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Talent Is Everywhere

Using ZIP Codes and Merit to Enhance Diversity

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A distinguishing feature of American society has long been its commitment to education as the pathway that might enable anyone, starting from any point on our social map, to achieve social success. We have depended not on aristocratic titles or hereditary privilege to determine who might play a leadership role in society. We have looked instead to see who has made the most of the project of personal development, both intellectually and socially.

We have great respect for those remarkable individuals who have excelled at self-cultivation and achieved great things without the advantages of formal education, or with very little of it—for instance, Benjamin Franklin, Abraham Lincoln, Frederick Douglass, and Susan B. Anthony. Yet as a people we have also worked hard to build a comprehensive network of institutions—schools, colleges, and universities—that can provide a platform for success for the very many of us who do not have the same capacity for self-creation as our eighteenth- and nineteenth-century ancestors.

We have sought to build colleges and universities that can bring to true maturity the cognitive, emotional, and inter-personal capacities that individuals use for the ongoing work of unleashing their human potential. One of the hardest parts of building these institutions has been to settle on the appropriate means for identifying talent. Who should get the opportunity presented by a college or university—and particularly by an elite, selective one—to acquire, in their best form, the invaluable keys to unlocking one's potential?

The history of American education contains many moments when people have set a radical course in search of talent. In the 1830s, Oberlin College in Ohio decided to admit women and African Americans, making it the first college in the country to pursue coeducation and a racially integrated student body. In 1855, Berea College did the same for the South. In the period of the 1860s and 1870s, coeducation spread dramatically through the landscape of higher education.

The 1930s brought another radical change in how America's colleges and universities spotted talent. James Conant, president of Harvard, wanted to open his university to students from a wider array of social backgrounds. This meant developing new admissions procedures to replace the historical reliance on exams held at Harvard, College Board-administered essay tests, and close ties to a small set of elite schools. His advisors brought to his attention the SAT, or the "Scholastic Aptitude Test" as it was then known. (Now, because the test has been shown not to succeed as an "intelligence test," the letters "SAT" no longer stand for anything.) Conant worked to prove that such a test could be administered nationally and to establish the organization that could administer it (today's Educational Testing Service). This transformed American admissions processes.[1]

In the 1960s and 1970s, further changes to the admissions process emerged under the banner of affirmative action. Because those practices have varied considerably from institution to institution, a single account of their content is not possible. Their general goal, however, has been to increase the ethnic diversity of student populations at the country's selective colleges and universities. In the past decade and a half, some institutions have added socioeconomic diversity as a parallel concern to ethnic diversity.[2]

The question of how elite institutions can best and most fairly identify talent continues to be one of the hardest and most important questions in higher education policy. In this chapter, I propose a novel technique for selective college and university admissions, the purpose of which is to make good on the idea that talent is everywhere.

A Proposal: Why Not Increase Geographic Diversity?

For decades, colleges and universities have pursued geographic diversity in their student bodies. Web pages proudly trumpet that this year the college has students "from all 50 states and from over 80 countries" (Harvard) or that "the students come from throughout the United States and the world" (Stanford).[3] Even public universities use these formulations. At the University of Michigan in 2011, students came from "81 of 83 Michigan counties, all 50 states, and 54 countries."[4] And Rhodes and Marshall Scholarships, those pinnacles of leadership and academic excellence, are awarded on the basis of regional competitions.

Geographically based structures for seeking talent are tried and true.[5] Perhaps we should consider whether selective colleges and universities could make more of them. My suggestion is that the pursuit of geographic diversity in admissions is our best hope of merging the goals of diversity and excellence. This could and should be taken to the level of ZIP codes and, in particular, to the level of the ZIP+4 system, which divides the United States into geographic units as small as a city block or group of apartments. Given current residential patterns—with their extremely high degree of socioeconomic, racial, ethnic and ideological segregation, well-described in Bill Bishop's book, *The Big Sort,* among others—geographic diversity at the level of ZIP+4 address codes should bring other sorts of valuable diversity along with it.[6]

