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IASSL NEWSLETTER

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"Without data, you're just another person with an opinion."
- W. Edwards Deming

Featured Segments

From IASSL President's pen

Dr. Rajitha M. Silva
President/IASSL

As I begin my second consecutive year as President of the Institute of Applied Statistics, Sri Lanka, I do so with deep gratitude, renewed energy, and a strong sense of responsibility. The year 2025 strengthened our foundations; 2026 now opens a wider horizon.

This year, I see IASSL as a **compass on a growing statistical map**. A compass does not move the journey for us, but it gives direction, confidence, and purpose. In 2026, that direction is especially meaningful as **IASSL has, for the first time, received affiliated membership of the International Statistical Institute (ISI)**. This historic milestone connects us more strongly with the global statistical community and encourages us to contribute with greater visibility, relevance, and confidence.

In line with the international statistical theme of navigating the data revolution through innovation and impact, our focus this year will be on strengthening collaborations, initiating new research and development projects, and expanding short courses that respond to emerging national and global needs. We are also pleased that ISI has agreed to conduct a webinar on higher study opportunities for Sri Lankan university undergraduates. In addition, ISI has offered two courses free of charge for IASSL members serving in academia at Sri Lankan universities.

These opportunities mark the beginning of a new chapter. They remind us that IASSL's role is not only to train, publish, and conduct research, but also to connect Sri Lankan statisticians with the wider world.

Let us move forward in 2026 with clarity, collaboration, and purpose—guided by our compass, strengthened by our members, and inspired by the expanding map of statistics.

Together, we will continue to grow, inspire, and lead.
President,
Institute of Applied Statistics, Sri Lanka (IASSL)

Editorial

Dr. S.G.J. Senarathne
Editor/IASSL

Dear Readers,

I am delighted to present this latest issue, which continues our tradition of sharing knowledge, fostering collaboration, and celebrating the achievements of the statistical community.

This edition brings together a diverse collection of contributions from academics, researchers, industry practitioners, and students, reflecting the breadth and vitality of Statistics in Sri Lanka and beyond. The articles featured in this issue explore a range of topics, from methodological developments and innovative applications to emerging research directions that demonstrate the growing impact of statistical thinking across disciplines.

In addition to these insightful contributions, we provide updates on key activities and initiatives undertaken by IASSL in the recent months, as well as information on forthcoming events, conferences, and opportunities for professional engagement. These highlights showcase the Institute's ongoing commitment to advancing statistical knowledge and strengthening connections among members of our community.

We are also pleased to continue the popular Sudoku challenge, offering readers an enjoyable opportunity to test their problem-solving skills. Congratulations to the winners from the previous edition, and we encourage all readers to participate in the new puzzle featured in this issue.

I would like to express my sincere gratitude to the authors, reviewers, editorial team, and all those who contributed to the preparation of this newsletter. Their dedication and support have been invaluable. I also extend my appreciation to our readers, whose continued interest and engagement inspire us to maintain the quality and relevance of this publication.

I invite you to share your feedback, ideas, and contributions for future editions. Together, we can continue to strengthen the role of IASSL as a platform for knowledge exchange, professional development, and the promotion of excellence in Statistics.

I hope you find this issue informative, engaging, and inspiring.

Warm regards,
Editor,
Institute of Applied Statistics, Sri Lanka (IASSL)

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Reflective vs Formative Measurement Models in SmartPLS

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Introduction

"The manuscript incorrectly specifies several multidimensional constructs as reflective without sufficient theoretical justification. Given the nature of the indicators, a formative measurement model appears more appropriate. This misspecification raises serious concerns regarding the validity of the reported results and conclusions." Reviewer 1 commented on the methodological section.

In the current academic environment, many researchers encounter difficulties in successfully publishing their work when using SmartPLS. A common reason for rejection lies beyond problems linked with data validity, methodological soundness, or the use of relevant theories, but the mis-specification of the measurement model. The above statement was taken from one of the reviewers' comments about the misclassification of constructs as reflective instead of formative.

Reflective vs Formative

Reflective Measurement Model

A latent variable should be molded as reflective when there is interdependence among its indicators, and when variations in the latent construct are expected to be reflected when corresponding changes in all observed indicators (Hair et al., 2017).

Statistical formulation of the reflective model: In a reflective measurement model, the latent construct causes variation in its observed indicators. Therefore, any changes in the latent construct lead to corresponding changes in all its indicators.

