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The Quest for Origins
Academic Filiations in the *Studium Parisiense* Database

The *Studium Parisiense* database contains the prosopographical records of more than 20,000 members of the schools and the University of Paris between the twelfth and sixteenth centuries. It thus enables us to carry out a wide-ranging analysis of relations between masters and students within the Parisian studium. The network of relationships thus reconstituted provides a considerable amount of information: 1,969 individuals, 2,743 links, and 2,750 nodes. The hierarchical approach, using simple indicators of centrality (degree, betweenness, PageRank), enabled us to qualify the social prestige of individuals by highlighting lesser known but socially central figures. By combining quantitative and qualitative analyses, this study offers a more nuanced view of academic filiations at the University of Paris, while providing statistical validation for the empirical hypotheses that had been formulated by historiography.

Keywords: digital humanities, medieval prosopography, social network analysis, University of Paris

The University of Paris was one of the largest and most famous centres of higher education in the medieval West, attracting scholars from all over Latin Christendom. Born of the mutation of the Parisian schools at the turn of the twelfth and thirteenth centuries, this educational institution defined itself as a corporation of masters and students, an 'universitas magistrorum et scolarium'. Analysis of the social networks that emerged from master-student relationships is therefore essential to understand the workings of the Parisian studium and, more generally, the medieval university system.

To do this, we have at our disposal a unique research tool in the form of the *Studium Parisiense* database.[1] This computerised database contains the prosopographical records of more than 20,000 members of Parisian schools and faculties between the twelfth and sixteenth centuries, making it the largest collection of biographical data on the teachers and students of a medieval university. This database is of course structured according to a uniform questionnaire, but it is written in natural language, as the text of the entries is indexed using an internal tagging system, which offers greater adaptability to the diversity of historical sources. Lastly, it is a bio-bibliographical database, with biographical data supplemented, for Parisian authors, by a list of their works and the manuscripts that contain them, which makes it possible to reflect the dual nature of the University of Paris, as both a place for the production of knowledge (*studium*) and a social institution (*universitas*). This knowledge base has already been put to good use, revealing the socio-economic role of Parisian colleges and reconstructing an informal but very real group of mathematicians at the University of Paris.[2] This type of investigation can therefore be applied perfectly to the question of academic filiations.

Statistical analysis of the thousands of items of data in the *Studium Parisiense* database is a challenge in itself, as the networks of master-student relationships have never before been the subject of such an extensive study for the medieval period. Putting together a series of indications of relationships and, above all, displaying them in the form of graphs, linking individuals in pairs, is also of undeniable heuristic interest, as the large-scale application of network analysis tools enables unexpected patterns to be discovered which, although undetectable to the naked eye, nonetheless reveal underlying structures. To carry out this study, we will first present the conditions of network production, before considering the traditional indicators of social network analysis, in order to identify the academic filiations in the *Studium Parisiense* database.

1. Network production conditions

The social networks recorded in the *Studium Parisiense* database are of different kinds, each offering a particular depth of analysis. Inter-individual relationships, when clearly indicated in the sources or rigorously deduced, are recorded in the database. Family, professional, and economic links, as well as academic filiations, are all recorded. Using information to identify social relationships is not new; it is one of the dimensions of prosopography, and this approach is quite closely linked to an approach that seeks to understand

[1] For a presentation of the project, see: GENET – IDABAL – KOUAMÉ – LAMASSÉ – PRIOL – TOURNIEROUX 2016. The database is available online: http://studium-parisiense.univ-paris1.fr/

[2] See: GENET – KOUAMÉ – LAMASSÉ 2021 and the paper of T. Kouamé and S. Lamassé at the international Heloïse conference *L'Europa delle Università: contesti comuni e peculiarità locali attraverso l'esame delle fonti (origini – XX secolo)*, Università di Bologna, 29-30 March 2021: 'Les mathématiciens à l'université de Paris au Moyen Âge (XII^e–XV^e siècle): tentative de reconstitution d'un groupe de savants'.

environments and identify trajectories. These links make it possible to systematically compare the files and improve the quality of the information, where possible, but also to test and deepen certain knowledge about the University of Paris and how it operates.