Moreover, prioritizing geographic diversity is fully compatible with pursuing excellence. To embrace geographic diversity most fully, a college would have only to determine the combination of SAT score and GPA that would constitute its entrance threshold; then, it could admit students out of those in its applicant pool above the threshold in such a way as to maximize geographic diversity, both in that cohort and over time. The entrance threshold should be determined on the basis of the college's knowledge about the level of preparation students need to thrive on its campus. Within any given ZIP code, the highest performing applicants would be chosen first. Whereas Texas chooses the top 10 percent from each high school, each selective college or university would choose from each ZIP code in its applicant pool the top "x-percent" of applicants over its threshold that will yield a full class.[7] Data science is now sufficiently powerful that this could be easily done. In an appendix (see page 157), the computer scientist Tina Eliassi-Rad and the philosopher Branden Fitelson, both at Rutgers, provide a formal analysis and algorithm (for implementation in software) to show how.

While I here propose a full-fledged system of admissions based on academic credentials sorted by ZIP code, variations on this basic approach are also possible. First, there is the question of the policy goal elected. Universities and colleges could, for instance, retain discretion for a certain subset of spots in the first-year class and admit the balance of students with the geographic diversity formula I suggest. Or they could review the cohort identified by the geographic diversity algorithm and review the identified admits, case-by-case, confirming or disconfirming selection. Public universities would, of course, reasonably weight decisions toward ZIP codes in their state, and all institutions would also need a separate but complementary strategy for international admissions. Then, there is the matter of methodology. Methodologies for formalizing the selection process could be developed that would be different from the one proposed in the appendix. Or one might want to use census tracts, instead of ZIP codes. In other words, a wide degree of variation in practice might flow out of a collective commitment to geographic diversity. My central goal in this chapter is simply this: to propose a plausible alternative to current practice that is sufficiently concrete to provoke fresh thought.

This novel approach of employing academic criteria sorted by ZIP code would, I will argue, establish a method of admissions that (1) would better embody an equal access ideal than present practice; (2) would more honestly acknowledge what we can and cannot tell about talent, or excellence, on the basis of SATs and GPAs; (3) would increase campus diversity along multiple dimensions, thereby enhancing the educational environment; and (4) would permit the transfer of resources from the labor-intensive process of handpicking a relatively small number of individuals from large application pools to the similarly labor-intensive process of recruiting talented individuals into those pools in the first place.

Justification

In the United States, we have a higher education system that includes, as its summit, a set of highly selective institutions, both private and public, that offer matriculants an extraordinary opportunity not only for intellectual development but also for social advancement. The most selective institutions provide the highest economic returns to their graduates.[8] The number of places at such institutions is very small in comparison to the relative size of the national population. The number of seats in the Ivy League is barely two-thirds the number of those in the University of Texas system.[9] If anything, the relative number of seats has shrunk in the past few decades, since growth at most elite colleges and universities has not kept pace with population increases. To take Harvard as an example, the College enrolled 6,555 students in 1980; in 2010, it enrolled 6,641.[10] The question, then, of how these opportunities might be fairly awarded is necessarily heated and contentious.

Consensus reigns, however, around one point: the seats should go to the most talented. But how exactly are we to measure talent? The SATs, which were introduced initially as a measure of aptitude—that is, as a quasi-IQ test—fail at that. The reasons are legion. Students with financial resources take test prep courses, sit the exam multiple times, and thereby achieve higher scores.[11] The tests themselves have been shown to have implicit cultural biases.[12] They also trigger stereotype threat effects that lower the performance of students from populations vulnerable to stereotype threat.[13]

The SATs and other such tests are not, however, altogether useless. Other than socioeconomic background, what the SATs do seem to report with some accuracy is level of preparation for college. They predict reasonably well how people perform in their first year of college, although not over the course of all four years.[14] For that, GPAs are a better predictor.[15] A combination of SAT and GPA would, therefore, seem to serve as a rough predictor of the likelihood a student will thrive in a particular environment.

