The following use case is a simplified application based on the extended research performed for the Memorial Sloan-Kettering Cancer Center (Lee, Zaider 2008), which won the **2007 Franz Edelman Award** for Achievement in Advanced Analytics, Operations Research, and Management Science from INFORMS.

Radiation therapy for prostate cancer can be delivered by brachytherapy (permanent implantation of radioactive seeds or high dose rate treatment). In brachytherapy, radioactive sources (Iodine-125 or Palladium-103) are permanently implanted in the prostate in a pattern designed to **maximize the dose to the tumor while avoiding overexposure of the surrounding normal tissues**. A major limitation of radioactive-seed implants has been the difficulty of accurately placing 60-150 seeds within the prostate in a specified geometric pattern. If a seed is placed in a specific location, then it contributes a certain amount of radiation dosage to each point in the area to the treated. Lower and upper bounds for dose to all structures are stated in terms of percentages of prescription dose.

Let's consider the following simplified problem. The diagram below shows a treatment area, divided in 16 sections, each section containing tissue classified as H (healthy) or T (tumor). Assume only 3 seeds can be placed and the radiation exposure in each section is inversely proportional to the distance from the seed location to the center of the section, calculated as exposure = 1/(distance + 0.01). Each tumor section needs to have exposure of at least = 3 and we want to minimize total healthy tissue exposure.