

THE UNIVERSITY OF GEORGIA
DEPARTMENT OF STATISTICS
AND
THE STATISTICS CLUB
jointly present



The Bradley Lecture

Friday, April 26, 2019
Special Collections Library | Room 285

Dr. Art Owen

Department of Statistics
Stanford University

Importance sampling: some recent results and low hanging fruit

This talk will present some recent work on importance sampling to compute the probability of a rare event. The original motivating problem was to compute the failure probability μ in a model of the electrical grid. That reduced to the probability that a high dimensional Gaussian random vector \mathbf{x} belongs to one or more half-spaces H_j for $j = 1, \dots, J$. We used (reinvented actually) an importance sampling strategy of Karp and Luby (1983) from theoretical computer science. The sampler chooses H_j with probability proportional to its own Gaussian content, and takes \mathbf{x} conditionally on $\mathbf{x} \in H_j$. Then we count the number $S(\mathbf{x})$ of half spaces including \mathbf{x} . The estimate is then

$$\hat{\mu} = \frac{\bar{\mu}}{n} \sum_{i=1}^n \frac{1}{S(\mathbf{x}_i)}$$

where \mathbf{x}_i are n independent draws like this and $\bar{\mu}$ is the union bound. We prove that $\text{Var}(\hat{\mu}) \leq \mu(\bar{\mu} - \mu)/n$.

We also show that $\sqrt{\text{Var}(\hat{\mu})/n} \leq \sqrt{(J + J^{-1} - 2)/(4n)}$. The same geometry shows up in sampling for false discoveries in genomics where $\mathbf{x} \in H_j$ indicates a falsely rejected null. It also appears in some vector quantization problems where a noisy signal arrives in the wrong Voronoi cell. This talk will also include a useful bound on inefficiency of some deterministic weighing of an adaptive importance sampler.

▪ *About the Speaker* ▪

Art Owen is professor and chair of the statistics department at Stanford University. He invented the empirical likelihood which provides likelihood based inferences without requiring a parametric model, as well as randomized quasi-Monte Carlo sampling which yields a variance nearly $O(n^{-3})$ for smooth enough integrands. His interests include bioinformatics, statistical approaches to numerical problems such as integration and approximation, and research synthesis combining data from different populations. He is a fellow of the American Statistical Association and of the Institute of Mathematical Statistics. He recently gave a series of 9 lectures as the 2019 London Mathematical Society invited lecturer.

More information can be found at <http://statweb.stanford.edu/~owen/abocv.pdf>



▪ *History of the Bradley Lecture* ▪

The University of Georgia Department of Statistics and the Statistics Club are proud to host the 23rd Annual Bradley Lecture. The event honors former faculty member Dr. Ralph A. Bradley, who was born on November 28, 1923 in Smith Falls, Ontario, Canada, and who grew up in the village of Wellington. After graduating from Queen's University in 1944 with an honors degree in mathematics and physics, he served in the Canadian Army from 1944 to 1945, and afterwards earned his Masters of Arts degree in 1946. He received his PhD in 1949 at the University of North Carolina Chapel Hill, and went on to a very distinguished career. He was founder of the Department of Statistics at Florida State University and served as its chair from 1959 to 1978. He joined UGA in 1982.

Dr. Ralph Bradley made many contributions to the field of statistics as a researcher in design of experiments, nonparametric statistics, sequential analysis and multivariate analysis. He also had an exemplary record of service to the profession of statistics as a member of ASA, IMS, ISI, as well as by serving as a president of ASA in 1981.

The Bradley Lecture provides an opportunity for UGA graduate students to interact with the speaker, who is normally an eminent statistician of their choice. After the seminar in the afternoon, the speaker gives an after-dinner presentation and often stays for the next day's spring picnic to mingle with faculty and students.

We hope you'll join us for what should be an informative and exciting event!

▪ *Schedule of Events* ▪

Friday, April 26, 2019

3:30pm – 4:00pm

Arrival

Special Collections Library Room 285

4:00pm – 5:00pm

Lecture

Dr. Art Owen

Special Collections Library Room 285

5:00pm – 6:00pm

Happy Hour

(Cash Bar & Light Refreshments Will Be Served)

Special Collections Library Room 285

6:00pm – 8:00pm

Dinner and After-Dinner Talk

Dr. Art Owen

Special Collections Library Room 285

Saturday, April 27, 2019

11:00am – 3:00pm

Bradley Spring Picnic

Sandy Creek Park | Pavilion #1

▪ *After-Dinner Talk* ▪

Dr. Art Owen

Speical Collections Library Room 285

Variable importance in statistics and in real life

What makes a variable important? The short answer is that a variable is important if changing it makes a difference to something else that we already thought was important. This talk will discuss and unite numerous ways that variable importance has been measured by statisticians and mathematicians, with some real world examples.

▪ *Bradley Spring Picnic* ▪



Sandy Creek Park | Pavilion #1

Saturday, April 27, 2019 | 11:00am – 3:00pm

Enjoy a relaxing afternoon full of food, fun and fellowship! Mingle with the guest speaker, faculty members, and graduate students while watching the students show off their outdoor grilling skills.