1986: The Hydrographic Data Problem

The table below gives the depth Z of water in feet for surface points with rectangular coordinates X, Y in yards. The depth measurements were taken at low tide. Your ship has a draft of five feet. What region should you avoid within the rectangle $(75, 200) \times (-50, 150)$?

X	Y	Z
129.0	7.5	4
140.0	141.5	8
108.5	28.0	6
88.0	147.0	8
185.5	22.5	6
195.0	137.5	8
105.5	85.5	8
157.5	−6.5	9
107.5	−81.0	9
77.0	3.0	8
162.0	−66.5	9
162.0	84.0	4
117.5	−38.5	9

Comments by the Contest Director

The problem was contributed by Richard Franke (Dept. of Mathematics, Naval Postgraduate School, Monterey, CA). His paper [1982] compares 34 approaches to this problem.

Two points on the suggested outline for papers received scant attention: testing and (especially) stability. In particular, none of the papers questioned how the depth data—all depths were given in exact numbers of feet—were arrived at: rounding down? truncation? rounding up?

Although the concept of *stability* (conditioning, robustness, sensitivity, well-posed, etc.) was introduced by the great Jacques Hadamard in 1923, it seems to have difficulty establishing itself in the undergraduate mathematics curriculum.

Reference

Franke, Richard. 1982. Scattered data interpolation. *Mathematics of Computation* 38: 181–200.