We must recognize, though, that this combination of SAT and GPA cannot offer a fine-grained instrument, for all the same reasons that the test itself fails as an aptitude test. The results of differential access to test preparation and of stereotype threat are enough on their own to generate 100+ point advantages to those in the advantaged position.[16] In other words, we cannot assume that the difference between scores of 2100 and 2200 is terribly meaningful. Because of their indubitable imprecision, therefore, these scores are best used not as the basis for a rank ordering of individuals but as thresholds, dividing an applicant pool into those above and those below a line that is roughly predictive of likelihood of success.[17]

Indeed, even as thresholds, combinations of SAT and GPA are so far from succeeding as fine-grained distinguishers of talent that, for any given school, identification of the threshold over which students can be expected to succeed typically leaves at least twice as many individuals above that threshold as there are places. Or so, at least, we have reason to believe given the admissions officer's common lament that he or she could fill the class twice over with equally qualified admits.[18] The current response to this predicament, which arises from the inadequacy of our measures, is to commit significant resources to poring over essays and hand-picking, person by person, the individuals who will constitute the admitted group. It is not at all clear that this hand-picking can be considered a fairer method than the geographic lottery, described above.

Legally, a full embrace of geographic diversity would be equivalent to the Top 10 Percent program used for admission to the University of Texas system, which guarantees admission to a public college or university in the state to students who are in the top 10 percent of their graduating high school class. The Texas method did not come in for criticism in *Fisher v. University of Texas,* the anti-affirmative-action lawsuit that the U.S. Supreme Court decided in June 2013. Michigan's attention to the number of counties from which it recruits students is a similarly fine-grained geographical approach, also without the controversy that has surrounded its other diversity initiatives. Moreover, the law of association, particularly the Court's rulings on private clubs, suggests that some adjustment of college and university admissions practices, in the direction of a geographical lottery among qualified applicants, might even be commendable.

When the Supreme Court ruled in its 1987 case *Rotary International* that Rotary clubs, despite being private, could not exclude women from membership, they endorsed "the State's compelling interests" "in assuring . . . equal access to public accommodations."[19] They then defined that equal access to public accommodations thus: "The latter interest extends to the acquisition of leadership skills and business contacts, as well as tangible goods and services."[20] Rotary Clubs self-consciously provided social capital to their members; for this reason, women had an equal access right to membership. In its ruling, the Court in effect identified an equal access right to the social capital produced when organizations set about to cultivate leadership skills and business contacts, which is just what colleges and universities most frequently claim they do these days.

In response to public pressure to explain their value, colleges and universities increasingly make social capital arguments to justify themselves. They cite the economic return of their degrees, the very valuable social networks represented by their alumni clubs, and so on.[21] There is clearly an equal access right at stake here and, while there is no longer an issue of the formal exclusion of women or minorities from selective colleges and universities, we are not generally providing that equal access. As Amy Gutmann, president of the University of Pennsylvania, points out:

> 36 percent of all highly qualified seniors (with high grades and combined SATs over 1200) come from the top 20 percent [of the income distribution] while 57 percent of selective university students come from this group. The wealthiest 20 percent of American families are overrepresented on our campuses by a margin of 21 percent.[22]

Socioeconomic groups are not among the categories protected by equal access jurisprudence, but that jurisprudence nonetheless establishes a useful framework for a moral consideration of what it would take to establish that we had achieved equal access. Admissions procedures that maximize geographic diversity by selecting for such diversity from a pool of applicants above the entrance threshold would be far stronger contenders for meeting an equal access bar than current practice.

Let me conclude this elaboration of a geographic diversity strategy by being explicit about the approach to talent it represents. My title, "Talent Is Everywhere," conveys my starting point. Academic talent and leadership potential, like physical beauty, can appear anywhere: in individuals of all races and ethnicities, sexes, socioeconomic status, and cultures. If one grants that talent is everywhere, then another point must follow: an actually successful mechanism for identifying academic and leadership potential should result in a student body rich in ethnic, socioeconomic, and cultural diversity. My suggestion is that, in order to spot the talent that is everywhere, one needs to identify those who, above all others, have made the most of the resources available to them in their immediate surroundings. It is reasonable to consider achievement contextually as a means of assessing potential. If universities were to conduct their talent searches by attending more comprehensively to excellence in local contexts, they would do a better job of identifying the individuals most likely to metabolize fully their campus's intellectual resources.

