1.
Good morning, the paper I will present today is called “Quantifying hierarchy and prestige in US ballet academies as social predictors of career success” by Guzman, Gates, Candia e Barabasi

2.
In the scientific field, a lot of research has been done to quantify processes and behaviors of professionals of the field. This made it possible to develop a set of tools that can predict career patterns in scientific professions. For example with the field of science of science developments have been made that can link the composition of scientific teams to productivity or understand how long does influence of technological innovations and products last on the market, to name a few.
Recent studies suggest that the same rules and patterns can be applied to more creative fields, however this has been challenging due to:
subjective valuation of performance, creative fields are often dependant on the taste and like of each individual
multifaceted ways that success can be manifested through recognition
data scarcity
Since in artistic careers performance is subjectively appreciated, the success in this field is highly influenced by the visibility and social prestige, so artists depend on their social networks and the prestige they hold within them to be successful professionals. For example, a recent study proved that the professional position and rich-get-richer mechanisms drive the allocation of acting jobs, so that among many other recent studies prove that network position and social prestige are good predictors of success. However there are still some difficulties in disentangling the role of individual performance and the collective influence of the networks

3.
And thats why this work aims to

4.
So why ballet? Ballet first gained influence in france, due to king louis the fourteenth in the 17th century as a display of the elegance, power, and perfection of human beings. Even in that time, access to court was easier if dancers had connections with the king or were part of some guild.
Ballet performance is characterized by perfectionism and requires a lot of physical struggle to endure. Dancers often have injuries, eating disorders and poor sleep behaviors, along with stress that can hinder their longevity in the field. Their success does not only rely on physical abilities, but also on subjective perceptions of quality, connections and past experiences.
This characteristics centralize the social system on the network of relationships and hierarchies between dancers, schools, companies and all other members of the ballet community, and the lack of analysis of this system in particular made it a nice field to try and test science of science tools on other creative domains.

5.
All the experiments were done using data collected between 2000 and 2021 of the YAGP, the Young America Grand Prix, a ballet competition within the United States. They use the competition performance as proxy for dance performance quality, that can ensue some bias, but historically it has been used as on objective measure of quality.

6.
So what did they do?

They built a network of ballet academies according to participation in competitions, with ranking done using betweenness centrality, that functions as an indicator of prestige. They hypothesize that the prestige of a school facilitates the professional development and job placement of its students
They also predict students job placements by comparing their competition outcomes with the prestige of their schools.

7.
Grounded on the approach that network position captures social prestige, they try to prove that schools that do better in competitions have higher ranking and hierarchical prestige than schools that have worse positionings in competitions.

Schools are then represented as nodes and the links between them are established if their students were ranked among the top 12 in the same competition, reflecting a degree of similarity between schools since they both produced highly qualified dancers for the same setting.

This figure represents all the ballet schools and the links between them, organized by color according to detected communities, over their geographic location. As we can observe, schools tend to compete in clusters, but bridges are made between communities.

8.
To measure social prestige they considered two factors: schools achievement and schools centrality within the network, and explored the interplay between them. As for achievement, they measured it by the total number of awards a school gets and the ratio of awards per school which is divided by 4 categories: no medals which means that the school got no awards, under achiever which means that the school has less than one award per competition, break even which means that the awards are even with the number of competitions and high achiever which means that the school got more than one award per competition.
They found that most schools who have won awards have obtained only one or two awards, while a few schools collected more than 100 awards, as we can observe with figure A. Only 60% of schools had at least one award, and the number of awards increases proportionally per student. The ratio of High-achievers however is independent of the number of top students, as per figure B
In C we can observe the relationship between betweenness centrality and achievement, where we can see that most school with no awards have low centrality and only highly central schools are in high achiever groups, even though some high achievers are non central. This proves the correlation between high achieving schools and their central network position.

9.
To test the best centrality measure, schools were then ranked through a dense rank function, where rank 1 specified the most central (most prestigious school), given by the correspondent centrality measure, in ascending order, so more central schools have higher ranks.
Through a classification model with a binary system, so 0 for not a top school and 1 for top school, they compared the predicted ranking with a list of top ballet schools in the United States, using different centrality measures. Using the AUC metric they concluded that the most accurate centrality measure in predicting the schools prestige was the betweenness centrality, that they normalized using Min-Max scaling, and where B=1 represents the most central school

10.
Here we can see the AUC metric computed for the other centrality measures tested: closeness centrality, degree centrality and eigenvector centrality. The ratio of awards per students was also examined using the same metric to predict the school’s prestige, but it underperformed next to the other measures. This means that award recognition takes a less central role in defining schools ranking, and should not be the only factor when evaluating if the school has prestige or not.