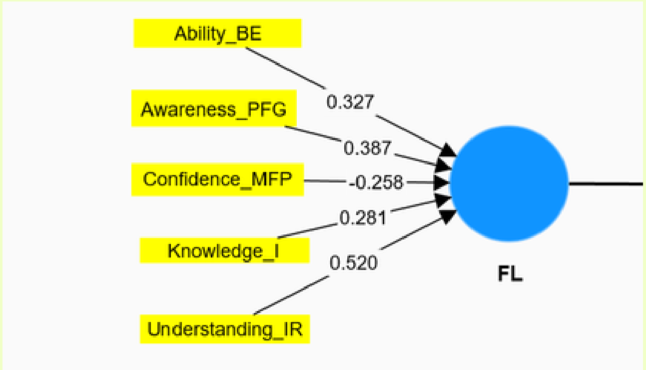
$$x_i = \lambda_i \eta + \varepsilon_i$$

Where:

$x_i =$ Observed indicator i
$\eta =$ Construct
$\lambda_i =$ Factor Loading
$\varepsilon_i =$ Measurement Error $\quad (i = 1, 2, 3, \ldots, k)$

For example, Financial Literacy (FL) construct reflected by the Ability to Budget Effectively (x_1), Awareness of Personal Financial Goals (x_2), Confidence in Managing Financial Products (x_3), Knowledge of Inflation (x_4), and Understanding of Interest Rates (x_5) (Lusardi & Mitchell, 2014).

$$
\begin{aligned}
x_1 &= \lambda_1 \eta_{FL} + \varepsilon_1 \\
x_2 &= \lambda_2 \eta_{FL} + \varepsilon_2 \\
x_3 &= \lambda_3 \eta_{FL} + \varepsilon_3 \\
x_4 &= \lambda_4 \eta_{FL} + \varepsilon_4 \\
x_5 &= \lambda_5 \eta_{FL} + \varepsilon_5
\end{aligned}
$$



Where x_1, x_2, x_3, x_4 and x_5 are the observed indicators of Financial Literacy; $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \text{and } \lambda_5$ are the respective factor loadings; denotes the latent Financial Literacy construct; $\varepsilon_1, \varepsilon_2, \varepsilon_3, \varepsilon_4, \text{and } \varepsilon_5$ represent the measurement error associated with each indicator.

Formative Measurement Model

A formative construct is modeled by a set of conceptually distinct indicators, where each indicator captures a unique component of the construct. The indicators are non-interchangeable, and the omission of any indicator alters the meaning and scope of the construct. In formative measurement, the direction of causality runs from the indicators to the construct, such that the construct represents a composite of its indicators rather than a common underlying factor reflected by them (Hair et al., 2017).

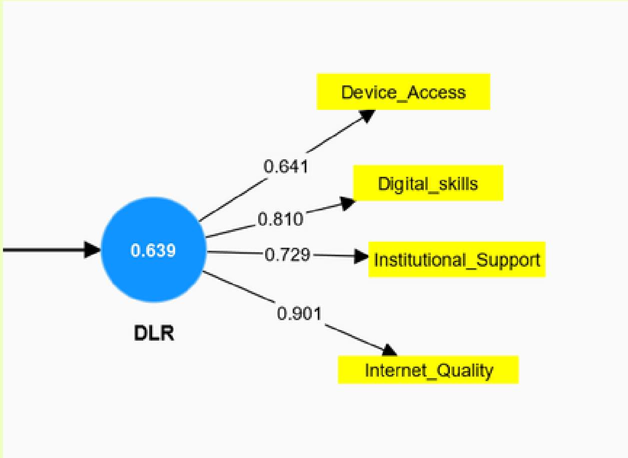
Statistical formulation of formative model: In a formative measurement model, the observed indicators collectively cause the latent construct. Therefore, any changes in one indicator led to changes in the construct.

$$\eta = \sum_{i=1}^{k} w_i x_i + \zeta$$

Where:

η = Latent construct
ω_i = Indicator weight
x_i = Observed indicator
k = Total number of indicators
ζ = Disturbance term

For example, Digital Learning Readiness (DLR) measurement construct formed by Device Access (x_1), Digital Skills (x_2), Institutional Support (x_3) and Internet Quality (x_4) (Hung, 2010). The latent construct is formed as a weighted linear combination of its indicators known as formative measurement model. These weights estimated, and their significance assessed through bootstrapping.



$$\eta_{DLR} = \omega_1 x_1 + \omega_2 x_2 + \omega_3 x_3 + \omega_4 x_4 + \zeta$$

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Precision, Probability, and Power: Statistical Lessons from the Operation Desert Storm

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Operation Desert Storm (January – February 1991) remains one of the most data-rich air campaigns in the modern history. Over 43 days, coalition forces flew more than 100,000 sorties approximately at an average of 2300 per day. But beyond volume, what do the numbers reveal about effectiveness?