Anticipating Objections

Objections to this proposal will immediately spring to mind. The first, perhaps, would be a concern about what it would mean to turn away from the careful work of crafting a class. A second, following close after, would involve concern about what would happen to applicants who are children of alumni. And a third, different in kind, would be that people might game the system by moving strategically to ZIP codes that have been under-represented historically at their school of choice.

First, I will address the consequences of abandoning an effort to craft a class. As leaders of admissions offices of elite colleges and universities will tell you, they shape their classes with care. Perhaps the orchestra needs more horn players. They will pursue that special talent in their selections. Perhaps the dance program needs more male dancers. Applications reviewers will keep their eyes out. Or perhaps the football team needs a few more running backs. The goal is to produce a class that is well-balanced, year after year, with regard to that school's vision of its ideal community; often that vision includes a serious investment in athletics. Our selective colleges and universities really are cities on a hill, where residents are handpicked at great expense to constitute the perfect community, and they come with football teams. This, in the first instance, presents a political problem. Those hand-selected communities develop committed constituencies to defend them. (This is something I understand personally, since Princeton's head of admissions in the late 1980s, Fred Hargadon, still has a special place in my heart.) And this helps explain the nature of the politics surrounding collegiate athletics. A turn to geographic diversity would certainly return us to amateurism in college sports, and the prospect of that would generate a firestorm.

But would a turn away from this careful handpicking also present an educational problem? What would we lose educationally if we turned to a quick algorithm for decision-making? One can argue that a college or university that cannot maintain its symphony or that sees its classics major headed toward obsolescence is indeed permitting a degradation of its intellectual environment. But on the other hand, that might not be so. Perhaps there are other forms of community, equally compelling, that would emerge from a relaxation of an effort to match the applicants to a pre-existing social ideal.

Social scientists have long distinguished between "bonding ties," which connect people who share similar backgrounds, and "bridging ties," which link people who come from different social spaces. Since the 1970s, scholars have been aware that bridging ties are especially powerful for generating knowledge transmission; more recently, scholars have argued that teams and communities that emphasize bridging ties and learn how to communicate across their differences outperform more homogenous teams and communities in the development and deployment of useful knowledge.[23] Historian Josiah Ober, for instance, makes a powerful case that the decision to organize ancient Athens by routinely bringing together citizens from urban, rural, and coastal areas in teams for knowledge-generation and decision-making was a major source of that democracy's strength.[24] Geographic diversity is a sure way of maximizing the role of bridging ties within a campus community. The odds are good, as George Washington thought, that this approach would enhance the campus educational experience, not diminish it. He sought to build a national university that would ensure "the common education of a portion of our youth from every quarter."[25] His purpose was to prepare potential democratic leaders for their jobs and in the process "to counteract the evils arising from Geographical discriminations."[26] He wrote: "prejudices are beginning to revive again, and never will be eradicated so effectually by any other means as the intimate intercourse of characters early in life, who, in all probability, will be at the head of the councils of this country in a more advanced stage of it."[27]

Then, second, there is the question of alumni loyalty, and what is required to nurture it. Selective colleges and universities seek to enroll within each class a reasonably sizable proportion of the children of alumni—let us put it at 10 percent to 15 percent.[28] The stakes of those alumni admissions are great. We have an educational system that depends significantly on private resources to sustain the highest peaks of excellence. Selective institutions, not only private ones but even some public ones, require the regular philanthropic contributions of their alumni in order to sustain the highly enriched education they offer.

Here one must concede that a switch to maximizing geographic diversity would indeed present a challenge. Development offices would have to learn to function with a very different kind of alumni community. Yet that community would be bigger and broader. In it, there should be many people for whom the life-changing opportunity to attend the relevant school inspires the will to repay the gifts, but whether fundraising could be as successful on this model as in the current model is a matter that could be determined only by trying. Some evidence suggests that the link between alumni generosity and legacy preferences is much weaker than is commonly assumed. Indeed, a number of institutions, from Caltech to Texas A&M, are able to generate enthusiastic alumni support in the absence of legacy preferences.[29] The necessary transformation of the development model would take time, and there would no doubt be a significant period of transition before institutions surmounted an initial hit to fundraising.