However, identifying individuals in a relationship is not so simple, particularly as there are always ambiguities inherent in gathering this information. The relationship is often inferred and rarely explicitly stated, and the facts indicating these relationships are never entirely certain. For example, the fact that Guillaume d'Oresme was Nicole Oresme's brother is a likely inference. As far as we know, there does not seem to be any direct evidence of this in the archives. It should be borne in mind that biographical notes drawn up by historians, or even sociologists, are always constructions. From a certain point of view, this weakness is not a weakness, because it allows the prosopographer to move towards a more precise formalisation of his investigation by increasing his rigour in relation to the object he is constructing and to take his sorting and statistical analyses as hypotheses addressed to his volume of data.

In our presentation, we focused on academic filiations. Eventually, we would like to consider all inter-individual relationships by integrating a more in-depth analysis of careers, in order to make use of possible relationships as well. In fact, if master-student relationships are directed, the capture of information contains a fundamental ambiguity. While we always know that a person (the one in the file under consideration and who has an identifier number) has an educational relationship with 'someone else' (individual B), this 'someone else' is never precisely identified, i.e. there is no identifier for him or her. The relationship is generally indicated in the following way:

A is the master of B for year *x* and degree *y*

As we can see, the relationship information is quite rich: it is often dated, and the degree is often indicated. However, the authors of the database did not decide directly on the relationship, even if this is sometimes done in a more implicit way by introducing symmetrical information in the record of the 'someone else' (individual B). However, given the uncertainties of medieval anthroponymy, this means accepting that we can never be certain of the identity of this person. Each time, therefore, we have to carry out an investigation which leads us to consider the individuals as candidates for identification. From then on, the database takes on a new interest, as it constitutes our experimental space. It covers the most complete group of Parisian academics that we know. It is therefore the most likely place to find individuals. However, the idea of using the database as an endogenous standard, a source in which the individual in the relationship can be found, is attractive but does not provide any more certainty. The absence of a predefined identifier for individual B might seem problematic, but this choice underlines the fact that academic filiations are possible constructions and not absolute certainties.

A number of operations had to be carried out on the data before it could be analysed. *Studium Parisiense* is in fact a textual database, where researchers are given a great deal of freedom to enter data. For example, as far as the academic filiation is concerned, the direction is not really fixed, so we had to make a number of transformations.

When it was registered	We have modified
student of master …	His master is …
His student is …	Master of …

Identifying a candidate in the database is the most difficult operation. Either the symmetrical information is known: we know that one person is the master of another, as, for example, Adolphus de Werda whose master is Henricus de Kempen for the bachelor's and master's degrees in 1355, and the Henricus de Kempen record indicates the reciprocal link. Or we only know part of the relationship.

In the same way, the textual model of the database encourages the researchers who enter the information to make it denser: the database records that Albertus de Saxonia was the master of Gobelinus de Kempen for the bachelor's degree in 1352, as well as for the licenciate and master's degree in 1354. In this case, we created a line for each diploma, which enabled us to compare it with the rest of the information in the record to complete the degree and, much more rarely, the discipline.[3]

When we did not find any candidates for identification in the database, we assigned a new identifier, artificially creating a record. Thus, out of a total of 1,969 individuals, 627 were not identified. We checked for ambiguity between several candidates by verifying temporal plausibility. For individual A, the temporality of individual B had to be included or overlapped. The difficulty lay in the fact that, in order to reduce uncertainty, we would have had to check a large number of data and redo the survey path for each individual.