11.
Finally this is the representation of the network of schools, reduced to the most relevant hierarchical connections, where the node color and size reflects the schools betweenness centrality: the bigger and warmer, the more central the

school is. The position of nodes is defined by force estimations that maximize the separation of nodes into clusters. The yellow connections represent the weak structure, that connects nodes that have dense connectivity within the cluster and sparser connections to the periphery, that is, that only obtain regional success, and the red connections the strong structure, that represents schools with the most influence, in strategic network positions.

12.
So what can we gather from all this?

That the betweenness centrality is a better measure of social prestige and that, coupled with the schools achievement, can create an ordered hierarchy where schools with high achievement are better perceived by others. Highly connected schools also are more likely to have top dancers in the competition.
Since dancers competed in more competitions, they also increase their schools visibility, That is influenced by their potential to bridge between communities in the network.

13.
Besides analyzing and build a network of ballet schools to study the hierarchies of institutional prestige, the authors also focused on the career success of ballet dancers to understand how prestige influences their job placements, besides their individual abilities.

To better understand the background of eligible to work dancers, they aggregated them based on the awards they had received: 22% had received no awards, 59% didn’t went to finals, but still won an award on the semi finals, 9% were finalists but only had semi final awards and 10% won both final and semi final awards. This breakdown suggests that there are different routes and factors other than achievement driving the selection of dancers towards a job placement in a ballet company.

14.
To investigate the interconnections between individual performance and the social prestige on job placement, they did a logistic regression model that predicts which students are placed on a dance company.
The independent variables consider the aggregated measures of students achievement within the YAGP, like their bronze, silver and gold medals, as well as the grand prix award; the total number of competitions they attended, the prestige of their school given by the betweenness centrality and the gender, to account for confounding factors, that affect both the success and the aggregated measures (dependent and independent variables)
They also added a variable that accounts for being a finalist or not, to test the importance of achieving that on job placement.
Analysing the results, there was a significant positive effect on the job placement with the increase of the schools prestige, either if the student had gone to finals or not: despite equal competition results, students that have gone to more prestigious schools have higher probabilities of job placement.

15.
The greatest impact on job placement by awards is with the Grand Prix with an increase of 67%, which tell us that winning the subjective evaluation of the jury is more aligned with the system, way more than winning regular medals.
Unexpectedly a long competition career may hinder the job placement opportunities for the students, there is an 18% decrease with the additional competition participation.
Both being a finalist and the schools prestige have the biggest increase on the likelihood of success, with a 200% increase for the case of the prestige
However, it is still hard to disentangle school prestige with individual performance since

16.
And that’s why they investigate the prestige beyond performance, by matching students with similar career paths (identical medal and competition counts), but

who differ on their school’s prestige.
The equation calculates the average difference in job placement outcomes between individuals from prestigious schools and their matched counterparts from less prestigious schools.

Applying this, they observed that there is a increase of 65% in the odds of obtaining a job placement for those who attended a prestigious school, by comparing similarly skilled students.

The 200% increase reduced to 65% since some observable confounders or variables that both affect the changes of students getting a job placement and the prestige of the school were eliminated, that were inflating the results.

This proves that even though students have similar career paths, their affiliations play a way more important role in defining their success.

17.
They also investigate the of awards on the careers of students who change schools.
85% of students only attended one school while 15% attended two up to five schools, which implies they transferred.

They measured the difference of prestige between the first and last school attended by students and found an increase on schools prestige on all cases. The same applies to students that get a job placement in a new company, they also go to places with higher prestige, even more than those without a job placement.

There is no relationship between previous awards obtained in School 1 and the change in school’s prestige of School 2 which could mean that there are other mechanisms of recruitment such as self selection or peer effects.

18.
Overall, the research highlights the usefulness of the science of science and network science methods as an efficient tool to quantify career patterns in creative professions that were not possible to elucidate before, which confirms the high potential and applicability of data-driven tools to performing arts. They proved that both individual competition performance and schools’ prestige are good predictors of successful job placements in ballet.

Social prestige is predictive of higher jury’s recognition of students, competition advancement, and better career prospects, that can enhance and allow students to make more conscious choices about their careers, and what schools to affiliate themselves to. There is a 65% job placement on the 5% more prestigious schools, and dancers can use this information to their advantage.