Jerry@82
(1982, That is)

Dave Henry
Bristol-Myers Squibb Company (retired)
1982

• Jerry joined Stanford Statistics Faculty
• Appointment Joint with Stanford Linear Accelerator Center
  • Head of SLAC Computation Research Group since 1972
• I was looking for a Ph.D. topic and thesis advisor.
1982

- *Projection Pursuit Regression* (Friedman and Stuetzle) published previous year (1981)
- Projection pursuit a long-term interest for Jerry
Approaches to Projection Selection in Regression

\[ Y_i = \beta_0 + \sum_{j=1}^{r} f_j(\beta_j^T X_i) + \epsilon \]

\( X_i: 1 \times p; Y_i: 1 \times 1; \{\beta_j\}: \) unit vectors of length p

**Standard Linear Regression**

\( r = 1; f = \) scalar function

**Neural Networks**

\( \{f_j\} \) prespecified nonlinear transformations

Estimation simultaneous

**Projection Pursuit Regression**

\( \{f_j\} \) estimated smooth functions; data-driven

Estimation sequential with updating
Projection Pursuit Regression vs. Neural Networks

• Both handle “curse of multidimensionality” by identifying interesting projections and applying functions to them.

• Different in several ways:
  • PPR more general. Neural networks pre-specify the functions, while PPR estimates them through smoothing.
  • Neural networks estimate everything simultaneously, while PPR operates in a stepwise manner, accompanied by updating.
  • Since the functions in PPR are also being estimated, there are more “parameters” being estimated, so that more data is required to avoid overfitting. (Usually not an issue in large data sets)
With his Ph.D. in Physics, Jerry brought a different perspective to Statistics. Although he knew a lot about applied statistics, he didn’t come through the traditional theoretical statistics pathway that most of us travelled. So he could view problems differently.

I was intrigued and signed on as Jerry’s student.
Early Projection Pursuit Challenges
Interpretation of Smooth Functions

• Smooth functions are fine if you’re building a black box, but what if you want to interpret the functions?
• Human gift of pattern recognition when presented in low dimensionality
• Sally Morton, Interpretable Projection Pursuit
  • Trading Accuracy for Interpretability
Early Projection Pursuit Challenges
Computing Requirements

• Highly Computer Intensive (by 1980s standards)
  • Large data sets, many variables
  • Each candidate projection requires smoothing
  • Numerical search for optimal projection

• Limited facilities with adequate computing power
  • Delayed acceptance

• Ahead of its time – looking toward a future without computational limitations

• Jerry and Werner keenly aware of this limitation and worked to make the code more efficient
Projection Pursuit Challenges
Computing Requirements

• Most statistics centers couldn’t develop this methodology
• Simulations to understand the properties of the methodology prohibitively expensive
• But SLAC always had access to the fastest IBM supercomputers
• If I kept my simulation data sets reasonably sized, I could get results back in 15-30 minutes
  • (500 observations, 4 variables; 5000 repetitions)
Statistics Department’s Computer (1982)

• Stanford Statistics had access to two “computer systems”
  • University computer system for funded research and classwork
  • Stat Department DEC VAX Minicomputer (unfunded research)

• Simulation Example
  • In 1982, I was one of two graduate students assigned to maintain the department’s VAX.
  • A professor asked me to program a simulation that included inverting covariance matrices.
  • The program ran for almost two weeks, interfering with many other programs.
Everyone forgets Radio Shack, but in 1980, Radio Shack and its parent company, Tandy, sold more computers than anyone. In 1980, it was just about as easy to find a Radio Shack as it was a McDonald’s, and Tandy had a hard time keeping up with demand. Up until 1982, Radio Shack outsold Apple by a factor of 5 to 1.

Radio Shack TRS-80 computers featured Z-80 CPUs expandable to 64K of RAM and ran their own operating system, TRS-DOS. They could also run CP/M if you wanted. Tandy had some issues with quality control early on, which led to the unfortunate nickname of “Trash 80,” but they sold well because Radio Shack got rule #1 of marketing right. Their computers were easier to buy than anyone else’s.

In 1980, Radio Shack also issued the Color Computer, a $399 computer that could connect to a TV. It had a chicklet keyboard, 4K of memory and cost $399. It was the cheapest computer with color on the market in 1980, even if it only displayed four of them. For less than $1,000, any computer in 1980 came with a lot of compromises.

Read more: https://dfarq.homeip.net/computers-in-1980/#ixzz5n76UtGyV
Extensions to Projection Pursuit Regression

• Multiplicative Models
  • Both regression and classification (modelling likelihood)

• Projection pursuit regression with enhanced statistical and computational advantages

• PPR generalized to multivariate responses
  • Classification as a special case
Perspectives on Jerry

• As an advisor
  • Gave me room to run
  • Provided useful perspectives and feedback (both technically and strategically)

• Had a clear view on the implications of the evolving nature of data
  • Data sets becoming increasingly larger and more complex
  • How should statistics react to this challenge?
  • Jerry was far ahead of his time here!
History of Sequoia Hall

• In 1891, the original building opened as Roble Hall, a three-story women's dormitory. Roble Hall housed the first women admitted to Stanford. In 1917, a new women's dormitory also called Roble Hall was constructed on another part of campus and the earlier building was renamed Sequoia Hall and renovated as a men's dormitory. During World War I, Sequoia Hall was used by the Army for officers attending the War Department civilian defense school.

• In the 1930s and 1940s, Sequoia Hall fell into disrepair and was vacant by 1945. In 1957, the building was deemed an earthquake hazard. The top two stories of the building were demolished and the bottom floor was renovated. The renovated building became home to the Statistics Department.
Sequoia Hall in 1982

• First floor
  • Faculty offices
  • A few shared offices for advanced graduate students
  • Two small 8-person offices (primarily first year students)

• Basement ("dungeon"): offices for the rest of the students

• 25 years since renovation
History of Sequoia Hall, continued

• In the late 1980s, Stanford University began planning a $120 million Science and Engineering Quad (SEQ) Project, scheduled to be completed by 1999. Part of this project included the construction of a new building for Statistics.

• On August 22, 1996, the original Sequoia Hall was demolished to make way for the new facility. The new Sequoia Hall opened January 17, 1998 on an adjacent site. The 14,000-square-foot (1,300 m²) facility is current home to the Statistics Department.
Summary

• Jerry’s arrival in 1982 was an important addition to Stanford Statistics Department.

• He added new perspectives to the statistical community at a time when
  • the volume and complexity of data was exploding
  • the computing capability to address these challenges was just beginning to develop.
  • Jerry was light years ahead of the statistical community in this regard

• I am also personally appreciative of Jerry’s contributions to my development as a statistician.