A third immediately apparent objection has to do with the likelihood that people would seek to game the system. Perhaps the geographic diversity approach would lead the well-to-do to move strategically into neighborhoods with marginally less good provision of schooling, thereby displacing, as the likely beneficiaries of particular ZIP code slots, those who are currently at more of a disadvantage in the college sweepstakes. Indeed, researchers have documented such a phenomenon in Texas since the Top 10 Percent program was introduced. A 2011 paper written for the National Bureau of Economic Research analyzed Texas school transitions between eighth and tenth grade and found, "Among the subset of students with both motive and opportunity for strategic high school choice, as many as 25 percent enroll in a different high school to improve the chances of being in the top ten percent. Strategic students tend to choose the neighborhood high school in lieu of more competitive magnet schools."[30]

But that, I would counter, is not bad news at all. Just as bridging ties are beneficial on college campuses, they are also valuable in schools and neighborhoods. As Richard Rothstein of the Economic Policy Institute argued in a recent paper, ongoing racial residential segregation is one of the most important causes of low achievement in the public schools that serve disadvantaged children.[31] Other scholars, including Annette Lareau at the University of Pennsylvania, have made similar points about socioeconomic residential segregation.[32] Just as getting students with more family and social resources back into neighborhood schools should help those schools, getting those families back into somewhat less advantaged neighborhoods should help those neighborhoods.

That there are major political landmines along the path that I propose goes almost without saying. Yet, with regard to our current practice of crafting a class and the question of strategic moving, we have as much to gain as it presently looks as there may be to lose. This may also be true with fundraising, although this is a harder case to assess up front.

The Open Questions

Finally, there are several other, extremely important questions that cannot be answered without further research.

First, what would be the actual impact of an effort to equalize the geographic distribution of a college's student body on the profile of that student body, with regard to the overall distribution of pre-collegiate SATs and GPAs? Will sufficient numbers of the overall top-scorers still get in? Any admissions process that proposes to admit the "top p percent" from each of a set of geographically correlated units (for example, the Top 10 Percent program used for admission to the University of Texas system) will have to face this general question.

A more specific version of this general question arises in connection with the present proposal. Owing to the need to round percentages to integers, in order to identify the number of students to be admitted when allotting the "top p percent" of each ZIP code, it may happen that the total number of admissions slots is filled before we get to the end of the list of ZIP codes. The algorithm proposed in the appendix handles this rounding problem by sorting the ZIP codes. The historically least-represented ZIP codes are allotted first; and the historically best-represented ZIP codes are allotted last. This raises the following more specific question. Would such an admissions process, moving down the list of ZIP codes, from least-represented historically to best-represented, require a college to make multiple passes through the list of available ZIP codes or would it routinely fill all of its slots before it got to, for example, Palo Alto? According to the current proposal, if Palo Alto goes unselected in one year, then it will become a higher priority ZIP code in the subsequent year. More importantly, however, both the general and the specific questions depend on how a college sets its entrance threshold, as well as its target number of admits for generating an adequately sized class of matriculants.

The second major question not yet answered here is this: What would be the impact of this method on ethnic and socioeconomic diversity on campus? This is a matter of how the geographic diversity method would interact with current applicant pools, and also of how its introduction might even shift the very constitution of the applicant pool.

With regard to ethnic diversity, we know that the number of "ethnic census tracts," in which African American, Hispanic, or Asian residents are more than 25 percent of the tract population, increased between 1990 and 2000, from approximately 25 percent to 31 percent of all tracts. These tracts are of varying socioeconomic status.[33] In the remaining 69 percent of tracts, the average presence of minorities was 20 percent in 2000, with "sharp declines in all-white neighborhoods since 1970."[34]

One might indeed expect, then, that at selective colleges and universities a stronger orientation toward geographic diversity could well support diversification of student populations by ethnicity, thereby permitting us to slip free of the contested terrain of affirmative action.

