INTRODUCTION

MATHWORKS MATH MODELING CHALLENGE 2018:
"BETTER ATE THAN NEVER: REDUCING FOOD WASTE"

Introduction By: Cleve Moler, Chief Scientist and cofounder, MathWorks

Most people in the United States have consistent, dependable access to enough food for active, healthy living—they are food secure. However, about 15.6 million American households experience food *insecurity*, meaning they have difficulty at some time during the year providing enough food for all their members due to a lack of resources, according to an annual survey conducted by the U.S. Department of Agriculture's Economic Research Service. At the same time, more food ends up in landfills and incinerators than any other single material in our everyday trash, according to the U.S. Environmental Protection Agency. Keeping wholesome and nutritious food in our communities and out of landfills can help the 42 million Americans that live in food insecure households, but what are the best ways to do this? That's the problem 912 teams comprising of 4,175 high school students examined in the 2018 MathWorks Math Modeling (M3) Challenge. Using their mathematical expertise, observations about their own personal choices when it comes to food consumption, and sometimes a bit of technical computing, juniors and seniors across the country examined the problem of reducing food waste.

During the intensive M3 Challenge weekend in early March 2018, teams gathered and evaluated data, then built a solution. The problem prompt specifically asked teams to create a mathematical model to determine if a state could feed its food-insecure population using its wasted food, and to build a second model to determine the amount of food waste a household generates based on its traits and habits. Students were then tasked with using their models to provide insight about which strategies communities should adopt to repurpose the maximal amount of food at the minimum cost. Teams submitted their solutions via computer upload after working under the strict time limit, akin to the way things often happen in the world.

Judges looked for creative, outside-the-box thinking on reducing wasted food in the U.S.— indeed even for ideas to be shared with the USDA and other agencies who might be interested in realistic, computationally derived ideas about feeding the food-insecure population. The U.S. Department of Agriculture's Economic Research Service provided advice and data pointers for this year's M3 Challenge problem.

After two rounds of judging by professional applied mathematicians over the next eight weeks, six finalist teams were selected to present their solutions to a panel of mathematical experts in New York City on April 30. Thirty-seven teams were recognized with scholarship prizes totaling $100,000, with the champion team receiving $20,000.

M3 Challenge is organized by the <u>Society for Industrial and Applied Mathematics (SIAM)</u> and funded by MathWorks to give high school students the opportunity to answer big, open-ended questions by applying mathematics, to motivate students to pursue careers in science and math, and to inspire use of technical computing to solve significant problems. Since its inception in 2005, SIAM's Math Modeling Challenge has drawn the participation of more than 41,000 students, 4,000 high schools, 5,000 teachers, and 400 Ph.D.-level judges and has awarded more than $1.3 million in scholarships.

The following is the Champion team's paper from the 2018 MathWorks Math Modeling Challenge **with some reviewer suggestions incorporated**.

Complete information about the MathWorks Math Modeling Challenge, including an archive with problems and solutions from each Challenge year, is available at <u>http://m3challenge.siam.org</u>.