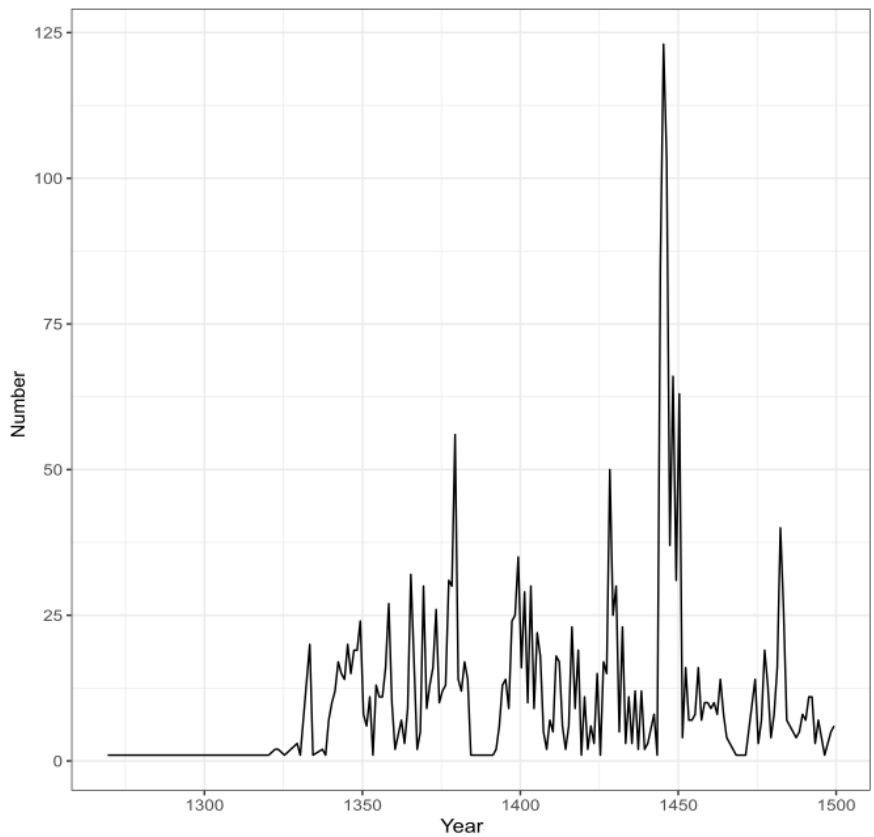
The resulting graph consists of 2,750 nodes and 2,743 links, but in fact there are a multitude of small components involving 769 nodes (27%) and 528 links (19%). These educational relationships are small, detached relationships in which neither individual A nor individual B can find matches in the database. Of these small components, 700 have a degree of less than two.[4] The largest related component is made up of 1,981 nodes and 2,215 links. We can therefore observe 80% of the links and 72% of the nodes, i.e. a significant proportion of the relationships. Obtaining such a graph with such heterogeneous data is very surprising, and some of the links undoubtedly come from the reconciliations we have had to make on the basis of names alone, and this will influence the hierarchies we observe.

[3] The three variables used to document the relationship are unevenly filled in: degrees have 42% unknown values, years of graduation 38.6% and disciplines 80%.

[4] These cases bear witness to existing relationships, and the survey should provide us with more information.

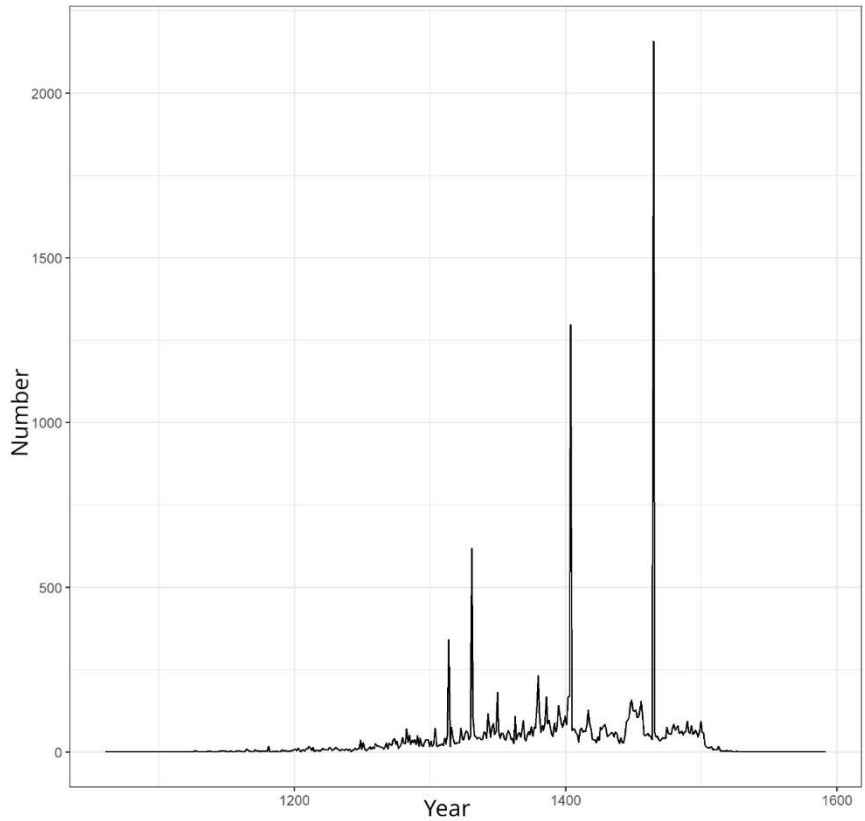
The first observation over the long term is that the year of the educational relationship is relatively well documented, at least better than might have been feared (Figure 1). The first relationships identified date back to the twelfth century, but they have not been represented on this graph. There is better documentation from the beginning of the fourteenth century, and there are a few structural gaps that may explain the less dense relationships: 1364–1368, 1384–1392, 1438–1442, 1464–1474, and then after 1491.

