

FIFTY-EIGHTH CONVOCAATION ADDRESS

BY

Professor Trevor J. Hastie

John A. Overdeck Professor of Mathematical Sciences,
Professor of Statistics and Professor of Biomedical
Data Science, Stanford University, USA

19th December 2023



INDIAN STATISTICAL INSTITUTE

President Prof. Sankar Pal,
Chairman Dr. Pranab Sen,
Director Prof. Sanghamitra Bandhyopadhyay,
Prof. Pradipta Maji,
Professors and Teachers,
Graduates
Families and Friends

It is a huge honor for me to address this famous institute, a source of many great people in the history of statistics. It has also been a real treat for my wife Lynda and me to visit India for the first time. We have seen some truly amazing and beautiful places in our short time here. We did five day tour including Delhi, Agra and Jaipur with our good friends Balasubramanian and Katherine Narasimhan. We are both avid readers, and have read many wonderful stories about the history and people of India.

I love to teach multivariate statistics using Kanti Mardia's textbook, and Mahalanobis rolls off my tongue. As an undergraduate I studied from CR Rao's Linear Statistical Inference book, and met the great man on a number of occasions. Ram Gnanadesikan was an early mentor at Bell Laboratories, and I met Raghu Bahadur several times at University of Chicago, and Debrabrata Basu at the JSM meetings. These are some of the great mathematicians and statisticians from your institute, and have left huge marks on our field. They have also had a big influence on my career.

I have been a Professor at Stanford University for nearly 30 years. We admit between 10 and 12 new Ph.D students each year, from a pool of applicants from all over the world. Guess what? Typically each year we admit two students from ISI. Sometimes three, sometimes one, but generally two. There is no algorithm written down that says we should do that (it would probably not be legal), but we all have one built into our heads. We have had a long history of success with ISI students.

Here are some examples.

- Sourav Chatterjee (graduated 2005, advisor Persi Diaconis) is professor of Statistics and Mathematics at Stanford, and is super famous already — many prizes (Doebelin, Loeve, Infosys), and was elected a Fellow of the Royal Society this year. I taught Sourav a first year applied statistics class. During the class I gave a rough proof of the convergence of backfitting, an algorithm we use in additive models. After class

Sourav came to the board and questioned my proof. After a while the droplets of sweat appeared on my brow, and I knew we had someone really special in our new Ph.D intake.

- Rahul Mazumder (graduated 2012, advisor Trevor Hastie) is tenured associate professor at MIT Sloan School of Management. Wonderful recent work on convex and mixed integer optimization, with stunning breakthroughs in best-subset selection. While a graduate student Rahul wrote a paper explaining why the Friedman, Hastie and Tibshirani algorithm for fitting a graphical lasso model worked. It was clever, involved technical manipulations in convex duality, and removed the cloud of confusion left by those authors in their original paper.

Here are some more, not in any particular order, and all in very successful careers:

- Debashis Paul (Professor, University of California, Davis, for 18 years, now Professor in Applied Statistics at ISI, graduated 2005, advisor Iain Johnstone).
- Gourab Mukherjee (Associate Professor, University of Southern California, graduated 2013, advisor Iain Johnstone).
- Sumit Mukherjee (Associate Professor, Columbia University, graduated 2014, advisor Persi Diaconis)
- Bhaswar Bhattacharya (Associate Professor, Wharton School, University of Pennsylvania, graduated 2016, advisor Persi Diaconis)
- Arnab Chakraborty (Associate Professor, ISI, graduated 2003, advisor Persi Diaconis)
- Subhabrata Sen (Assistant Professor, Harvard, graduated 2017, jointly advised by Amir Demobo and Andrea Montanari)
- Pragya Sur (Assistant Professor, Harvard, graduated 2019, advisor Emmanuel Candes)

- Swarnadip Ghosh (Radix Trading, graduated 2022, advised jointly by Art Owen and Trevor Hastie)

- Kinjal Basu (Stealth Startup, Austin, Texas, graduated 2016, advisor Art Owen)
- Sudeshna Adak (CEO and founder, Omix research, Bangaluru, graduated 1996, advisor Iain Johnstone)
- Samyak Rajanala (Adobe India, graduated 2023, advisor Rob Tibshirani)
- Ennapadam Seshan Venkatraman (Memorial Sloan Kettering Cancer Center, graduated 1992, advisor David Siegmund)
- Disha Ghandwani will hopefully join this list in a few years. She is currently doing her PhD research with me. (That was just to tease her — she will certainly join the list.)

