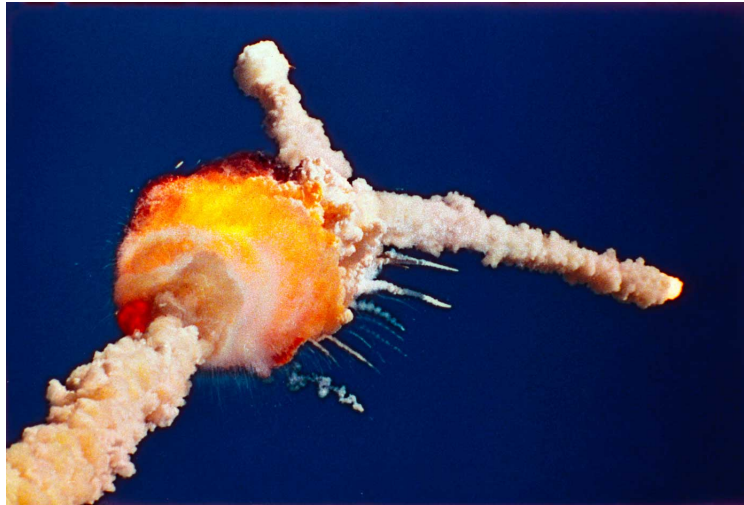


DS-510 Project 2
Assigned April 11, 2017
Due April 25, 2017

The following programming assignment concerns the task of approximating the fitted values for a logistic regression model.

On the morning of January 28, 1986, despite concerns within NASA and among others working on the launch that the weather was too cold, the shuttle Challenger blasted off. Seventy-three seconds later, it broke apart in long, grotesque fingers of white smoke in the sky above Cape Canaveral, Florida.



The consensus of the commission and participating investigative agencies was that the loss of the Space Shuttle Challenger was caused by a failure in the joint between the two lower segments of the right Solid Rocket Motor. The specific failure was the destruction of the seals that are intended to prevent hot gases from leaking through the joint during the propellant burn of the rocket motor. The evidence assembled by the commission indicates that no other element of the Space Shuttle system contributed to this failure.

Nobel laureate and theoretical physicist Richard Feynman was on the commission which investigated the cause of the disaster. Feynman's investigation eventually suggested to him that the cause of the Challenger disaster was the very part to which NASA management so mistakenly assigned a safety factor. The O-rings were rubber rings designed to form a seal in the shuttle's solid rocket boosters, preventing the rockets' hot gas from escaping and damaging other parts of the vehicle. Feynman suspected that despite NASA's claims, the O-rings were unsuitable at low temperatures and lost their resilience when cold, thus failing to maintain a tight seal when rocket pressure distorted the structure

of the solid fuel booster. Feynman's suspicions were corroborated by General Kutyna, also on the commission, who cunningly provided Feynman with a broad hint by asking about the effect of cold on O-ring seals after mentioning that the temperature on the day of the launch was far lower than had been the case with previous launches: below freezing at 28 to 29 Fahrenheit. Previously, the coldest launch had been at 53 Fahrenheit. In 2016, Kutyna revealed that his O-Ring insight had in fact come to him from astronaut Sally Ride, who had secretly provided him with NASA test results showing the O-rings became stiff when they were too cold.



The data file `challenger.txt` contains instances of a binary response variable y_i and a single input variable x_i for $i = 1 \dots 23$. This data describes temperature and failure of field-joint O-Rings for 23 pre-Challenger space shuttle flights. The first column contains the input variable which is the air temperature for a given shuttle flight while the second column contains the binary response variable which indicates if there was erosion or blowby in the O-Ring on that flight.

Your assignment is to use the data in `challenger.txt` to assess the probability that the O-rings on the Challenger flight that morning would have failed. You are to include the fitted values for the parameters in the logistic regression as well as a plot of the estimated probability of O-ring erosion or blowby along with the discussion of your assessment.