Mission Types and Effectiveness

Strike missions formed the backbone of offensive air operations, accounting for approximately 40% of the total sorties (≈41000). However, their success rate (≈85%) highlights the difficulty of targeting heavily defended Iraqi targets. In contrast, Suppression of Enemy Air Defence (SEAD) missions accounted for only 6% of the total sorties (≈6000) yet achieved a success rate of nearly 95%. The impact of SEAD missions was disproportionate to their number. Neutralizing Iraqi radar and missile systems enabled safe air corridors for other aircraft to operate unhindered. This mirrors that the mission effectiveness depended not only on number of sorties flown though upon the mission function.

Reconnaissance missions (≈8%) achieved nearly 90% success, bolstering the intelligence network of the campaign. This was instrumental during the target acquisition process. In the meantime, airlift and air to air refuelling missions collectively contributed more than one-third of total number of sorties. Those were operated at a near perfect rate (≈98%) highlighting that logistical consistency sustains combat power.

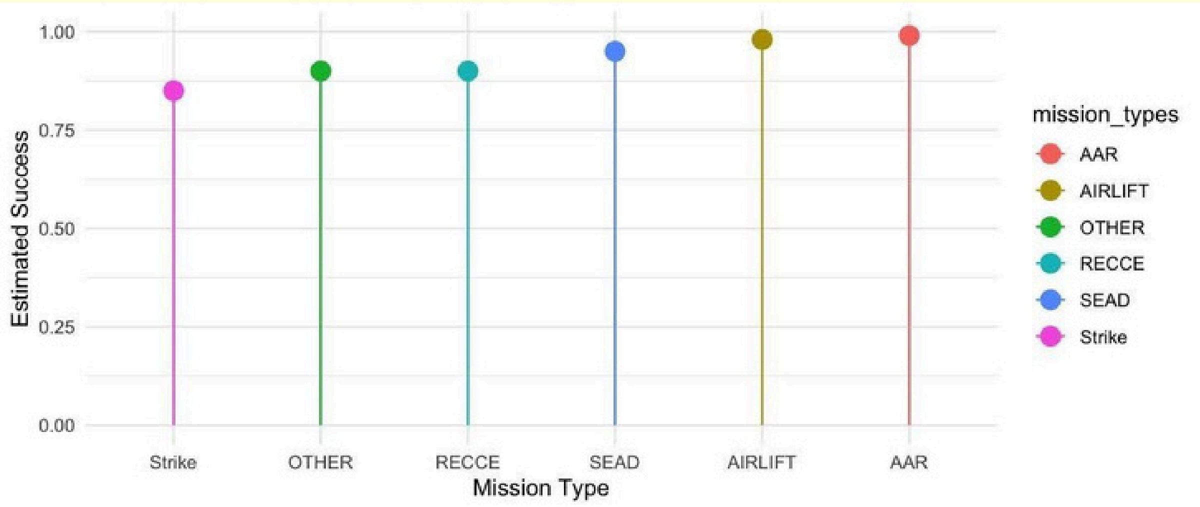

Figure 1: Lollipop chart for estimated success rate by the type of mission

Precision vs Quantity

Precision-guided Munitions (PGMs) accounted for only 3% of weapons deployed (≈7400) throughout the Desert Storm, yet they achieved hit rates of 80-90%. By contrast, unguided bombs or commonly known as general purpose bombs (≈97%) achieved only 25-30% hit rates. In terms of the probability, precision increased hit likelihood by beyond 50% shifting the operational reasoning from mass to accuracy. Besides, cruise missiles (≈85% effectiveness) also further reinforced this shift. This demonstrates that technology did not replace volume, though it multiplied effectiveness.