I have known and taught all but one of these listed above, and have many fond memories. So thank you ISI for these wonderful students that make us Stanford faculty look good.

OK, enough about ISI — let me tell you about me!

I grew up in South Africa during the apartheid regime. My lifetime heroes are Mahatma Gandhi and Nelson Mandela — they both made a huge impact on South Africa.

Like many of you graduating here today, I chose statistics as a major because I was good at mathematics but wanted to do something more applied. I bet this was the same for many of you? With a BSc from Rhodes University, I got a job in Cape Town at the Institute for Biostatistics in 1977, at the SA Medical Research Council. I loved working with real data, and computer packages were just emerging.

After three years, which included a working year abroad at the London School of Hygiene and Tropical Medicine, the Johnson Space Center, and Oxford University, I realized I needed a deeper education in statistics. I was admitted into the Ph.D program at Stanford University in 1980 (luckily no ISI students applied that year).

Let me pause here. For those of you receiving bachelor degrees, itching to get out in the real world. There is no need to rush into graduate school. Working for a few years (two or three) can be really good for you. If like me, you come to realize that graduate study would further your goals, then it is time to go back to college. I have found that graduate students who have

taken these gap years often make the very best students, eager and hungry to further their knowledge.

My 1984 Ph.D thesis was titled “Principal Curves and Surfaces”, and my advisor was Werner Stuetzle. Rob Tibshirani was a fellow student, and we became friends at Stanford. Before we graduated we wrote a paper “Generalized Additive Models” which was published in 1986 in *Statistical Science*.

After a brief stint back in South Africa, I got a job at AT&T Bell Laboratories in 1986, in the statistics research group. This is the place where the transistor was invented, and a large part of the Unix operating system. The S language was invented in my research group, which was the precursor to R. I loved computing, and I was in heaven. I was there for 8 years. During that time I wrote a monograph “Generalized Additive Models” with Rob Tibshirani, who was a frequent visitor. I also wrote a lot of statistical modeling software for S, and coedited “Statistical Models in S” with John Chambers.

I had promised my wife Lynda no more than 4 years in New Jersey (a state with very hot and humid summers, and freezing cold winters), and it ended up 8 years! Fortunately she did not leave me. In 1994 we returned to California, and I have been a professor at Stanford ever since. Lots of wonderful Ph.D students (28 and counting), five more books and lots of research papers.

Why do I tell you all this? Well, its fun to reminisce, but I had a reason. When you look back after a long career, you think of what you are most proud. Of course I am proud of the awards I have received and some of the books/papers I have written. But that is just a bit of vanity and it wears off quickly. In my mind the most rewards are gained from what you can do for people. By the way, an applied statistician gets rewarded often. A biologist comes to you for help with their data analysis problem. You do some magic, give them some confidence intervals and p-values, sometimes much more, and they go off very happy. As do you!

Since 2009 my coauthors and I have made agreements with our book publishers that the pdf of our books should be freely available. So we have five books that are free to anyone anywhere. Tibshirani and I also filmed a 10-week course on Statistical Learning that is freely available via EdX, and has been taken by more than 300 thousand learners all over the world. About 17% of these are from India. This is what I am proud of.

One more thing, for the statistics graduates. When I entered this field, statistics was a considered a boring, nerdy subject, disliked by many. If I sat next to someone on a train, and they asked me what I do, I would say I am

into computers rather than admit the “S” word. Fast forward 40 years, and now statistics is super cool. AI and data science are in, and you tell someone you are a statistician and you get “wows”! (OK, maybe thats a bit of an exaggeration.)

Be proud of your achievements — ISI is a fantastic Institution. Remember those that have helped you get here — your family, teachers and friends. And most important of all — whatever you do, make sure you like it. Better still, love it. That way you will set yourself up for success.

It is a wonderful period for our field, and I hope you all have exciting careers ahead of you. I wish you all well, and congratulations class of 2023.

Trevor Hastie, December 19, 2023