	-.073	-1.534	.127
	dummyR	-3.395	1.904	-.084	-1.783	.076
	Age	.047	.060	.034	.781	.436
	NotableWorks	1.878	.102	.815	18.447	.000

a. Dependent Variable: Outdegree

Fig. (7) Coefficients table of Multiple Regression from SPSS

While Age and dummyC are insignificant, Notable Works is significant at 1%, and dummyR is significant at 10%. We may conclude that notable works have a significant positive effect on out-degree. However, being a composer from the Romantic period has a significant negative effect on out-degree. This result makes intuitive sense, because the Romantic period came after the Baroque and the Classical period, composers from the Romantic period cannot influence composers from the previous periods, and they have less time to propagate their influence over the whole network.

## 6. Conclusion and Limitations

The aim of this paper is to analyze the network characteristics and the influence of music composers during three key periods of music, the Baroque, Classical, and Romantic period. In our scale-free network, centrality measures results show that J.S. Bach is the most influential artist in terms of Out-degree and Betweenness. However, in terms of eigenvector centrality, Beethoven has more influence. This shows that Beethoven has more influence in the whole network in terms of extended connections compared to Bach who has more influence on singular composers. Furthermore, certain origins are more prone to higher influences in different periods. This is due to the fact that each period had its own characteristics and input from certain countries, for instance the Baroque period was highly influenced by Italian culture and music. Lastly, we observed that the Baroque and Classical periods were more susceptible to influence composers compared to the Romantic period. This might be due to our focus on three periods. Overall, we have found that music composers rely heavily on other's influence to create their own work and usually a few key figures of each period distinguish themselves to have the most impact on future works.

### 6.1 Limitations

Future research could elaborate on the influence of composers. We only analyzed three periods and 202 composers from them, this means that we haven't looked at the preceding and following periods. This can therefore provide additional information on the influence of artists on future generations and following periods.

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Furthermore, regarding the serious collinearity problem between Out-degree and Notable Works, the best solution is to run out-degree against the number of works. However, due to time constraints, we were unable to collect the complete data on the number of composers' works, and the only available data of composer's work on the *Classical Music Navigator* is the number of notable works, which we could only perform the regression with collinearity. Further analysis could examine whether the number of works, age, and origin have an effect on the extent of a composer's influence.

