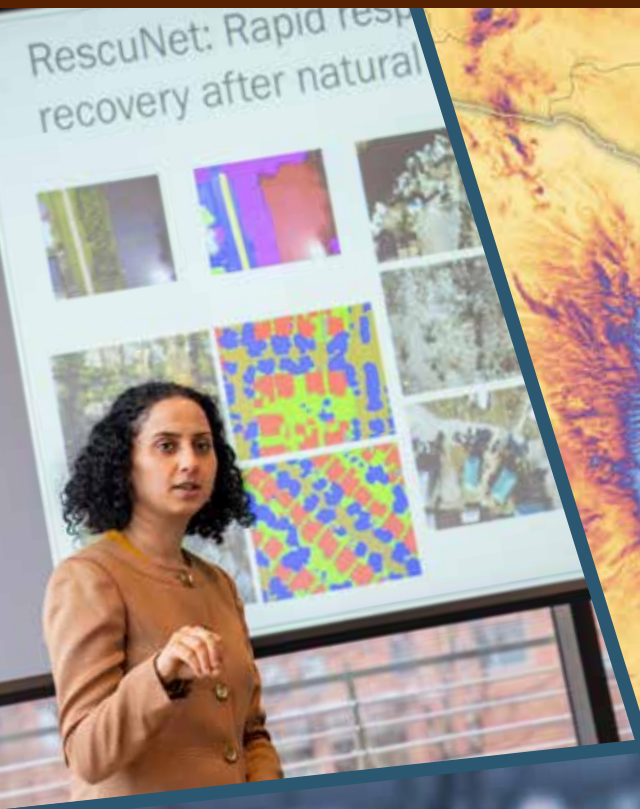
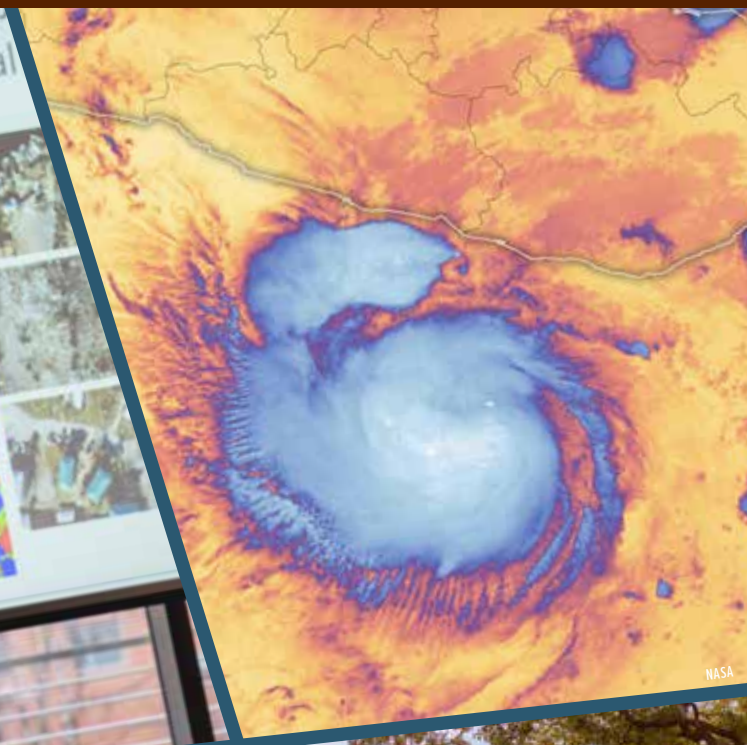
LEHIGH UNIVERSITY | P.C. Rossin College of Engineering and Applied Science



# CATASTROPHE MODELING & RESILIENCE

MS & Certificate Program

# WHAT IS CATASTROPHE MODELING?

Catastrophe Modeling, often called CatModeling, is a scientific approach used in the insurance industry to carefully study natural disasters and their impacts.

Traditional methods of setting insurance premiums rely on historical claims data, but when it comes to rare events, this isn't practical. CatModeling integrates the limited available data with physical models, while considering uncertainties. Today, CatModeling has a broader scope that covers infrequent events like epidemics, financial crises, and political unrest.

CatModeling and Resilience Analysis play a vital role in how our communities prepare for, adapt to, and recover from extreme events. Before disasters, CatModeling helps communicate risk, through access to lower insurance premiums or better policies when investments in retrofit and mitigation are made. After disasters occur, resilience plans allow our communities to recover quickly and effectively.

The field is growing, companies actively seek graduates with expertise in Catastrophe Modeling and Resilience, and salaries are very competitive.

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# WHY CATASTROPHE MODELING?

