

## **Overview of the issue**

There are various ethical issues in Computer Science, ranging from privacy rights, data collection, hiring practices, web accessibility, hacking, and algorithmic bias. Educating the public, educators, and students on what these issues are and possible solutions are extremely important to our society. Computer Science ethical issues are both a government concern and citizen concern.

The New York City (NYC) high school admissions process is complicated and unethical. This application process is reserved for urban cities across the USA. Students who live in suburban and rural areas graduate middle school and attend their local high school based only on school zoning. This paper will discuss the high school admissions process for NYC schools, the matching algorithm, and the ethical issues with this admission process.

“New York City has more than 400 public high schools with 700 programs. Roughly 120 of these use “screens,” such as grades, essays or exams. Twenty-five high schools require auditions. Eight base admissions solely on the Specialized High School Admissions Test, or SHSAT. Given this landscape, New York City is home to more schools that screen students based on academic performance than other large school districts nationwide.” (Zimmer, 2022)

## **HS Admission process**

Students apply by Dec 1st to 12 school programs ranking them in order of preference. Below are reasons students might not be assigned to their top choice:

- Schools have an admissions maximum based on seat availability.
- Schools have set-asides and will admit students based on priority grouping.

Below are possible grouping criteria:

- ◆ low income
- ◆ students with disabilities
- ◆ English language learners
- ◆ zone (by home address)

→ Schools have a method of assigning rankings of preference for students. Below are possible selection criteria based on individual schools:

- ◆ lottery
- ◆ auditions
- ◆ interviews
- ◆ exams
- ◆ 7th grade academic records for core subjects (within this group are 5 groups based on grade point average within the school and/or citywide)

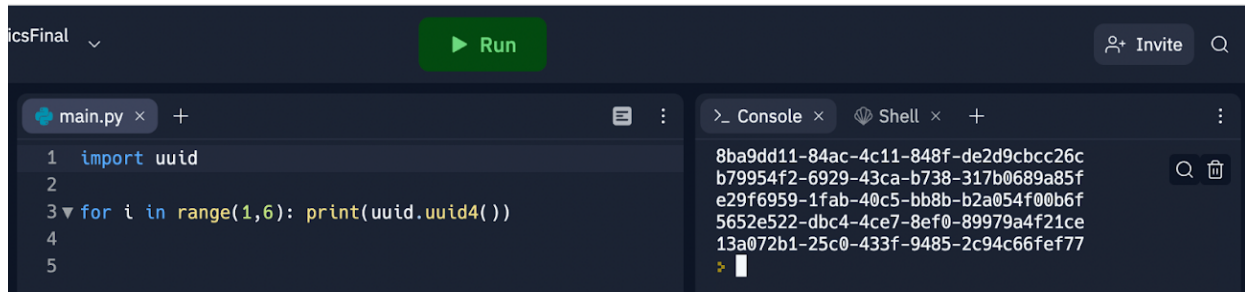
Once the criteria has been applied, if there are more students than seats available in that group, their assigned lottery number will be used to create the match.

The NYC HS admissions process is continuously being revised. Each year, the NYC Department Of Education (DOE) spends months gathering feedback from various constituencies before revising the admissions process. The following is a brief description of the process for the 2023-2024 school year. Each middle school student ranks their top 12 choices of high schools. The nine Specialized High Schools and charter schools have separate admissions processes; one cannot add them to the high school application process we are discussing. The current algorithm is a huge improvement from the previous algorithm. Parag Pathak, Alvin Roth, and Atila Abdulkadiroğlu helped design the award winning algorithm in 2012. (Jacobs, 2019)