Figure 1: Temporal distribution of master-student relationships in the database



On the other hand, if we look at the more general curve of the distribution of the total population of the *Studium Parisiense* database, we find some spikes, which reflect exceptional moments of documentation, such as the list of 1464 (Figure 2).

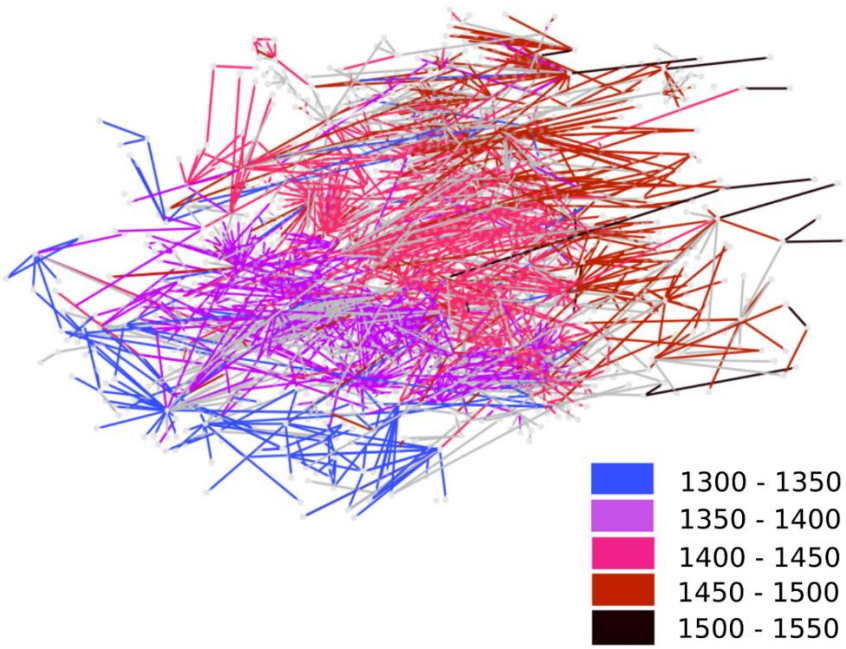
Figure 2: Temporal distribution of all the records in the database



We tried to group together all the links for which the year is given, by 50-year generation. This is an artificial division that, when projected onto the graph, shows the earliest periods on the left and the very late Middle Ages on the right (Figure 3). Temporality highlights two useful phenomena for the prosopographer. The first concerns inconsistencies in the data, insofar as links sometimes establish relationships between men who are more than 60 years apart.[5] The second phenomenon concerns chronological continuity and the possibility of observing a number of filiations over an extended period of time. As far as we know, such phenomena have never before been identified on this scale, for such a large population and over such a long period.

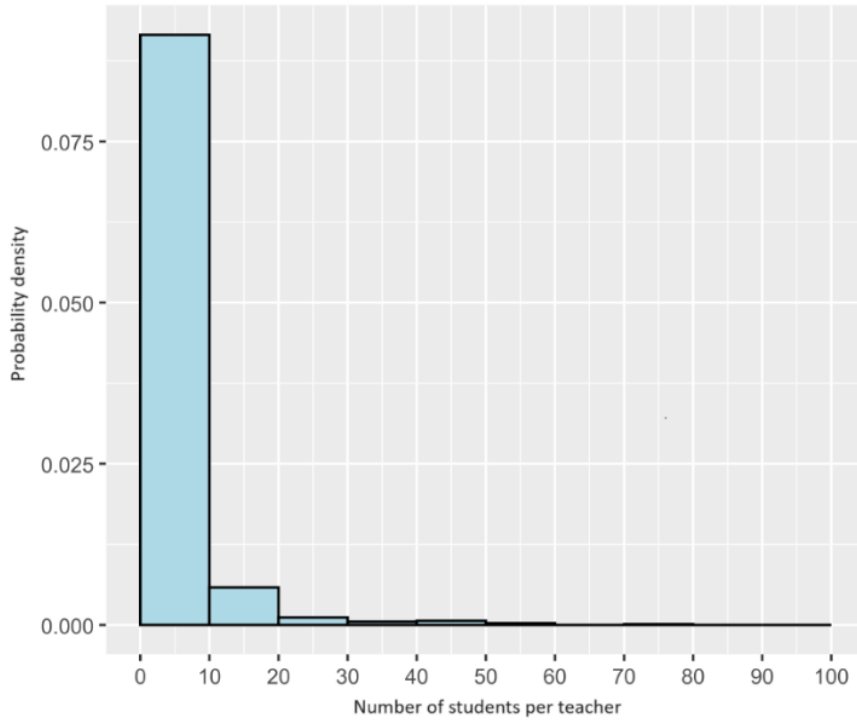
[5] More often than not, these were new ID allocations for incorrectly associated individuals outside the database.