## YOUR BACKGROUND

Engineering
Natural Sciences
Computer Science
Mathematics
Economics
Social Sciences

## YOUR PASSIONS

"I enjoy analyzing data to help make informed decisions."

"I want to build a more resilient world for future generations."

"I like solving complex problems, especially those with uncertainty."

"I'm fascinated by the idea of predicting the impact of natural disasters on communities."

## MS in CATASTROPHE MODELING & RESILIENCE

Addressing challenges involving...

DISASTER RECOVERY EPIDEMICS
EARTHQUAKES INSURANCE EQUITY
PROBABILISTIC MODELING
STATISTICS DATA FLOODS COMMUNITY
SYSTEMS CLIMATE ANALYSIS PREPAREDNESS
CHANGE PREDICTIVE MODELING
CRISIS RESPONSE RISK MANAGEMENT
INFRASTRUCTURE RESILIENCE HURRICANES WILD-FIRES

# OUR PROGRAM

### The Curriculum

- Interdisciplinary approach
- Foundations in data science and actuarial science
- Analytical focus
- Project-based learning
- Electives from multiple colleges

### The Experience

- On campus and/or online
- Part time or full time
- Multidisciplinary faculty
- Opportunities for short-term research

## Master of Science in Catastrophe Modeling & Resilience Courses

**Catastrophe Modeling & Resilience**

**Introduction to Data Science**

**Numerical Methods for Scientists & Engineers**

**Applications of Catastrophe Modeling & Resilience**

**Mathematics of Actuarial Science**

**Supervised Research in Catastrophe Modeling & Resilience**

**Catastrophe Modeling & Resilience Capstone**

*Additional elective courses are chosen from a broad portfolio to tune the program to each student's interests and goals.*

## Certificate in Catastrophe Modeling & Resilience Courses

**Catastrophe Modeling & Resilience**

**Applications of Catastrophe Modeling & Resilience**

**Introduction to Data Science**

**Catastrophe Modeling & Resilience Capstone**

## How Will You Benefit?

In as little as 11 months, master's students gain a comprehensive understanding of catastrophe, risk, and resilience modeling, with specialized knowledge in areas like infrastructure resilience, epidemic forecasting, or probabilistic modeling in engineering and science. You will graduate with an in-demand skill set that draws from engineering, data science, actuarial science, and social sciences. Your master's degree or certificate will translate to career opportunities both in the private sector—companies in the (re)insurance sector, CatModeling firms, and general consulting firms focusing on risk and resilience—and the public sphere, working with emergency management agencies, local administrations, government agencies, and more. Working professionals can also join the program part-time to pivot their career.

# WHAT SETS US APART

Lehigh's Catastrophe Modeling and Resilience Graduate Programs—the first of their kind—provide a rigorous curriculum combined with flexibility that makes them accessible for students from a variety of backgrounds. An interdisciplinary team of faculty leverages expertise from across the university. Students engage in meaningful classroom experiences to learn and implement CatModeling methods. They tackle project-based work that applies that understanding, while interacting with many experts from the public and private sectors who collaborate with the program as guest lecturers and project supervisors. Students may write a master thesis or a project report, or opt for a coursework-only path. Graduates join a connected global community of Lehigh alumni who are leading in industry, academia, and government sectors.

## Center for Catastrophe Modeling and Resilience at Lehigh

The center was established in 2021 to provide an interdisciplinary home for the scientific and educational activities of scholars working on natural-disaster and health-related threats. In 2024, Catastrophe Modeling and Resilience was selected as primary area for strategic investment and expansion by Lehigh, and the center became its first University Research Center. In 2025, Lehigh and Rice universities established the Consortium to Enhance Resilience and Catastrophe Modeling (CERCat) with collaborators from Columbia University, Florida Atlantic, Washington State, and Missouri S&T. This industry-academia consortium supports research in collaboration with partner companies that are interested in advancing science, recruiting from our pool of talented students, and fostering collaborations between private and public sectors. Graduate programs offered through the center prepare the next generation of experts in this critical area.

**LEHIGH UNIVERSITY** is located in the heart of the beautiful Lehigh Valley, the third largest metropolitan area in Pennsylvania. Home to top-notch entertainment, shopping, and restaurants, our region is also known for its seemingly endless array of opportunities for outdoor exploration and adventure.

Bethlehem is a vibrant city, rich in history and radiating small-town friendliness and feel. The arts are alive here, with exciting seasonal events, nationally recognized musical acts, comedy, art, and more. Known as the "City of Festivals," Bethlehem hosts 20-plus major festivals and over 150 mini-festivals each year.

Need more action? Plan a day or weekend trip to New York City, Philadelphia, the Pocono Mountains, or the New Jersey and Delaware beaches—all within reach by car or public transportation.

catmodeling.lehigh.edu