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TEMPLE UNIVERSITY
Department of Mathematics

Final Project Presentations
Math 8107: Mathematical Modeling
for Science, Engineering, and Industry

Room 617 Wachman Hall
Wednesday, 4 December, 9:00am-10:20am

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Gravestone Preservation: Giving Our Past a Longer Future

Gravestone deterioration is a common phenomenon in cemeteries around the world. Methods of deterioration include atmospheric weathering as well as biological corrosion. The National Park Service (NPS) is interested in the deterioration occurring in order to determine whether current procedures for gravestone preservation can be modified to extend the life of the gravestone. In this project, we create a mathematical model for the damage done to marble by atmospheric weathering as well as the growth of lichens on the stone.
Deterioration of the stone occurs due to the reaction of sulfur dioxide in the air with the marble (which creates a gypsum crust that gets washed away by rain), as well as through organic acids produced by the lichens. At the same time, lichens provide a certain level of protection to the stone, hence it is a-priori unclear whether lichens increase or decrease the rate of deterioration of the stone. Using our model, we study under which circumstances one or the other scenario happens.

Team of students: Fariborz Soroush, Joseph Stoney, Yilin Wu
Partner: U.S. National Park Service

Entropy Models and Relative Attraction Models
for Trip Distribution Forecast

The DVRPC is the Metropolitan Planning Organization for the greater Philadelphia Area, and one of its core functions is travel demand modeling. This is carried out via a 4-step model; one of these four steps is Trip Distribution. In this project, different models for trip distribution are analyzed and compared, including the entropy-based model used by DVRPC and other models found in the literature. Moreover, a new model for the trip distribution, called the Relative Attraction Model is proposed. The accuracy of all models are evaluated based on census and survey data provided by the DVRPC.

Team of students: Farhan Abedin, Jose Garay, Nathan Wagenhoffer
Partner: Delaware Valley Regional Planning Commission (DVRPC)

Faculty Advisors: Yury Grabovsky, Isaac Klapper, Benjamin Seibold, Daniel Szyld