### **HS Matching algorithm**

The exact algorithm NYC uses is not public information. The NYC DOE had legal action taken against them to reveal some aspects of the algorithm. For years, families did not have access to the randomly assigned numbers for their child. Through court action, the NYC DOE has available on the online portal, MySchools.nyc, each student's unique randomly assigned numbers (think lottery). The exact program they

use to create the randomly generated numbers is not available, however the results are posted to each student's account in the MySchools.nyc portal. An example of a UUID (Universally Unique Identifiers) using python is given to get an idea of a program that generates random numbers.



```
icsFinal  Run  Invite  Search
main.py x +
1 import uuid
2
3 for i in range(1,6): print(uuid.uuid4())
4
5

Console x Shell x +
8ba9dd11-84ac-4c11-848f-de2d9cbcc26c
b79954f2-6929-43ca-b738-317b0689a85f
e29f6959-1fab-40c5-bb8b-b2a054f00b6f
5652e522-dbc4-4ce7-8ef0-89979a4f21ce
13a072b1-25c0-433f-9485-2c94c66fef77
```

One advantage of the algorithm for families is that the algorithm is student-facing instead of school-facing. This means, student choices are inputted first into the algorithm instead of schools choosing first. The NYC algorithm is based on the stable marriage problem. “In the early 1960s, the economists David Gale and Lloyd Shapley proved that it was theoretically possible to pair an unlimited number of men and women in stable marriages according to their preferences”. (Tullis, 2014) So in comparison, in the stable marriage problem the male chooses first and for NYC the student chooses first.

The NYC HS matching algorithm optimizes the outcome for the students based on its inputs: students’ choices, schools’ rankings of students, and system priorities (zones, continuing students,...). It has been tweaked over the years to include more system priorities, such as set-asides for low income students and various admission priorities. (Marian, 2021)

### **Why it should be addressed**

The NYC HS matching algorithm's complicated system is reasonable given the size of the NYC school district. In 2019-2020, there were 1,033,669 K-12th graders enrolled in the NYC public schools. Of this, 76,664 were 8th graders who are expected to do the research to make an informed decision of which 12 high schools they will apply to by December 1st out of having 400+ high schools to choose from. (NYSED

Data) These are 12 and 13 year olds engaged in a complicated process before they are halfway through their 8th grade year in middle school.

One ethical issue is the NYC DOE does not provide transparency about this admission process. They do not report (even when requested) the historical cutoff information. (Marian, 2021) Students/families/researchers don't have a transparent understanding and have to engage in a timely and resource consuming process. One simple part of the process (randomly assigned number) was denied under the guise that providing the info would not be 'understood'. In order for students/ families to have access to the students' randomly assigned numbers, several families had to request the info via the Freedom of Information Law (FOIL). (Marian, 2021) Initially, it was only provided to families that requested them, but in 2021-2022 it is available to all students.

Another ethical issue is the composition of the student body in the NYC public schools system is inherently unequal. Schools that screen have students that are disproportionately to other public schools regarding students with disabilities (SWD), English Language Learners (ELL), and race, and income status. Below is the data based on the school year, 2019-2020 (no data is available for more recent years), that clearly demonstrates the racial disparity rampant across NYC public schools. The two chosen schools are both in Manhattan District #2.

	NYC public schools (1,033,669)	Stuyvesant HS (3384)	HS of Fashion Industries (1606)
American Indian or Alaska Native	1%	1%	0%
Black or African American	25%	1%	44%
Hispanic or Latino	41%	3%	48%
Asian or Native Hawaiian/Other Pacific Islanders	16%	72%	3%
White	15%	19%	4%
Multi-racial	2%	5%	0%

(NYSED Data, n.d.)

“The system concentrates lower-performing students on the same campuses and contributes to the city’s status as one of the most racially segregated school systems in the country”. (Zimmer, 2022)

Which students are adversely affected by the current high school admissions process? A student could have talent, and yet it has not been nurtured and their academic potential is stunted. These students come from poor, overcrowded middle schools and previously similar elementary schools. How are they expected to be prepared for the standardized test by 8th grade? The one admissions criteria locks those students out of the opportunities of specialized education.

