

# Project Proposal

Group #6

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## I. Introduction

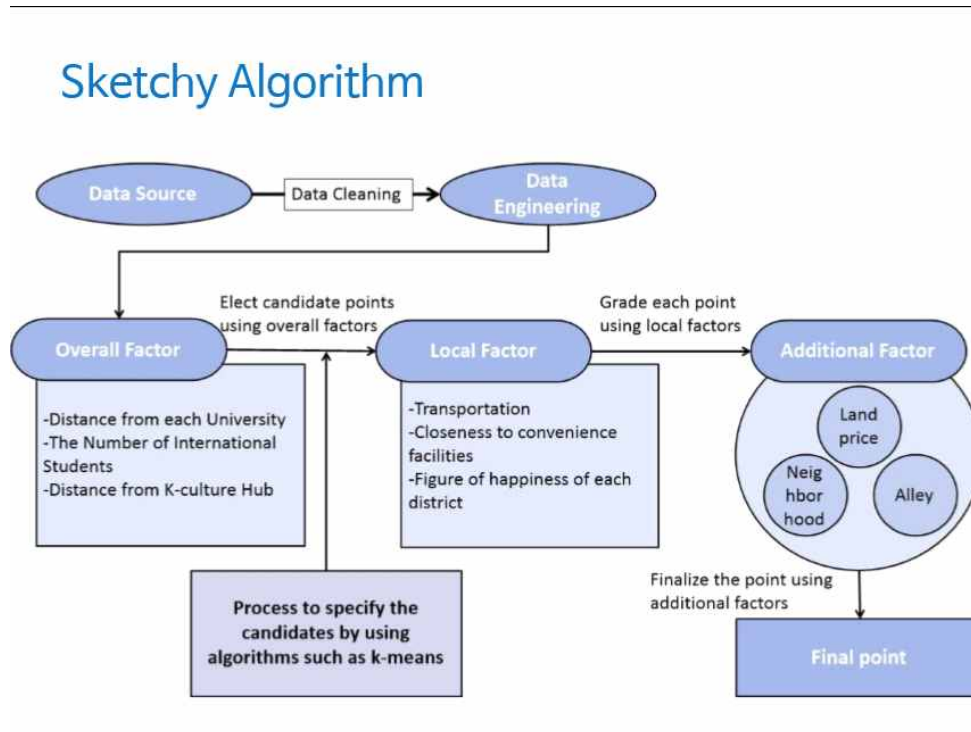
*'Nurigwan' in Daejeon, the first international accommodation dedicated to foreign students in South-Korea, is set to be remodeled in July. 'Nurigwan' was built inside Daejeon Expo Park in 2007 by Daejeon City aggressively declaring that it would attract foreign students. It has 10 floors above ground and 1 basement, with a floor area of 7,043 square meters and 226 rooms. Why do they tear down a decent building that's only been built 10 years ago? The "Nuri Pavilion" has been reduced to a nuisance due to its low utilization rate. The vacancy rate reached 30 percent even after filling it with Korean students due to the failure to recruit foreign students. In the end, the city of Daejeon decided to completely purchase the "Nuri Pavilion" and convert it into a youth dormitory.*

South Korea has been trying to make successful international students promotion by borrowing (actually almost imitating) the idea of international accommodation in Paris, only to fail because of some misunderstands on what international students really need and want. As a matter of fact, most of them preferred to live in Seoul rather than in others, which means what feature they considered as the most important one was the very 'distance' and next, maybe 'cultural facilities'. After that shocking failure of international accommodation despite many people's expectation, building architects and designers became motivated to analyze the problem clearly and make the success.

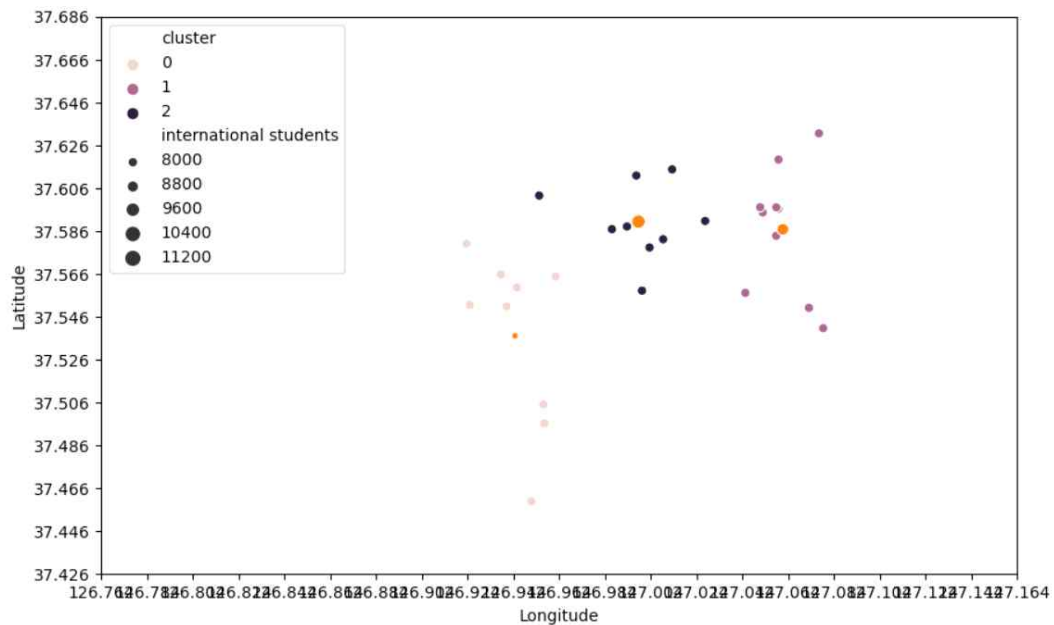
Our mission is the same as what they have in problem - do our best to locate the international accommodation in terms of financial benefit, national fame, everything. But to do so in the whole range of South Korea would be fairly tough for us. Then what if the location should be limited in Seoul? Problem would become simpler a bit, but still pretty complex due to many other problem-related factors - linked each other like a spider web. To solve this challenge, we devised the algorithm below. It will help us to

