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Seren Snow

## **Advanced mortality modeling earns UCSB team international actuarial prize**

For Nhan T. Huynh, the news came in an unexpected email from her former adviser, [Michael Ludkovski](#), a professor in UC Santa Barbara's Department of Statistics and Applied Probability. The note contained word of a career-defining achievement: The pair had won the Peter Clark Prize from the U.K.-based Institute and Faculty of Actuaries (IFoA) for their research on innovative mortality modeling.

The annual prize honors an outstanding paper presented to an actuarial audience and highlights the methodological rigor and real-world impact of their research. Their paper, "Joint Models for Cause of Death Mortality in Multiple Populations," published in [Annals of Actuarial Science](#), offers a significant advance in a field central to modern risk management and demographic planning.

Huynh, who recently completed her Ph.D., recalled the moment with surprise and gratitude. "I was surprised and super honored to receive this award," Huynh said. "I just feel like all of the hard work that Mike and I did together for the past few years had paid off."

"Dr. Huynh and Professor Ludkovski have demonstrated how advanced probabilistic modeling can be applied to real-world demographic challenges," said Department Chair Tomoyuki Ichiba.

“Their integration of Gaussian processes with mortality data opens new avenues for understanding cross-national trends in public health. It’s a remarkable achievement and a proud moment for our department to be honored with this recognition two years in a row.”

## **A fresh approach to mortality modeling**

For decades, actuaries and demographers have sought to understand the trends embedded in mortality data. However, existing models often focus on isolated components, such as a single country or a specific cause of death. The work by Huynh and Ludkovski introduces a unified framework that offers a more comprehensive view of these evolving patterns.

Their paper draws on the Human Cause-of-Death Database (HCD) to develop joint stochastic models that capture dependencies across causes and populations. As Ludkovski describes it, they are building “a big lattice where we look across genders, countries and causes and how this whole cube of mortality trends evolves together.”

This multidimensional approach enables more nuanced analysis. For example, the model can reveal whether a decrease in heart disease deaths in one country is offset by a rise in cancer deaths, or how mortality trends in post-communist Poland compare to those in the Czech Republic. The authors used a subset of the HCD data for a U.S. case study to analyze how trends in overdose deaths interact with other causes and ultimately affect Americans’ projected life expectancy.

By fusing data, the model improves predictive power, offering insight into shared and diverging trends across causes, countries and genders.

## **Advancing actuarial science with real-world applications**

This award-winning work stands out for its practical value. As Huynh, now a data scientist, explained: “A lot of time, actuaries value methods that are simple and transparent. But now, because of the recognition of this prize, it highlights the fact that we can actually use very cool advanced methodologies to help improve the

credibility and quality of actuarial work.”

Ludkovski, a leading expert in longevity analysis, was quick to credit his former student for her role in the project. “This one’s really cool because this is all her work,” he said. “It’s nice to have a former student be recognized.”

The research, which formed the basis of Huynh’s doctoral thesis, grew out of her interest in extending Ludkovski’s previous work using the statistical technique of Gaussian processes to model mortality.

## **Mentorship meets innovation**

The Peter Clark Prize recognizes what Ludkovski calls a winning combination: “A cool dataset, an innovative method and topical applications.”

Both researchers are continuing to build on this success. Ludkovski has related papers in the pipeline, further pushing the boundaries in this growing area of study. Meanwhile, Huynh is applying and advancing statistical methods in her role at Arbital Health, an AI-powered health care technology firm that provides critical infrastructure for providers and payers to successfully manage risk-based contracts. The company was founded by Ian Duncan, an adjunct professor of actuarial statistics at UCSB who now serves as its senior adviser.

“It’s especially meaningful to see this recognition come from the IFoA, an organization of which I am a fellow,” Duncan said. “Having mentored Nhan during her graduate studies and collaborated with her in the private sector, I’ve seen the depth and practicality of her work firsthand. This award highlights how innovative statistical thinking can directly inform the future of actuarial practice.”

Their collaboration underscores the value of mentorship and student-driven research, with findings that may influence how mortality is modeled in the future.

## **Positioning the work in the field**

Mortality modeling has long been a cornerstone of actuarial science, demography and public policy. Traditional approaches, such as the widely used Lee-Carter model, typically focus on overall mortality within a single population or cause of death.

While these models are well refined, they often overlook the interdependencies between different causes of death and demographic groups.

Huynh and Ludkovski's joint modeling approach offers an important step forward by addressing these cross-population and cross-cause relationships simultaneously. Their work reflects a growing trend in the field toward more advanced statistical and machine-learning techniques — including Gaussian processes — to analyze high-dimensional structures in data.

Their model's ability to integrate varied mortality data sources and extract actionable insights is especially relevant today, as demographic shifts, global health challenges and longevity risks become increasingly interconnected.

## Ongoing contributions and broader impact

Beyond this research, Ludkovski recently co-authored "Gaussian Process Models for Quantitative Finance" (SpringerBriefs, 2025) with Jimmy Risk, a UC Santa Barbara statistics Ph.D. graduate who now teaches at Cal Poly Pomona. The book offers a practical introduction to Gaussian process methods tailored to financial mathematics and reflects Ludkovski's ongoing expertise in probabilistic modeling and its applications in data-intensive fields.

He has also secured a three-year National Science Foundation grant focused on stochastic modeling for sustainable groundwater management. That work applies advanced mathematical tools to the design of water rights markets and conservation strategies — highlighting how his expertise can address pressing environmental and economic challenges.

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