With regard to low-income students, we know that students who live in the fifteen metropolitan areas that receive the most attention from admissions offices are far more likely to apply to selective colleges than students who live elsewhere; we also know that a great number of high achieving low-income students tend to live in that "elsewhere," namely rural areas and towns.[35] There, in rural areas and towns, the concentration of high achievers is insufficiently dense to justify the costly hands-on attention of admissions officers.[36] Would a prominent national campaign about the effort of colleges and universities to draw applications from new ZIP codes help recruit those high-achieving low-income students who live "elsewhere" into the applicant pool? This is an intriguing possibility.

While current degrees of ethnic, socioeconomic, and ideological residential segregation as well as rural/urban differences give us reason to believe that an emphasis on geographic diversity should increase all three kinds of diversity on selective college and university campuses, this question, like the one about fairness to Palo Alto, is testable. One would want to see the algorithm in action—to answer both these questions—before one could confirm that what, as a matter of policy, looks like a reasonable approach to equal access is in reality a reasonable approach. This research can easily be done. The algorithm is efficient, and these questions could be tested on historical data. Before any given institution or even the educational ecosystem as a whole should undertake a move in this direction, one would want to do that testing. For that, we need only a volunteer, an institution willing to let its historical data be analyzed in this way.

The prospects for uniting diversity and excellence are great enough along this path that I do hope to find that volunteer. Given our persistent failure to find equitable ways of providing access to seats at selective colleges and universities, as is evidenced powerfully by the problems with our current use of SATs for rank-ordering, the under-representation of low- and middle-income students at selective institutions, and the relative failure of selective institutions to find ways of drawing rural populations into their applicant pools, it is time for a radical change, again, in how our selective colleges and universities spot talent. Is anyone willing to step up?

Appendix. A Proposal for Decreasing Geographical Inequality in College Admissions

Tina Eliassi-Rad and Branden Fitelson

Here is an oversimplied description of a typical college admissions process (as it now stands). In a given year (y), a given school (s) receives applications from N_{ys} qualified[37] applicants. From this pool of N_{ys} qualied applicants, some "top tier" is ultimately admitted.[38] We will denote the number of applicants admitted by school s in year y as A_{ys}.

We will subdivide the set of N_{ys} qualified applicants into n geographical sub-groups—one for each zip+4 code z in the United States.[39] That is, the sub-group of qualified applicants from a given zip+4 code z will contain N^z_{ys} qualified applicants. Thus, the sum of the list of numbers $\{N^z_{ys}\}$ will be equal to N_{ys} (i.e., $\sum_z N^z_{ys} = N_{ys}$).

Similarly, we will sub-divide the set of A_{ys} admitted applicants into n geographical sub-groups—one for each zip+4 code z in the United States. That is, the sub-group of admitted applicants from a given zip+4 code z will contain A^z_{ys} qualified applicants. Thus, the sum of the list of numbers $\{A^z_{ys}\}$ will be equal to A_{ys} (i.e., $\sum_z A^z_{ys} = A_{ys}$).

Now, we can describe the *degree of geographical inequality* (DOGI_{ys}) of an admissions process (in a given year y at a given school s) as a function of A^z_{ys} and N^z_{ys}. One quick-and-dirty way to gauge DOGI_{ys} would be to use some measure of the degree of inequality of the list of geographical admission rates, where the admission rate of a zip+4 code z is given by $R^z_{ys} =_{df} A^z_{ys}/N^z_{ys}$. That is, R^z_{ys} is the *proportion of qualified applicants from zip+4 code* z *who were admitted* (in year y at school s). There are various ways of measuring the degree of inequality of such a list of admission rates $\{R^z_{ys}\}$. We will, for the sake of the current simple proposal, adopt the *Gini coefficient* $G(\{R^z_{ys}\})$ as our inequality measure.[40]

Typically, DOGI_{ys}—as measured by $G(\{R^z_{ys}\})$—will be *high* for present-day admissions processes. This is because the "top tier" of qualified applicants tends to be *geographically correlated/clustered*. So, if we seek to decrease the degree of geographical inequality of an admissions process (i.e., to decrease the value of DOGI_{ys}), then one way to go about this would be to try to decrease the value of $G(\{R^z_{ys}\})$.