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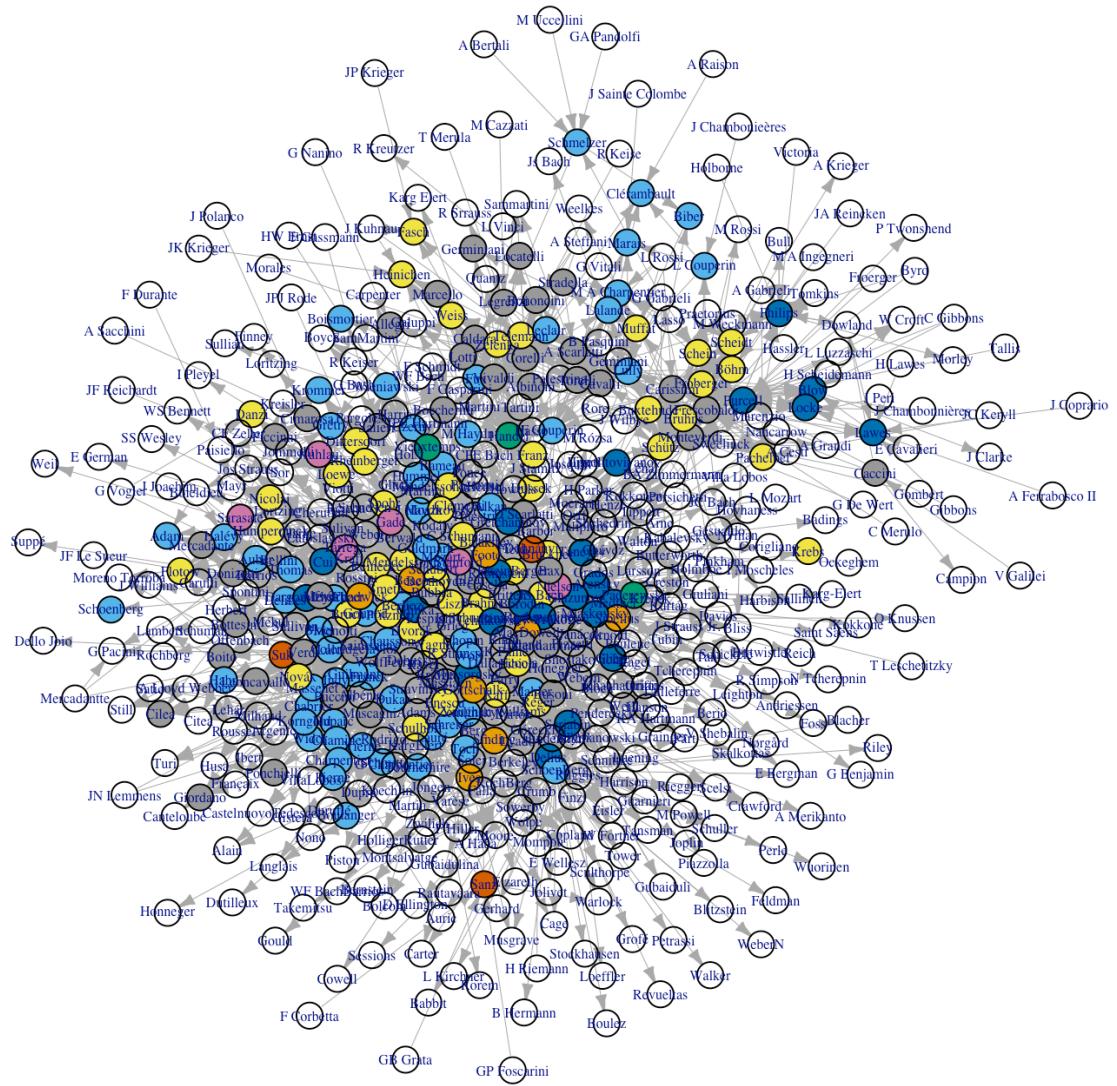
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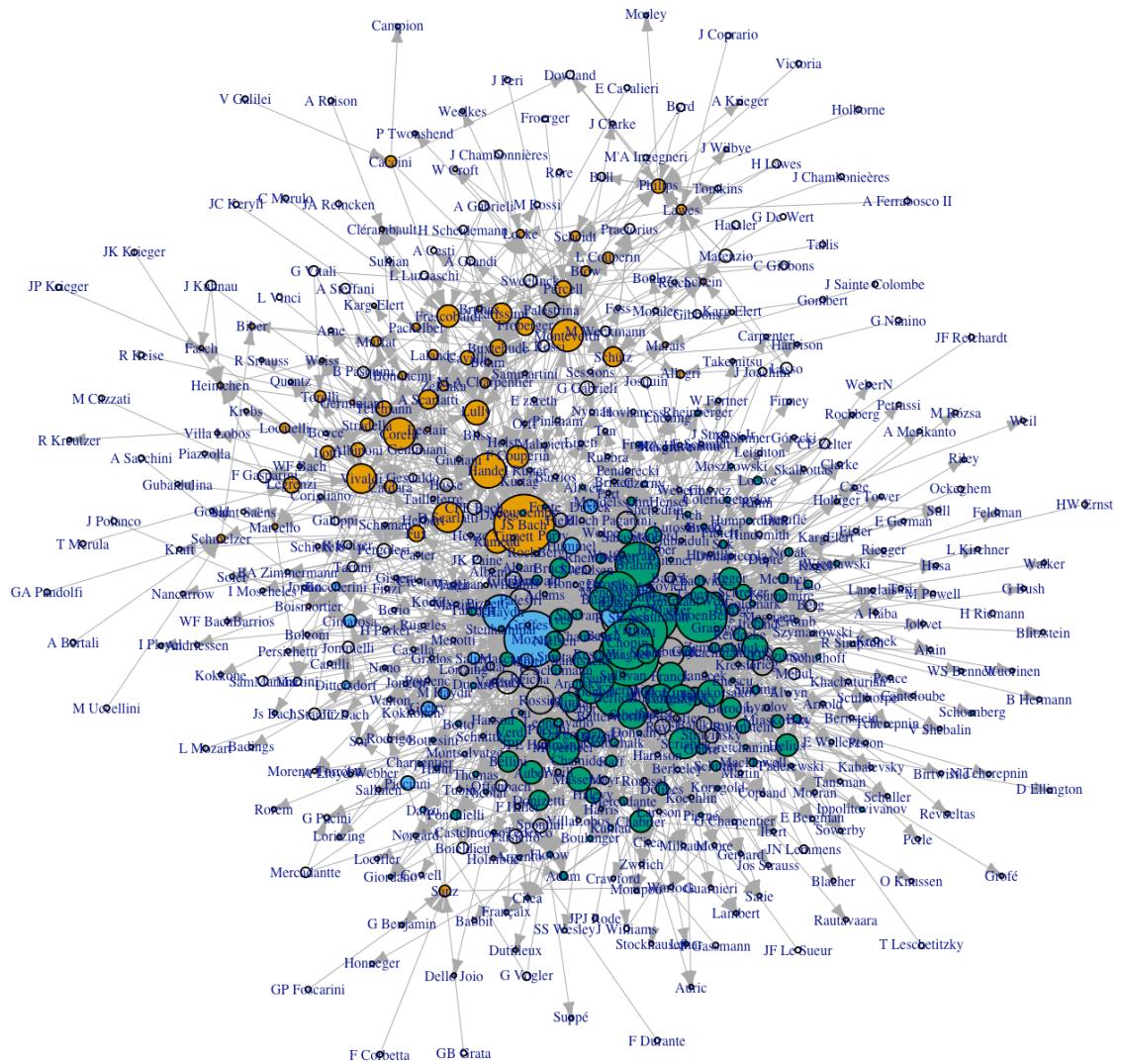
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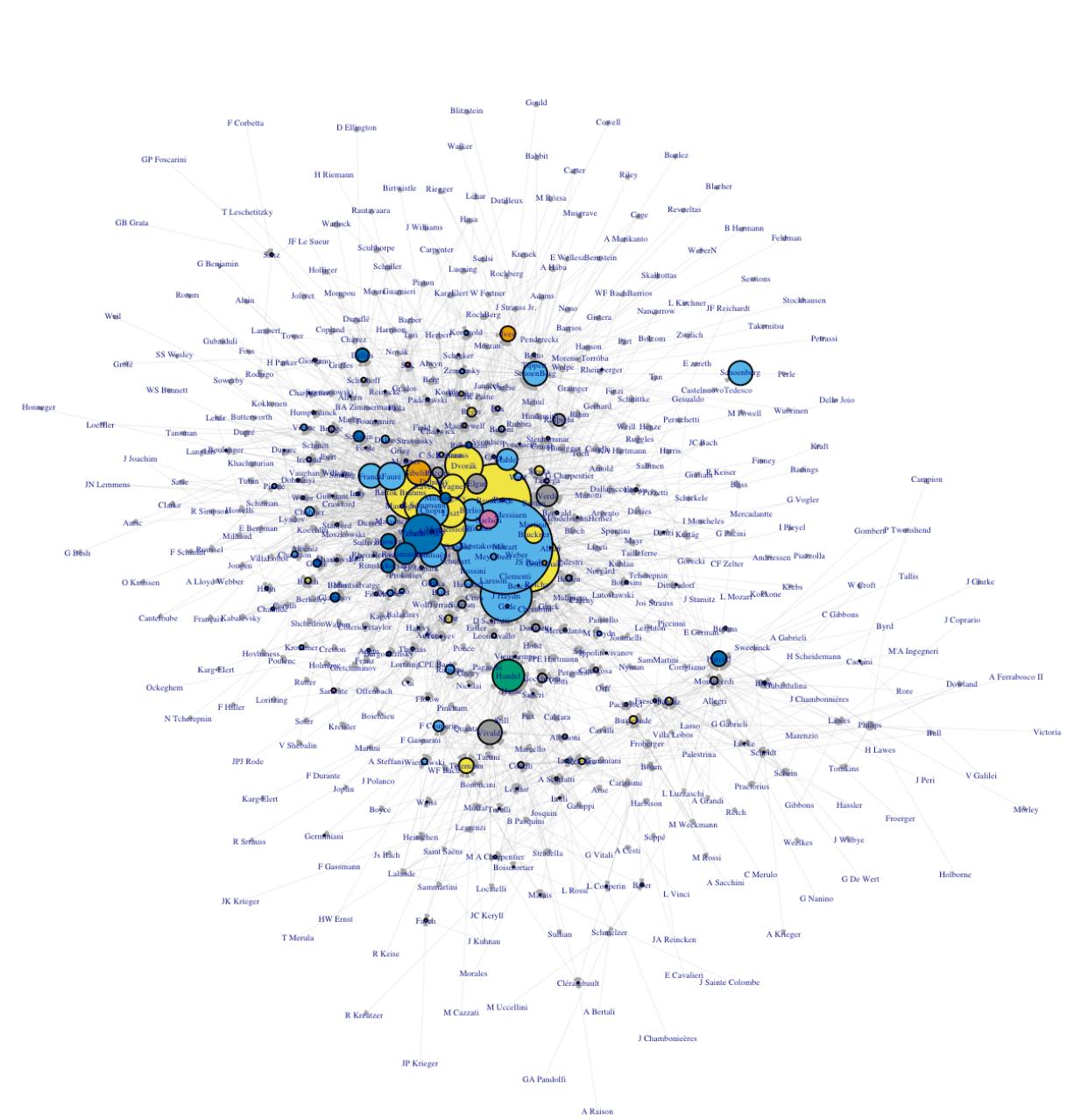
## 9. Appendix



## Appendix 1: Network of Composers with Node Color Based on Origin



## **Appendix 2: Network of Composers with Node Size Based on Out-Degree**



**Appendix 3:** Network of Composers with Node Size Based on Notable Works