Figure 3: Representation of master-student relationships between the fourteenth and sixteenth centuries



Teaching is a market in knowledge, which has to do with transmission, but it is also a way for teachers to make a living and perhaps enrich themselves. The histogram, which shows the distribution by teacher of the number of students presented for the degrees, reflects an asymmetric distribution on the right, indicating that there were a large number of teachers who presented few students for the degrees (Figure 4).

Figure 4: Distribution of the number of students per teacher



This distribution is characteristic of a rank/size logic in which most masters have between 1 and 10 students. Of course, there are exceptional situations where teachers have a large number of students. Here again, the quality of the data certainly puts this observation in doubt, but historiography does not put forward any hypotheses to contradict it. The power to confer the dignity of a degree is undoubtedly of economic interest and expresses social hierarchies. It is towards this 10% of masters who have more than 20 students that we should push the analysis to question the phenomena of concentration.

2. The traditional indicators for analysing social networks

Traditional centrality indicators classify and order the population according to a score.[6] The degree of centrality is one of them; it describes the connectivity of each individual: the more connections you have, the higher the degree indicator.[7] In the case described, the more students the masters have, or the

[6] See DEGENNE – FORSÉ 2004.

[7] We did not distinguish here between incoming and outgoing degrees. Instead, we focus on the masters. Other experiments in medieval history discuss the question of the interpretation of

more masters the students have, the more connected they will be. The other indicator we have used allows us to assess the central position of a node in the network, by calculating the extent to which it is necessary to pass through the node in order to move from one sector of the network to another, i.e. the shortest path or betweenness. The last indicator we have identified is PageRank. In this case, we consider that a node with a high score will be considered more influential because it is linked to many other nodes or to nodes that are themselves well connected. These scores may change as the data entry process evolves, but they allow us to observe unknown characters who nevertheless seem to have had a form of polarity within the University of Paris (Table 1).

Table 1: Highest scores for three centrality indicators

Name	Degree
Galterius Wardlaw	113
Johannes Beguini 2	80
Gerardus Kypot de Kalker	55
Johannes de Hoekelem	54
Henricus Hugonis	54
Galfredus Calvi	50
Guillelmus Buser de Huesden	47
Albertus Vorden	43
Bertrandus Pigouche	43

Name	Betweenness
Henricus de Aernhem	635
Gerardus de Eeten	552
Arnaldus de Gruthus	524
Nicolaus de Monikedam	314
Henricus de Gorinchem	258
Albertus Vorden	257
Godescalcus Vriese	240
Aegidius Bartholomaei de Jutfaes	198
Johannes Boutbour	197

Name	PageRank
Johannes Saresberiensis	0,0030323
Adam de Parvo Ponte	0,0029726
Nicolaus de Clamengiis	0,0021990
Petrus de Alliaco	0,0018310
Otto Boecii	0,0017364
Nicolaus de Ockham	0,0016913
Petrus Boussard	0,0016642
Rogarius Marston	0,0015248
Guillelmus de Grenlaw	0,0015153

The case of Galterius de Wardlaw is particularly noteworthy (113 contacts). His academic activity spanned the period from 1320 to 1387 and seems to

indicators, such as, for example, the relationship between temporality and betweenness in the network of bishops: see JÉGOU – LAMASSÉ 2021.