get rid of some nuisances and simplify, break down the steps previously complicated into systematic and organized ones.

## II. Progress



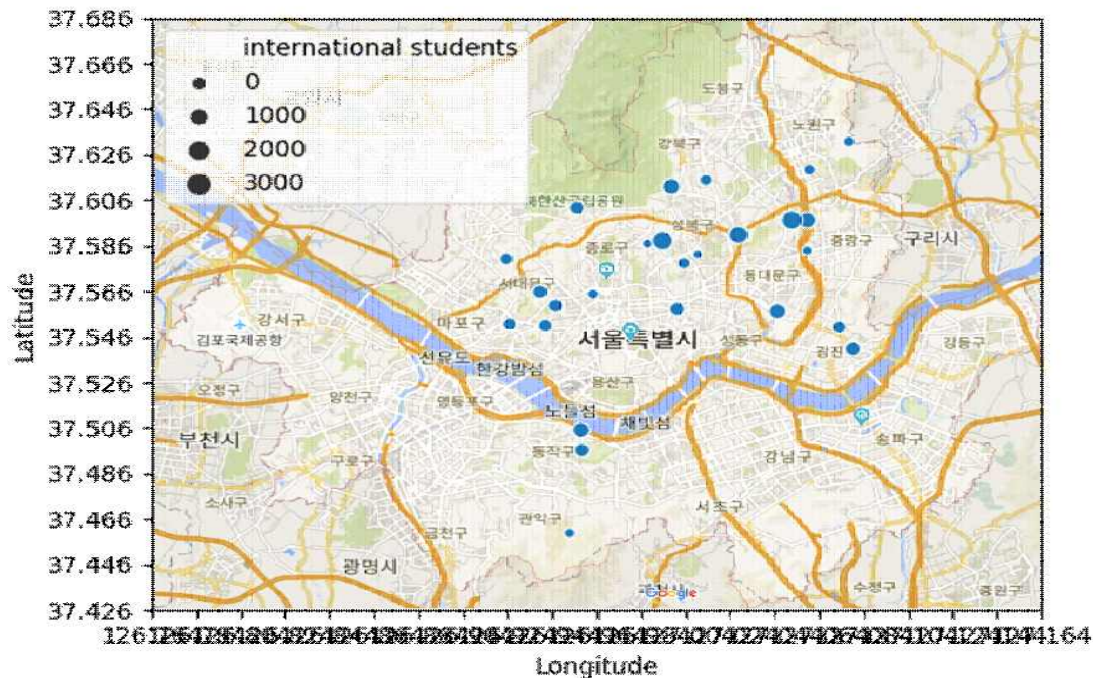
Since we have no comparison group data and obvious target class, we couldn't be able to properly use the correlation that we've learned last month. So we decided to use the idea of k-means clustering when we extract locations of candidate group through passing filter #1 then narrow them into the optimal one. However, just applying k-means to our problem in itself might be problematic because filter #1 - *our algorithm toward the solution may be quite similar with how sieve works: filtering system: overall factor works as filter #1, local one does as #2 and additional one is #3* - takes total three features (distance from each university, the number of international, distance from K-hub) into accounts but actually original k-means considers only distance.



<The result of mere k-means clustering on 28 universities in Seoul>

So we devised 3-dimensional R-kmeans to solve this problem. X-axis will be longitude, Y-axis will be latitude and Z-axis will be closeness to K-hub (we will elaborate on this at Final Project). And the number of international students will be disguised as nodes (originally node means the point of university) so that we could count them as if the number of students and distance have the same unit. And we are going to re-clustering the results after providing each node with weights to get higher accuracy, which is the idea from so-called R-kmeans (Revised k-means).

Also we are planning to make filter #2 through normalization and AHP model, then make it visually obvious by drawing heat-maps.