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Thus, a natural strategy for decreasing DOGI_{ys} would be to *minimize* the value of $G(\{R^z_{ys}\})$. To be more precise, this would involve *choosing numbers of admitted students* A^z_{ys} *so as to minimize the value of* $G(\{R^z_{ys}\})$. Of course, initially (i.e., in $y = 2014$), we won't be able to select our A^z_{ys} values so as to ensure that $G(\{R^z_{ys}\})$ is *zero*. But, as the years go by, one can reasonably hope to make $G(\{R^z_{ys}\})$ smaller and smaller.

Directly minimizing $G(\{R^z_{ys}\})$ as described above is likely to be infeasible for admissions offices.[41] However, there is a very efficient way of *approximating* this optimal allocation of admission slots.

1. Decide the total number of students we want to admit in a given year: A_{ys}. This initial choice will also determine the *overall proportion* of the total number of qualiffied applicants who are admitted: $R_{ys} = A_{ys}/N_{ys}$.
2. Calculate the *historical popularity* of zip+4 codes z at school s over some set of m years Y. We define historical popularity of a zip+4 code z as the following weighted average of the acceptance rates $\{R^z_{ys}\}$:

$$\text{Historical popularity of zip+4 code } z =_{df} w_z \frac{\sum_z R^z_{ys}}{m}$$

   The weights (w_z) used in this average decay exponentially, so as to favor zip+4 codes that have been popular in the more distant past over those that have been popular in the more recent past. These decaying weights (w_z) are computed via Algorithm 1. Finally, sort the zip+4 codes—in increasing order—based on their historical popularities. This step produces an ordered set of zip+4 codes $Z =_{df} (z_1, \ldots, z_n)$, where z_1 is the least historically popular zip+4 code and z_n is the most historically popular zip+4 code.
3. For each zip+4 code z in the ordered set Z, *admit the* "*top* R_{ys}%" of z. That is, pass through the ordered set Z and allocate (approximately)

$$A^z_{ys} =_{df} R_{ys} \times N^z_{ys}$$

   students from zip+4 code z, for each of the zip+4 codes, in order. This (initial) allocation will be approximate, because of *rounding errors* (A^z_{ys} is rounded to the nearest integer). On the one hand, rounding errors may cause us to initially allocate all of the A_{ys} slots before the end of Z is reached. But, because we have (in Step 2) sorted the zip+4 codes in increasing order of historical popularity, we can rest assured that historically unpopular (i.e., underrepresented) zip+4 codes will not be short-changed. On the other

> hand, rounding errors could result in there being some leftover admission slots after our first pass through Z. In this case, performing a second pass over the set Z will ensure a complete allocation. And, because the historically under-represented zip+4 codes occur at the beginning of our ordered list of zip+4 codes, they will be the first to receive any leftovers from our first pass.

The result of the above algorithm will be an allocation of the A_{ys} admission slots, which is (approximately) evenly spread across the zip+4 codes (and any errors in this approximation caused by rounding will tend to favor the historically under-represented zip+4 codes). That is, each of the zip+4 codes will contribute (approximately) its "top R_{ys}%" to the admitted class.

Algorithm 1 Calculating weights w_z for the weighted average of the $\{R^z_{ys}\}$.

$c := 10^{-6}$	Set exponentially decaying constant.
for $z = 1$ to n **do**	
$w_z := 0$	Initialize popularity weight w_z of zip+4 code z.
end for	
for $y = 1$ to m **do**	Consider data from the past m years.
for $z = 1$ to n do	Iterate over all the zip+4 codes.
if $(w_z = 0)$ **and** $(R^z_{ys} > 0)$ **then**	$R^z_{ys} > 0$ presently but not previously.
$w_z := 1$	
else if $(w_z > 0)$ and $(R^z_{ys} = 0)$ **then**	$R^z_{ys} > 0$ previously but not presently.
$w_z := ((1 - c) \times w_z)$	
else if $(w_z > 0)$ and $(R^z_{ys} > 0)$ **then**	$R^z_{ys} > 0$ previously and presently.
$w_z := ((1 - c) \times w_z) + 1$	
end if	
end for	
end for	
for $z = 1$ to n **do**	
$w_z := \dfrac{w_z}{\max(\{w_z\})}$	Normalize weights such that $w_z \in [0, 1]$.
end for	