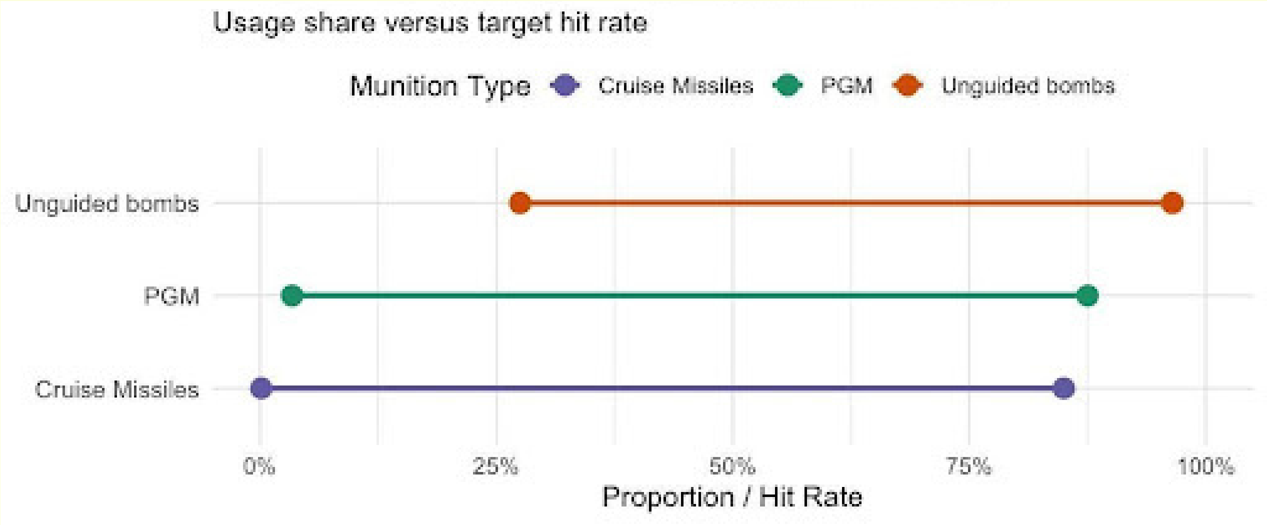

Figure 2: Dumbbell chart for hit rate by the type of munition

Coalition Contribution

The coalition air component consisted multiple air forces, along with army/navy/marine aviation units drawn from 35 different countries. Despite the United States (US) flew nearly 70% of total sorties (≈85000), coalition partners together contributed nearly 30%. The United Kingdom (UK), France, Saudi Arabia, and other allies also played essential roles, signifying the strategic importance of multinational coordination and interoperability in spite of the US dominance in the campaign. Furthermore, it also demonstrates how a distributed coalition operated as a unique single coordinated system, with varied contributions, aligned toward shared operational end-states.

