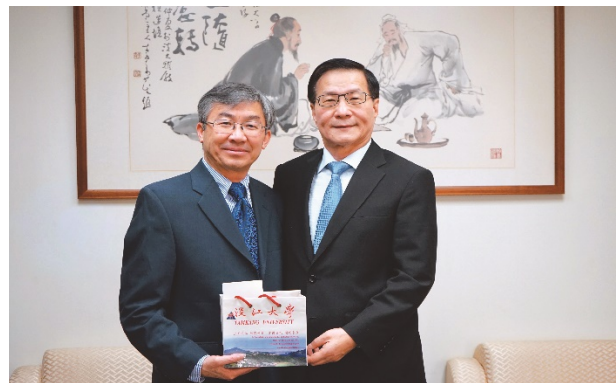


## LECTURE 5



### **Dr. Hoang Pham**

- **Distinguished Professor, Rutgers University, USA**
- **Fellow, Institute of Electrical and Electronics Engineers**
- **Fellow, Institute of Industrial Engineers**
- **Co-founding member and an Associate Director of the Rutgers Center for Information Assurance**

**Date: 2019.02.26**



## INTRODUCTION

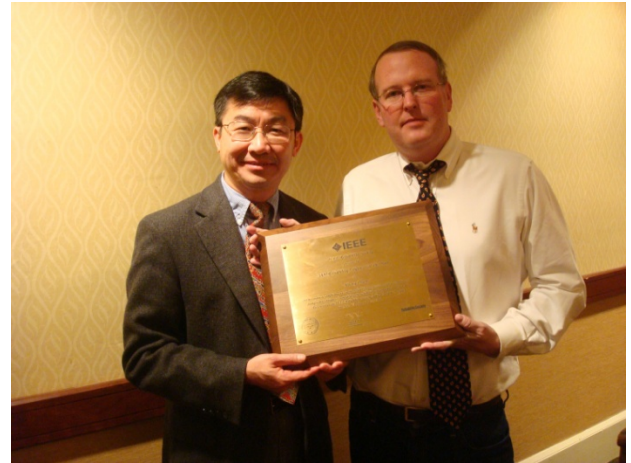
- Hoang Pham is a Distinguished Professor and former Chairman (2007-2013) of the Department of Industrial and Systems Engineering at Rutgers University. He is also a co-founding member and an Associate Director of the *Rutgers Center for Information Assurance*. Before joining Rutgers University in 1993, he was a Senior Engineering Specialist with the Boeing Company, Seattle, Washington, and the Idaho National Engineering Laboratory, Idaho Falls, Idaho.
- He came to America as a refugee in January 1980 with no English, no money. Hereceived his B.S. degrees in Computer Science and Mathematics both with high honors in December 1982 from Northeastern Illinois University, the M.S. degree in Statistics from the University of Illinois at Urbana-Champaign in May 1984, and the M.S. and Ph.D. degrees in Industrial Engineering from the State University of New York at Buffalo in 1988 and 1989, respectively.
- Dr. Pham has been served as Editor-in-Chief, Editor, Associate Editor, Guest Editor and board member of many journals. He is the Editor of *Springer Book Series in Reliability Engineering*, the Editor of *World*

*Scientific Book Series on Industrial and Systems Engineering*, and has served as Conference Chair and Program Chair of over 40 international conferences and workshops.

- Dr. Pham is the author or coauthor of 7 books and has published over 180 journal articles, more than 100 conference papers, and edited 15 books including *Springer Handbook in Engineering Statistical and Handbook in Reliability Engineering*.
- Dr. Pham has delivered over 40 invited keynote and plenary speeches at many international conferences and institutions include *The 75<sup>th</sup> Indian Statistical Institute (ISI) Platinum Jubilee Celebration (2008)*; *The International Conference of the M.S. Ramaiah Institute of Technology's Golden Jubilee Celebration, Bangalore (2012)*; and *The 25th Anniversary Symposium Celebrating 25 Years Reliability Engineering Center at the University of Maryland (2014)*.
- His numerous awards include the IEEE Fellow Award (2005) "*For Notable Contributions to Analytical Techniques for Modeling the Reliability of Software and Systems*", 2009 IEEE Reliability Society Engineer of the Year Award and 2011 IIE Fellow Award (2011) "*For Professional Leadership and Outstanding Contributions to*

*Industrial Engineering*".

- Selected 2009 Engineers of the Year Award from the IEEE Reliability Society "*For Many Accomplishments in the Reliability Profession with an Emphasis on Analytical Techniques for Modeling the Reliability of Software and Systems*".



- Dr. Pham, the Golden Jubilee Plenary Speaker at *The International Conference of the M.S. Ramaiah Institute of Technology's Golden Jubilee Celebration, Bangalore (2012)*, is on the News by The Hindu Newspaper, Bangalore, July 2012.