<The spread of international students for each Univ. in Seoul>

### III. Literature Review

Currently, the number of foreign students in South Korea is showing a high increase every year, and it is expected to continue to increase in the future. Therefore, there is a need to build international accommodation to accommodate a large number of foreign students. Under these circumstances, however, there is still a lack of accommodation to accommodate foreigners and each university has a different capacity to accommodate them. That is why we have a plan to set up international accommodation in Seoul, where the number of foreign students is the highest.

Various related data are needed to consider where to build an international accommodation in Seoul, and related data are taken into

accounts such as the number of foreign students studying at each university in Seoul, the location of cultural facilities in Seoul, the convenience of transportation, and the price of a house. In addition to the above data, the purpose of this study is to find out which location in Seoul is the best place to build an international accommodation, by considering various data. When we look at the papers written in Korea, there is a paper that focuses on cases such as the international accommodation in Paris from 2008 and seeks out how to build that in Korea. We, through **Lee Jung-kyu (2008), a study on the architectural characteristics of international accommodation for international students in Paris International University City, the youth facility environment, and the case of international accommodation in Paris at 6:2, 77-88**, are able to examine how to build it in Seoul, but just based on this paper, it is insufficient a bit to get inspiration to solve the problem. Since then, we have been able to analyze the cases of Paris and Tokyo in 2009 and that thesis gives hints on what Korea lacks and where to locate compared to the Nurigwan built-in Daejeon. According to **Kim Hye-jin (2009) Building an international accommodation for foreign students Validity Study 2009-049**, based on the Nurigwan already built in Korea, we are able to find out which element foreigners prefer among convenience of transportation, cultural facilities around them, or distance from school, but there was no clear solution and the description of the solution. Since then, the 2014 paper has expressed the need for international accommodation. Although **Lee Jung-gyu (2014) A Study on the Establishment of Joint accommodation at International Universities, Youth Facilities Environment, 12:4, 275-287** was fairly helpful for us in that institutional, social, and constructive consideration was given to suggest how to build accommodation, there were no any mentions, such as a methodology to decide where to build it in any particular place. Finally, The paper is talking about the lack of joint accommodation for foreign students in our country compared to overseas cases in 2017. **J. Pract. Eng. Educ. 9(2), 183-190, (2017), the study of a joint accommodation for foreign student education, Gong Hyo-soon, Department of Hotel Management at Namseoul University**; the content of the 2017 paper was almost the same as the 2009 paper, and very little progress was made in research. The above studies exemplified examples from overseas cases and suggested the direction for building a joint accommodation in Korea in the future. And based on overseas cases, we were able to find out what data

we should collect. For example, the importance of facilities around accommodations and distance from universities.

However, it seemed to lack of clear plans, although everyone agreed on the need for joint accommodation for foreign students, and precedent research on where to build accommodation in Korea and why it should be built in the particular region was very insufficient, and it was just mainly focused on comparing and analyzing cases abroad. So we decided to break away from this perspective and study where we should build our own joint accommodation for foreigners. The reason why accommodation should be built in Seoul is based on convenience of transportation. By building accommodation in seoul, we can delete convenience of transportation factor. Based on a paper, **Allen, J., & Farber, S. (2018). in How time-use and transport barriers limit on-campus partition of university students. Travel behavior and society, 13, 174-182,** we are able to obtain a basis for why accessibility is important even when compared to other vital factors. And **Cho Si-sung, Ahn Dong-eon, Jung Sung-jong, and Lee Shin-won (2003), which is about k-means clustering,** provided the weights by the number of documents, which gave us a gut insight on k-means idea. Also **The Korea Electronics Association Conference, 1557-1560,** gave us the idea of weighting each university and k-hub so that we become able to reflect those features on our algorithm at once.

#### IV. Summary

Our final solution (future) against the optimal international accommodation location problem will be based on our 3-dimensional version of k-means clustering considering many possible features. There could be numerous features related to our topic such as closeness to K-culture hubs, figure of happiness and the number of international students of each university, which are classified into three categories (overall factor, local one and additional one) as our intention. So our algorithm toward the solution may be quite similar with how sieve works: filtering system - overall factor works as filter #1, local one does as #2 and additional one is #3. We will elaborate on this idea at Final Project later.

Through this architecture, we tried not to miss any details and characteristics of each feature. Although the formula derives the optimal

point of international accommodation from distance factor primarily existed, we adopted (actually also modified a bit) so-called R-k-means (Revised k-means) so that we become able to reflect the effect of the number of international students and the distance from each university at once. Furthermore, we are going to try to converge features whose scales and units differ each other by using the idea of AHP (Analytic Hierarchy Process) and normalization thoroughly.

Of course, arbitrary weighting will cause problems that will result in errors. However, based on the 2009 data Daejeon.Kim Hye-jin (2009) Building an international accommodation for foreign students , it could allow us to refer to the preference for various accommodation form of foreign students, which is meaningful in that it suggests a new direction to build a international accommodation for foreign students in Seoul and finds an optimal location. We will keep an eye on this problem and constantly try to settle it down.