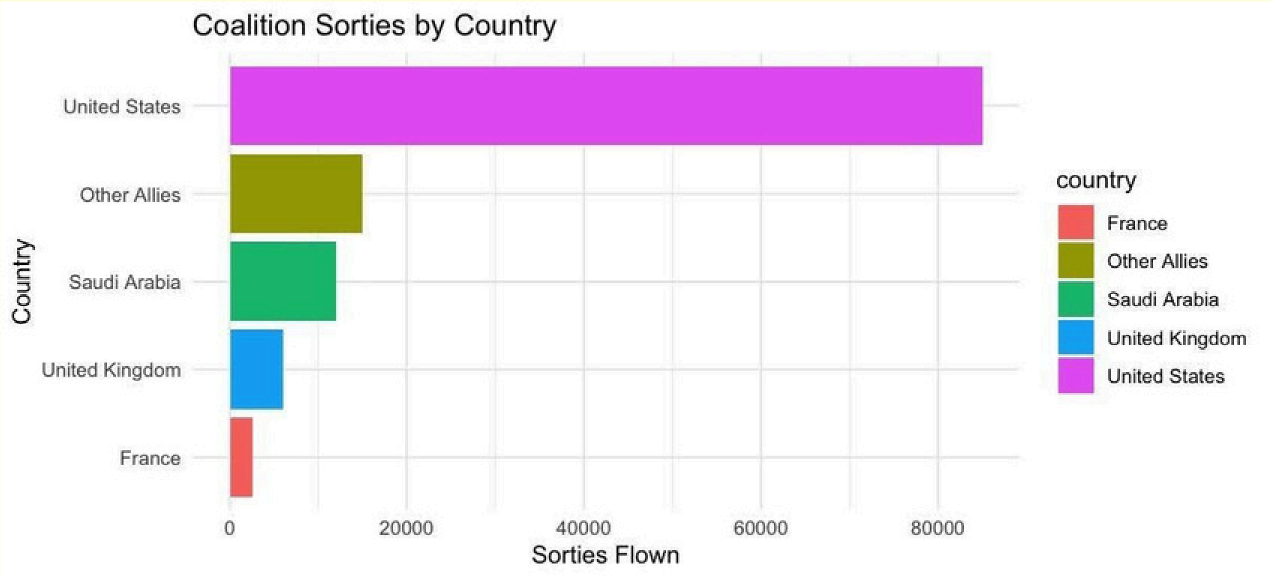

Figure 3: Bar chart for distribution of sorties by country

Conclusion

Operation Desert Storm was one of the classic examples that demonstrated overwhelming use of air power by the US. However, this article neither discussed air power nor geopolitics behind the operation.

Rather, it is about what the numbers reveal regarding this large air campaign. Therefore, Desert Storm gives us three enduring lessons:

- Efficiency can offset the sheer volume.
- Precision increases operational effectiveness.
- Coalition coordination and interoperability enhance the strategic reach.

Today, modern analytics can leverage these insights further helping decision-makers to prioritise missions, allocate resources and optimize effectiveness in highly complex operational environments.

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Statistics in Practice: Bridging the Gap Between Academic Knowledge and Industry Readiness

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1. Introduction – The Expanding Role of Statistics

In recent years, statistics has moved far beyond its traditional academic boundaries to become a core driver of modern industry. From artificial intelligence and automation to business decision-making systems, statistical thinking now underpins how organisations operate, optimise, and compete.

Despite this growing importance, a persistent gap remains between how statistics is taught and how it is applied in real-world environments. Many graduates emerge with strong theoretical foundations, yet face challenges when translating that knowledge into practical, production-level systems.

Through my experience in building data-driven solutions and working with technical talent across multiple regions, including Sri Lanka, Singapore, and beyond, I have observed that this gap is not due to a lack of capability, but rather a lack of exposure to real-world application. Statistical knowledge, when confined to theoretical understanding, does not fully prepare individuals for the complexities of modern industry, where data is often incomplete, dynamic, and closely tied to business constraints.

This article explores the role of statistics in practical systems, highlights key observations from industry hiring and team development at Redot Global, and discusses how education can evolve to better align with the demands of a data-driven world.

2. Role of Statistics in Real-World Systems and Decision-Making

Statistics in Modern Systems

In modern industry environments, very few decisions are made with complete certainty. Whether predicting user behaviour, optimising business performance, or evaluating system outcomes, most decisions are based on patterns, probabilities, and incomplete data. This is where statistics moves beyond theory and becomes a core operational tool.

At the foundation of most AI and machine learning systems lies statistical reasoning. Models do not produce exact answers; they generate probabilities based on observed data. Whether it is ranking search results, recommending products, or identifying anomalies, these systems rely on distributions, likelihood estimation, and error margins to function effectively. Without this probabilistic layer, what is often referred to as 'AI' would not operate reliably in real-world conditions.

In practice at Redot Global, I regularly see engineers who understand logistic regression or decision trees in theory, but struggle when they encounter a production dataset that is 30% missing values, skewed, and updated in real time. The statistical foundation is there, but what is missing is the trained instinct to apply it under real constraints.

A concrete example illustrates this well. Imagine a team tasked with identifying high-risk customer accounts for immediate review. The data available is incomplete, with some customer records lacking recent transaction history, communication logs may be fragmented across teams, and new data may arrive hourly. A team member might ask: should we wait for complete data before making a decision? In practice, the answer is no. The team must make a judgment call with what they have, accepting that some uncertainty remains.

A practitioner in this situation does not demand perfect data. Instead, they reason statistically: *if we flag accounts based on the 70% of data currently available, we estimate an 80% probability of catching actual risk cases, while accepting a 15% chance of false positives.* That trade-off, that probabilistic judgment made under incomplete information, time pressure, and cross-functional communication gaps, is precisely what separates theoretical knowledge from professional capability. It requires not just knowing the technique, but understanding the business context, the cost of different types of errors, and the confidence to act decisively with imperfect information.