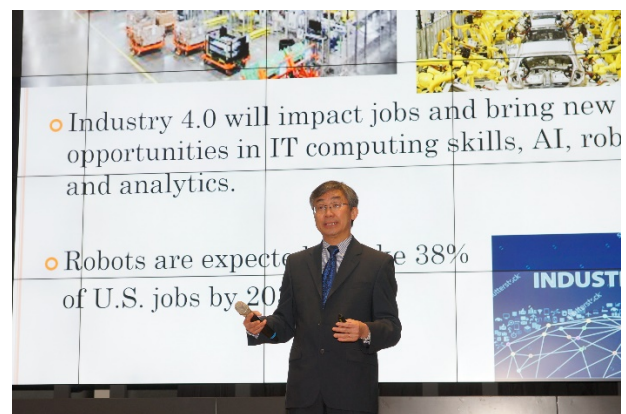
## Topic : Recent Trends in Reliability and Statistical Machine Learning

### ABSTRACT

We're living in an era of fast and unpredictable change. Billions of people are connected to each other through their mobile devices. Data is being collected and processed like never before. Automation, machine learning, cloud computing, artificial intelligence, and Internet of Things (IoT) — these are no longer revolutionary concepts, they are our reality. The Fourth Industrial Revolution (or Industry 4.0) will impact jobs, bring formidable challenges at the same time it will bring immense opportunities in many technical areas especially in IT computing skills, AI, robotics and analytics.

The era of big data through reliability and statistical machine computing with almost all applications has experienced a dramatic shift in the past fifteen years to a truly global industry. The forces that have driven this change are still at play and will continue. In this talk I will discuss: (1) recent trends in complex system

reliability as well as modeling selections, and (2) statistical machine-learning results of various applications from sampling distribution parameter prediction to airline customer satisfaction to breast cancer detection.



**Dependent Degradation Processes & Random Shocks**

- System degradation processes

$$M(t) = D(t) + S(t)$$

Time-scaled Covariate Factors

$$M(t) = X \cdot \eta(e^{G(t,t)}, \theta) + \sum_{i=1}^{N(t)} w_i$$

where

$$G(t, t) = \gamma_1 N(t) + \gamma_2 \sum_{i=1}^{N(t)} w_i$$

Random Shock Numbers      Cumulative nonfatal Random Shocks Amount

**A MEDIAN-BASED MACHINE-LEARNING METHOD**

**Random Sampling Bernoulli Parameter Prediction**

- In real-life applications we often don't have population data but we can collect several samples from a large sample size of data.
- Here we propose a median-based machine-learning approach and algorithms to predict the parameter of the Bernoulli distribution.

## MINUTE



Met with Chairman of the Board,  
Dr. Flora Chia-I Chang and TKU  
colleagues



Met with President, Dr. Huan-Chao  
Keh and TKU colleagues

- Prof. Hoang Pham visited Tamkang University on February 24 to March 1st in 2019. His visit was honored by Tamkang Clement and Carrie Chair Lecture Fund. The Dean of the College of Business and Management, Dr Tzong-Ru Tsai, he is also a professor at the Department of Statistics at TKU made receptions and accompanied him during his stay.
- Before the Chair Lecture at TKU, Prof. Pham visited President, Dr. Huan-Chao Keh and Chairman of the Board, Dr. Flora Chia-I Chang.

- Warmest welcomes were presented to the Chair Lecture.
- During the Chair Lecture, Business and Management College faculty and students were crowded at the international conference center to listen to the two-hour chair speech on *Recent Trends in Reliability and Statistical Machine Learning*. When delivering his speech, Prof. Pham received great attention from the audience, and successfully interacted with the audience during the Q&A session.



Delivering The Tamkang Clement and Carrie Chair Lecture at The International Convention Centre

- In the Chair Lecture, Prof. Pham focuses on the discussions of two topics (1) recent trends in complex system reliability as well as modeling selections, and (2) statistical machine-learning methods results of various applications from sampling distribution parameter prediction to airline customer satisfaction to breast cancer detection. Through the talk of Prof. Pham, the audience can have a comprehensive understanding on the engineering applications through using Big Data technologies. In the end of the talk, Prof. Pham encouraged the students should be aggressive and brave to meet any challenges.
- After the Chair Lecture, Prof. Pham delivered another lecture titled "International Collaborations on



*Reliability and Statistical Data Science Topics*” to faculty members and all master students in the Department of Statistics and entertained their special questions. The master students raised many

questions about the career in the area of Industrial Statistics and the potential areas with using AI technologies with statistical method. Prof. Pham is touched and patient to reply all questions.

## **International Collaborations on Reliability and Statistical Data Science Topics**





Met the faculty members and master students in the Department of Statistics



The banquet hosted by the Department of Statistics



The good time in Lanyang and Tamsui campuses