

## Edwin van den Heuvel

Department of Mathematics and Computer Science  
Technische Universiteit Eindhoven  
e.r.v.d.heuvel@tue.nl

### In Memoriam Alessandro Di Bucchianico (1963–2024)

# An effective and respected bridge builder

**Alessandro Di Bucchianico, associate professor in industrial statistics and program director of the Bachelor and Master programs in applied mathematics at Eindhoven University of Technology (TU/e), passed away far too early on July 8, 2024, from cancer, after a very brief illness at the Catharina Hospital in Eindhoven. Di Bucchianico was a pioneer in The Netherlands by contributing research towards real-world applications of statistics.**

Alessandro studied mathematics at the University of Amsterdam and graduated in 1987. Initially, he specialized in the field of mathematics known as “analysis”, and he began a PhD in this area at the University of Groningen. His PhD thesis, titled “Polynomials of Convolution Type”, earned him his doctorate in 1991. He remained in Groningen as a postdoc for two years but decided to take a different professional path. He began focusing on applied statistics, becoming an assistant professor at TU/e in 1993, where he spent the remainder of his professional career.

In 2001, Alessandro was promoted to associate professor, marking a significant milestone in recognizing his research contributions in industrial statistics. In 2007, he joined the Laboratory for Industrial Mathematics Eindhoven (LIME) as the indispensable right hand man of its founder, Prof. Dr. Bob Mattheij. LIME was established as a research institute at TU/e to support industry through innovation in processes and products. Alessandro was instrumental in securing funding through statistical projects in industry. LIME achieved significant success as a business and joined Sioux in 2011, but Alessandro chose to remain at the TU/e to continue his aca-

demical career. In 2018, Alessandro became a program director for the education in mathematics and in 2022, the master program on industrial and applied mathematics received the George Smith INFORMS price as the first university outside the USA.

Alessandro was a pioneer, because he was one of the first academic researchers in the mathematics department of a Dutch university who focused on statistical science for real-world applications. This was rather unconventional in the 1990s, because statistics at mathematics departments in the Netherlands was dominated by mathematical statistics. I believe that researchers like John Tukey and George Box inspired him. Thus, Alessandro wanted to make a change, and being confident in his strong mathematical foundation, he sought to apply mathematical rigor to practical problems. The phrase “nothing is more practical than a good theory”, often attributed to Kurt Lewin, who was considered a pioneer in social psychology, resonated deeply with Alessandro.

When an academic researcher focuses on developing theory for practical applications across many areas, there is a risk that the work or results may lack concentrated impact in any single discipline or applica-

tion domain, because it is scattered across many different areas. Although Alessandro also published on many different topics, both in statistics and different types of applications, he gained strong recognition. He was primarily recognized for his expertise and research in reliability and monitoring and, to a somewhat lesser extent, on exact distributions and predictive maintenance. He successfully advanced these areas by linking theory to practical applications, solidifying his reputation as a researcher in industrial statistics.

Although it is impossible to fully cover Alessandro’s contributions to statistics, I will highlight a few achievements in reliability and statistical monitoring, demonstrating his dedication to theory and applicati-



Alessandro Di Bucchianico

ons. He also made significant contributions to topics like nonparametrics (e.g., tolerance regions and null distributions) and density estimation, as well as providing entries in the *Encyclopedia of Statistics in Quality and Reliability* (e.g., Coefficient of Determination, Leverage, Measures of Scale, Outliers, Pareto Chart, and Sum of Squares), but his most prominent contributions were in reliability and monitoring.

Alessandro's early contributions to reliability were on software reliability, where he developed testing procedures to estimate and improve software quality and worked on estimating reliability models for software systems and failure probabilities. He also created statistical tools for software reliability analysis that were useful for industry and society. Later, Alessandro contributed to the field of end-of-life management, where loss of economic value would occur before technical failure, and performance monitoring and prediction of component failures are more important. He also contributed to the field of lifetime analysis, where degradation data and accelerated tests are used to estimate products' (functional) lifetime, and where uncertainty quantification is necessary, in particular when machine learning methods are used for prediction. I believe that he was often motivated to work in this area to make sure that more mathematical rigor was applied in the field of reliability, because he could become annoyed when confronted with sloppy and imprecise statistical practices.

In statistical monitoring, Alessandro's contributions are much more distinguished by "out-of-the-box" thinking, because he sought to revolutionize the field of Statistical Process Control (SPC) and go beyond the standard thinking in SPC. While the field was well-developed when he began his work, Alessandro believed that the statistical methods often relied on unrealistic or simplistic assumptions. Some of his notable contributions that demonstrate this out-of-the-box thinking include:

- Integrating SPC (focused on monitoring processes) with Automatic Process Control (focused on adjusting processes),
- Evaluating out-of-control situations beyond standard shift and trend assumptions,
- Monitoring high-volume processes, sparse events, and biological reference standards,
- Developing optimal sampling plans and generalized likelihood ratio control charts for monitoring impurities,
- Monitoring personal health for early disease detection,
- Linking predictability concepts with Shewhart's in-control monitoring concepts,
- Using copulas for multivariate monitoring of non-normally distributed data.

Besides his academic achievements and the societal impact of his work, Alessandro was deeply involved in the industrial statistics and mathematics communities. From 2007 to 2019, he served as director and webmaster of the European Network for Business and Industrial Statistics (ENBIS), a network founded in 1999 by Prof. Dr. Ronald Does to help connect academia and industry on topics of business and industrial statistics. Professionals working closely with Alessandro during his period at ENBIS as director spoke highly of his professionalism and dedication to the network. Furthermore, he also contributed to nENBIS, the Dutch section of ENBIS, as part of the Dutch Society for Statistics (VVS).

In addition to ENBIS, Alessandro played pivotal roles in several Dutch communities. He was instrumental in the first ten years of Eurandom, a national research platform on stochastics in the Netherlands established in 1998, which later evolved into a national workshop platform on the subject. Alessandro supervised many young researchers at Eurandom during its formative years. He also was a driving force behind Study Group

Mathematics with Industry (SWI) and the innovation committee of the Dutch Mathematics Platform (PWN), connecting Dutch mathematicians with industry. His extensive knowledge, commitment, and professional network made him an effective and respected bridge builder.

Alessandro shared his passion for statistics—both its theory and applications—with students. His numerous courses combined deep statistical knowledge with real-world industrial problems to illustrate the societal relevance of mathematics. Many of his master's students completed their thesis on practical problems, delivering empirical proof and mathematical rigor to the solutions for these problems and often spending time in industry to fully grasp the topics. Alessandro was incredibly proud of this achievement, but also for his role in establishing and contributing to the "modeling week", a mandatory element in the Applied Mathematics Master's program at TU/e. During this week, student groups tackled real challenges from the industry under the guidance of academic mentors and industry specialists. Alessandro was a dedicated supervisor during these weeks and responsible for attracting industry participants and ensuring meaningful collaborations. Many industry problems have been (partly) solved through the modeling week.

Besides his brilliance and numerous contributions to industry and academia, Alessandro was known for his kindness, integrity, and warmth as a person. He was always ready to assist others and was highly professional with a keen eye for detail. He was a great mentor, friend, and guiding light to many. His untimely passing is an immense loss to the broader statistics community in the Netherlands and beyond.



*Dit in memoriam verschijnt ook in STATOR*