Mathematic, Statistics, and MCS Diploma Ceremony

Stanford, June 17, 2018

Firstly I want to thank you and your families for the privilege you accorded us to contribute to your education. Teaching and interacting with students are among the best aspects of working in a university. As a sign of gratitude and to make you all understand why this is the case let me do something for you. Borrowing the words of a great "Since you cannot see yourself So well as by reflection, I, your glass, Will modestly discover to yourself That of yourself which you yet know not of." Your energy, determination and enthusiasm are contagious. Your ability to make sacrifices and work hard, keep us all on our toes and wanting to do our best. You have a diverse array of skills and talents, your interests and passions make up a symphony of colors and it is just beautiful to hang out with you. Today, you are so eager to get going, to do something of value that will impact the world positively. You also look a little scared. Graduation does not change you, but it does change others' expectations from you. And it is a little scary. Can I reassure you that you are ready for the new roles you will take on?

Two thoughts on this. One, nobody is ever ready for life. But that is OK. It is a process of experimentation that challenges and renews us constantly. And two, the degrees you are getting today, in mathematics, statistics or mathematical and computational science provide you with a powerful vantage point in todays world. We live in the digital age. We are constantly acquiring data about all aspects of our life and the natural world, and analyzing and modeling it to increase our understanding and our self determination. Think about progress in the life science: it is now possible to read out every single molecule in the DNA of each of us and know exactly where our genetic codes are identical and where they are different. Thanks to massive international efforts we can record the chirping sounds of stars colliding in space. And someone keeps track of every product we buy, website we visit, phone call we make: we have an unprecedented opportunity to look at individual preferences and patterns of social interactions. What are we going to do with all of this information? How are we going to use it? Here is where you are in a privileged position and where you have additional responsibilities. Your quantitative training is going to enable you to avoid common pitfalls and to help everyone. Let me give you a few examples.

There is a sort of "blind trust in numbers," the believe that if you can put a number on it it must be truth. Both people that are scared of math and big data enthusiasts often subscribe to the notion that numbers and data hold the key to everything, and we just have to listen to them. You know that this is not the case. Your mathematical training tells you that it is up to us to define the rules of the game. 2+2 is equal to 4 or to 0 depending on which context we are working in. Numbers are not gods or even demi-gods, they are instruments of our thinking. In your statistics classes you have learned that data do not speak by themselves: it is hard work to extract some information from them, and, most importantly, quantify the limits of our conclusions. I do not want to foment a general relativism here. You also learned that an argument, a proof, is either right or wrong, with no room for ambiguity. Your training gives you the ability to distinguish the statements that can be true or false from those that are a matter of opinion, or ideology, or so confused that they are "not even wrong." Ascribing to numbers, data, and our own reasoning about them their proper role will allow you to use all the information we are gathering in a productive manner. You will avoid jumping too quickly to conclusions that will eventually turn out false, eroding everyone's confidence in science and in the possibility of meaningfully and crucially say that some statements are false and some are true.

In your probability and statistics classes you have learned to distinguish between a distribution and its mean. You know that while the average man is taller than the average woman, there are a lot of women taller than a lot of men. You know that "the average man" and "the average woman" do not exist, they are just a useful mathematical concept. You know that if you are recruiting for a job that requires tall people (I do not know if you can think of one, but indulge me for a moment)

and you restrict yourself to male candidates you will be without reason cutting your self out from a large number of possible employees. And you also learned that starting from the largest possible population and letting chance play a role in the selection of qualities that are not known to be essential can work in your favor, protecting you from unknown biases. What if the job that requires tall people is carried out best by subjects with low testosterone levels? Restricting yourselves to male candidates would cut you out from your best employees.

You have learned that a model that fits the data does not automatically have any mechanistic validity. It is simply a description of the status quo, even when you have tried to come up with a robust one. Understanding how we got here, how different our world would be if we had a different history, and what will be the consequences of changes that we might enact requires more work. The fact that you describe the status quo with an algorithm does not make it any more normative. We might very well see an association between the race of a convict and the likelihood that she/he would commit a second offense. This does not mean that people of a certain race are more inclined to commit more than one crime. There are a lot of other variables that, in our present status quo, take on different values across races and are likely driving this association. Do we see the same pattern in other parts of the world? Would we see it here if our history had been different? If we act on the basis of this accidental association, do we end up re-inforcing the status quo, especially aspects of it we do not like? You know to ask these questions.

So, thanks to the knowledge and understanding you have acquired, you are in the position to help us all to use data and numbers for the good. You'll do that working in finance, and making sure that everyone can retire without worries and good ideas are backed up by good investments; or enabling doctors to use the molecular level information that might help them devise targeted treatments; enlarging the bags of tricks we have by working in academia; teaching about numbers to a new generation; or developping apps that allow blind persons to navigate daily life with more ease. It's for you to pick.

Let me conclude on a personal note. Twenty years ago, almost to the day, it was my turn to receive one of the degrees that will be awarded shortly, from this very same, very fine institution. What I learned here enabled me to have an interesting and rewarding carreer. One in which I met very smart people, and got to learn about many different things: from the challenges of psychiatric diseases to the history of places as distinct as Finland and Costa Rica. I got to experience the pleasures of coding: there is nothing like interacting with something that always follows your instructions to make you realize how often you do not quite know the way. And I also enjoyed a somewhat opposite experience advising: no matter how wise your suggestions are, a graduate student's first reaction is to challenge or ignore them! Most of my colleagues in statistics and mathematics are male and that can be lonely at times. But these are fields that judge you by the strength of your arguments and, while there are many things that vary with gender, sexual orientation, race or religion, the ability to carry out a mathematical proof, construct a logical argument, intelligently describe the conclusions we can draw from a dataset are not in that category. So, let me invite all of you to stick around in these fields: we need your company and the diversity of perspective you will bring.

Now, I have a confession to make. 20 years ago I did not show up for my graduation. I am really glad you made a different decision, but I do not regret mine. You see, I was busy getting married to someone I met during my studies here. Now, I do not want to suggest that you all should go get married, let alone with someone you met at Stanford. But I am sure that during your years on the Farm you met people that have become important for you. I do want to suggest, and quite strongly, that you do not graduate from them. No matter how meaningful and intrinsically rewarding your job will be, your happiness will depend on the people in your life. As you plan ahead, remember to make time for friends and family. With this in mind let us give a round of applause to every dad here and to all the fatherly figures in our lives for all that they have made possible and all the joy they bring us. And let me congratulate you all on your remarkable achievements and wish you a happy adventure out there!