have been well documented.[8] He was a theologian from the Diocese of Glasgow. He is known to have travelled to France, Avignon, England, and Flanders, and was the Scottish ambassador to Berwick and Vincennes. He had a diplomatic role for John II the Good in 1355 and was a papal chaplain in 1378. He wrote on astrology and divination, as well as philosophy. We are thus changing our profile to enter a career of excellence, marked by a very strong capacity for intermediarity and reasonable connectivity. As for Johannes Beguini 2, he left no major works or manuscripts. He was a master at the end of our period, working from 1443 to 1468.[9] Born in Berry, he came from the diocese of Bourges and belonged to the French nation. His education, as we know it, was organised around theology: he obtained his doctorate on 19 January 1459. He had been rector of the University of Paris, which shows his social standing. This social position undoubtedly explains his appeal, the extent of which can be seen from university sources (80 contacts).[10]

In the rest of the table, connectivity drops, but remains high. This is the case with Gerardus Kypot de Kalker, a Parisian master from the second half of the fourteenth century (1365–1383).[11] He was a member of the Anglo-German nation, born in the Rhineland. He obtained his Master of Arts in 1369 and his Bachelor of Theology in 1378. It is not certain that his fifty connections correspond to as many students. Indeed, a reading of the network reveals onomastic similarities that need to be investigated. In fact, these multiple connections testify to the fact that he accompanied his students: one of his pupils was Mathias Janov, whom he introduced to the bachelor's degree in 1376 and to the master's degree in the same year. The same can be said of the student Andreas Scoti, whom he supervised for his bachelor's and licentiate degrees in 1375. All these connections reflect, not an intellectual influence, but a form of notability, reflected in the players' investment in the university institution.

The shortest path (betweenness indicator) leads us to observe other hierarchies. We know little about Arnaldus de Gruthus other than that he was active in the middle of the fourteenth century, over a brief period (1345–1349).[12] He became master regent of the Anglo-German nation in 1346, and two elements seem to characterise his career: this artist obtained his bachelor's, licentiate, and master's degrees with three different masters, and he had four pupils, all of whom had pupils of their own. This was the case with

[8] See biographical data: http://studium-parisiense.univ-paris1.fr/individus/2505-galteriuswardlaw – accessed: 01-12-2024.
[9] See biographical data: http://studium-parisiense.univ-paris1.fr/individus/13308-johannesbeguini2 – accessed: 01-12-2024.
[10] TANAKA 1990. p. 121-122 mentions the case of rectors who are given students to present for exams.
[11] See biographical data: http://studium-parisiense.univ-paris1.fr/individus/2819-gerarduskypotdekalker – accessed: 01-12-2024.
[12] See biographical data: http://studium-parisiense.univ-paris1.fr/individus/1010-arnaldusdegruthus – accessed: 01-12-2024.

Henricus de Aernhem, whose master he was.[13] In this rather uncertain case, it is the disruption it would cause to the network if removed, that determines its relative importance.

Finally, the PageRank algorithm highlights celebrities who are better known to medievalists. The results show a number of great names over the entire period, such as John of Salisbury (c. 1115–1180), Nicolas de Clamanges (c. 1363–1437) and Pierre d'Ailly (1351–1420), often authors or figures better known to historians because of their political importance.

The distribution of links (Figure 1) can help us to look at these relationships in a way that attempts to limit the effects of sources. For this reason, we propose to look at the limited chronological interval between 1400 and 1470, a period with continuous relationships and fairly heterogeneous documentation. In this time segment, information on nations is more important, since this attribute is known for almost 56% of the nodes. This makes it possible to investigate with greater precision whether national logics exist. The Chi2 test on cross-tabulation of master and student origin[14] and a Cramer V measuring average intensity[15] suggest that this relationship may have existed. The rather conventional hypothesis that students choose or are led to choose masters from the same nation is supported by these statistical results.[16] The proposed graph superimposes the centrality of degrees (Figure 5). While intra-national polarities are perfectly obvious in the German and French nations, they seem to be a little less so in the other two nations, Normandy and Picardy.