Substandard high schools are allowed to exist and present another ethical issue. All public schools are free and the quality ranges from substandard to specialized high quality. Chancellor Banks said on Sept 16th, 2022: “One fundamental challenge is we need more schools and programs that provide all that students and families are seeking.” (Knudson, 2022) There are more students than seats available at certain top public schools. The Chancellor believes if a student works hard, they have the right to go to a top school rather than have their fate determined by chance. At the press conference, Banks said “I think it’s really important that if you’re working hard and making the grade, you should not be thrown in a lottery with just everybody.” (Zimmer & Elsen-Rooney, 2022)

The last ethical issue is related to access. The admissions process is an investment which some families are at a disadvantage. Which families/students have advantage? The 2022 NYC public schools admissions guide is 68 pages long, and advises families to read it, sign up for emails for updates, and deadline reminders, and admission events, visit school websites, and attend open houses for a variety of schools. If a student does not have the family support to engage in the process described above, do they have the agency to reach out for assistance from their middle school?

## **Possible solutions**

Two possible solutions will be examined with the understanding that all of the ethical issues raised above need solutions to create a more equitable high school selection process for New York City. Ultimately, it is not only students and their families that are affected by the ethical issues raised above, but also the field of Computer Science. Computer Science and the world will benefit from a diverse workforce. Future technological breakthroughs and better clientele services could be stifled due to untapped diverse persons that either are overlooked by recruitment or high school placement opportunities.

One solution to the first Ethical Issue of non-transparency is to publish the algorithm used. Why is this not public information? Who benefits from keeping this really important matching algorithm hidden? An algorithm is a step by step process to get a desired result. So, the algorithm is working as intended. It is the developers goal that is achieved by using a non-published algorithm that is the unethical issue.

A solution to the ethical issue #2 is to mandate the algorithm to have system priorities which set aside a certain number of seats to insure racial equity across the schools. The current algorithm has set -asides, but there is no mandate that race must be a factor. Essentially, the solution is to set an explicit diversity goal (race, ELL, and SWD) Usually, the school system must be forced to implement equitable practices even though the solution only requires tweaking a current algorithm instead of a more arduous task of creating a new algorithm.

## References

Jacobs, R. (2019, August 26). When Students Are Matched to Schools, Who Wins?

Economics is changing how public schools and students choose each other.

<https://www.chicagobooth.edu/review/when-students-are-matched-schools-who-wins>

Knudson, A. (2022, September 29). NYC announces new 'transparent and fair'

admissions process for middle, high schools.

<https://www.silive.com/education/2022/09/nyc-announces-new-transparent-and-fair-admissions-process-for-middle-high-schools.html>

Marian, A. (2021, June 7). Decoding the NYC School Admission Lottery Numbers

<https://medium.com/algorithms-in-the-wild/decoding-the-nyc-school-admission-lottery-numbers-bae7148e337d>

New York City Public Schools Admissions Guide. (2022).

<https://www.schools.nyc.gov/docs/default-source/default-document-library/2022-nyc-public-schools-admissions-guide---accessible>

NYSED's Student Information Repository System (SIRS). (n.d.). New York City Public Schools Enrollment. (2019-2020).

<https://data.nysed.gov/enrollment.php?year=2020&instid=7889678368>

NYSED's Student Information Repository System (SIRS). (n.d.). New York City Enrollment Stuyvesant High School. (2019-2020).

<https://data.nysed.gov/enrollment.php?year=2020&instid=800000046741>

NYSED's Student Information Repository System (SIRS). (n.d.). New York City Enrollment High School Of Fashion Industries. (2019-2020).

<https://data.nysed.gov/enrollment.php?year=2020&instid=800000046728>

Tullis, T. (2014, December 5). How Game Theory Helped Improve New York City's High School Application Process. NY Times.

<https://www.nytimes.com/2014/12/07/nyregion/how-game-theory-helped-improve-new-york-city-high-school-application-process.html>

Zimmer, A. (2022, October 20). Applying to NYC high school? Here's what you need to know.

<https://ny.chalkbeat.org/2022/10/20/23415028/nyc-high-school-application-process-lottery-admissions>

Zimmer, A., & Elsen-Rooney, M. (2022, September 29). NYC overhauls high school admissions, leaves middle school changes up in air.

<https://ny.chalkbeat.org/2022/9/29/23378824/nyc-middle-high-school-admissions-changes>