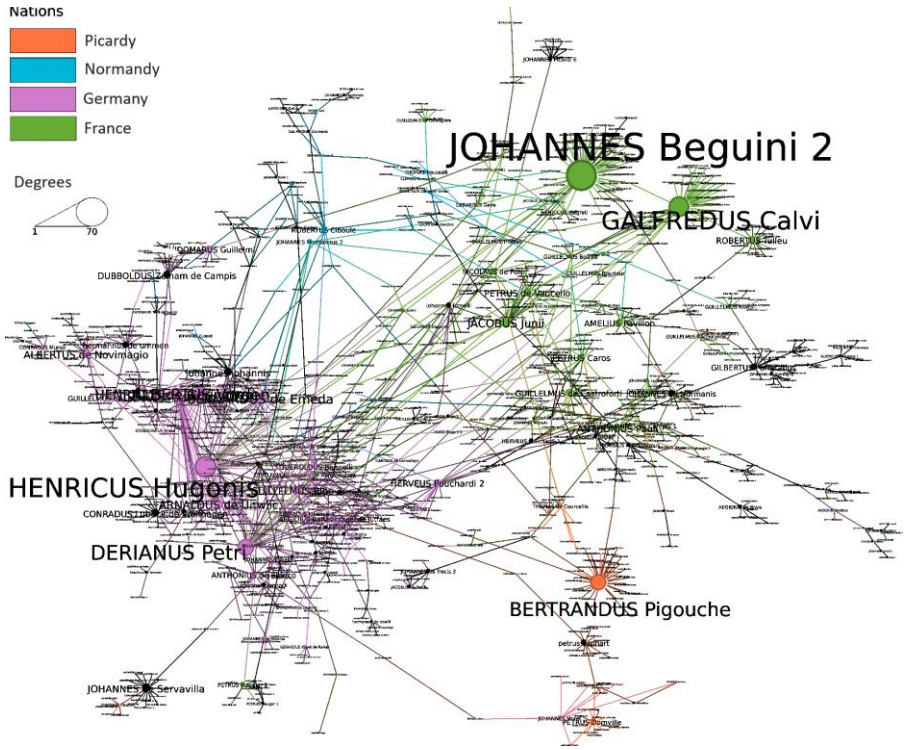
[13] Henricus de Aernhem is an artificial construction for the time being, as he does not exist in the database, but is mentioned in 16 records which designate him as a master. The onomastic and chronological matching is potentially faulty for some of these records, and it should be possible to better align all the biographical elements to reduce the uncertainty.

[14] The result of the Chi2 test allows us to rule out the hypothesis of independence. This result was obtained using R software and the instruction chisq.test delivers this result: X-squared = 756.33, df = 20, p-value < 2.2e-16.

[15] Using the same software, the Cramer V result is 0.2437.

[16] All these results are obviously problematic, given the proportion of the population for whom we do not have this information. But we think we can reduce this lack of knowledge to some extent.

Figure 5: Master-student relationships by nation (1400–1470)

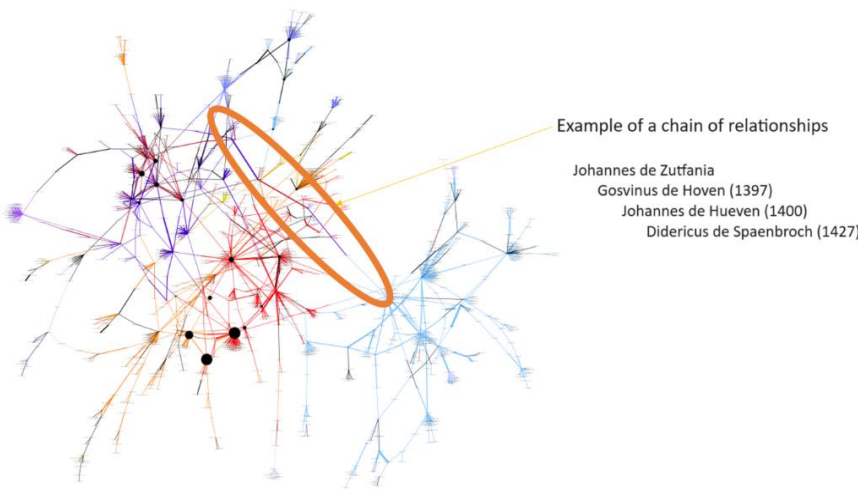


Trying to find out more about students' attachment to a nation is a research objective in itself, which we are still pursuing. One of the historical hypotheses that we could address through the study of a better-documented network of nations would concern the choice of particular masters by members of the same nation. There are several ways of reducing uncertainty on this subject. The first is to correctly trace the relationship between the individual and the document in which he is mentioned, since mention in a nation's register is an indication of national belonging. However, we should not assume that all the people mentioned in a nation's register necessarily belong to the nation that produced it. The second, more traditional approach, is to increase our available knowledge by looking at other archives. The third, and last, is to try to propose an assignment by a nation for each node. We are currently reflecting on this point because the strategies we have implemented for the moment are based on the behaviour of other students, and this only amplifies the phenomenon we believe we are observing.

3. Identifying academic filiations in the database

Sensitive to the quality of the data, but easy to understand, the paths enable us to observe routes that seem closer to the reality on the ground. The network is not very dense; the link is expressed over several generations. The pupil of a master can become a master himself and, obviously, we would like to know more about the profile of these men. So, we need to try and find all the distances between the nodes and classify these distances. This is what we did using Floyd Warshall's algorithm, which was feasible in the context of our small, fairly loosely interconnected network. We were therefore able to extract from the database all relationships with more than 3 or 4 interval nodes, i.e. generations of masters and students visible, sometimes to the naked eye, on the graph and whose concrete location makes it possible to study these 'passages' (Figure 6).

Figure 6: Identifying chains of relationships over time



While these paths should not be viewed too deterministically for the purposes of interpreting a biography, bringing them together in quantitative terms would undoubtedly give us a better understanding of these university environments. We can give an example of these filiations. Johannes de Zutfania does not yet have a record in the database but seems to have been a master of average importance at the end of the fourteenth century. He supervised four students, including two for the baccalaureate: Elias de Culenborch in 1398 and Gosvinus de Hoven de Arnhem in 1397. He also supervised the latter for the bachelor's and master's degrees in 1399. Gosvinus, born in Arnhem, Gelderland, became Master of Medicine.[17] His activity at the University of Paris

[17] See biographical data: http://studium-parisiense.univ-paris1.fr/individus/3256-gosvinusdehovendearnhem – accessed: 01-12-2024.

spanned the period from 1397 to 1419, during which time he was able to follow in his brother's footsteps to obtain a Master of Arts in 1403; he obtained his Bachelor of Medicine in 1404. This brings us to an interesting point, concerning the parallel between kinship and rank. In 1400, Johannes de Hueven, born in the same town and in the same diocese of Utrecht, also studied under him, and he in turn taught Didericus de Spaenbroch, alias de Harlem, who became a bachelor of theology in 1427.[18] This path, which spans some thirty years, may seem singular, but it raises questions about the proximity of academic filiations to spatial logics, which we know well, as well as to other networks that necessarily influence the awarding of degrees, and whose weight deserves to be measured.

* * *

The *Studium Parisiense* prosopographical database enabled us to explore the knowledge that could be extracted from social networks based on master-student relationships at the University of Paris. The construction of the network is fraught with a number of uncertainties, inherent in the textual nature of the database and the choices we had to make in an attempt to reduce this difficulty. As it is not always possible to analyse routes, using the database as a reference space inevitably produces identification errors. So, it is still a probable network that we are creating, and that is all it can represent.

However fragile it may be, this network of relationships provides a considerable mass of information on the social space under consideration: 1,969 individuals, 2,743 links and 2,750 nodes. This data could then be analysed to provide keys to understanding the groups and sometimes the careers. The first of these keys relates to chronology and temporal connections, giving a perspective that is more difficult to achieve by mobilising sources in a more conventional way. This diachronic representation suffers from the difficulties associated with documentation, although it can sometimes overcome them, and this is an observable result today.

The hierarchical approach, using simple indicators of centrality (degree, betweenness, PageRank), made it possible to nuance the social prestige of individuals. These metrics enabled us to quantify and compare the influence of various players within the academic network. They have also revealed unexpected aspects of social and academic dynamics, highlighting lesser known but socially central figures.

Examination of master-student relationships by nation revealed significant differences within the University. Nations, groups formed on the basis of the geographical origin of students and masters, had a significant influence on academic dynamics. Our study thus provided statistical proof of the reality of the hypotheses put forward about the weight of national affiliations in students' university careers. This national dimension adds a layer of

[18] See biographical data: http://studium-parisiense.univ-paris1.fr/individus/6121-johannesdehueven – accessed: 01-12-2024.

complexity to our understanding of university networks, revealing how geographical and cultural factors can shape academic trajectories.

We were able to identify and classify the distances between the nodes in the network, highlighting chains of relationships spanning several generations. This approach has enabled us to better understand the continuity and evolution of educational links over time, by highlighting academic filiations.

Ultimately, our study reveals the complexity and richness of medieval academic networks. By combining quantitative and qualitative analyses, we have been able to offer a more nuanced view of academic filiations at the University of Paris, while at the same time providing statistical validation for the empirical hypotheses that had been formulated by historiography. These are only initial, forward-looking results, but they should pave the way for future research into academic networks, by enabling comparisons and developing more detailed analyses of careers and inter-individual relationships.

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