"In real industry environments, waiting for perfect data is not an option. Statistical thinking means making the best possible decision with what you have, and knowing how to quantify the risk of being wrong."

Statistics in Organisational Decision-Making

Beyond AI, statistics plays a critical role in everyday decision systems within organisations. Consider a scenario I encounter directly: a team must decide whether to fast-track delivery of a project to meet client expectations. A rule-based approach might suggest speed leads to higher satisfaction. But in practice, such decisions cannot be made without data.

An informed approach requires evaluating internal capacity, historical delivery performance, cost structures, and market expectations. In statistical terms, this is a multi-variate optimisation problem, where we estimate the probability distribution of client satisfaction outcomes across a range of delivery speeds, weighted by operational cost and quality risk. Rushing delivery may shift the distribution toward short-term satisfaction but increase variance in quality, raising long-term maintenance cost. Over-investing in quality in a price-sensitive market may compress margin without meaningful satisfaction gains.

"The optimal decision lies in balancing multiple factors such as delivery speed, cost, quality, and market competitiveness, based on observed data and past outcomes. This is fundamentally a statistical judgment."

Statistical Thinking in Everyday Work

In practical working environments, professionals constantly face ambiguity. Bottlenecks, unexpected changes, and unclear signals are part of daily operations, particularly in fast-moving organisations such as startups. In such situations, teams must reason beyond fixed rules and make decisions based on observed patterns and incomplete data.

This requires a statistical mindset: evaluating probabilities, understanding how data behaves over time, and avoiding premature conclusions based on small samples [1]. Without this, individuals may rely on anecdotal judgment or overconfidence in limited observations, leading to incorrect assumptions and ineffective solutions.

This becomes even more critical when working with modern tools such as large language models (LLMs) and AI systems. These systems are inherently probabilistic; they generate outputs based on patterns learned from data rather than deterministic logic. Without an understanding of how such models behave statistically, users may misinterpret outputs or apply them incorrectly. Effective use of these tools requires not just access, but the ability to critically evaluate and validate results before acting, which is a fundamentally statistical skill.

3. Hiring and Industry Exposure: Bridging Academic Strength and Real-World Application

Having worked across multinational environments and Singapore SMEs, and currently leading Redot Global, I have had the opportunity to build and manage teams across multiple regions. This includes hiring technical talent primarily from Sri Lankan government universities, working closely with Singapore-based professionals in client-facing roles, and collaborating with engineers from India and other markets. This cross-regional exposure provides a clear perspective on how academic strengths translate, often imperfectly, into real-world industry performance.

One of the most striking observations is the strength of Sri Lankan government university graduates. Due to the highly competitive entry system, these students typically possess strong analytical thinking, mathematical foundations, and disciplined problem-solving abilities. Compared to many other regions, the depth of conceptual understanding is notably high [2].

However, this strength does not always translate directly into industry readiness. Across the Sri Lankan graduates I have hired and worked with directly, a consistent pattern emerges: strong theoretical knowledge does not automatically translate into applied capability. They may understand the mechanics of time series decomposition or hypothesis testing in isolation, but face difficulty when working with messy data, ambiguous business requirements, and production-level constraints such as computational efficiency or interpretability for non-technical stakeholders. While this is based on a small cohort, the consistency of the pattern is difficult to ignore.

Recent hiring experience also highlights a structural issue, namely curriculum alignment with industry demand. In several cases, candidates demonstrate strong academic exposure to statistical topics, but the combination of subjects studied does not effectively prepare them for roles currently demanded in the industry. From a statistical perspective, this is a misalignment between skill distributions and employment demand: if certain combinations of knowledge result in a low probability of employability, periodic evaluation and adjustment of curricula becomes essential [3].

In contrast, professionals from Singapore, particularly those from polytechnic or applied university pathways, tend to demonstrate stronger communication skills, higher confidence in expressing ideas, and greater familiarity with industry workflows. While their theoretical depth may vary, their ability to execute and integrate into real-world scenarios is often more developed.

This contrast highlights an important insight: academic excellence and industry effectiveness are not the same. Strong theoretical grounding provides a foundation, but without exposure to real-world problem-solving, statistical reasoning under uncertainty, and cross-functional collaboration, this potential remains underutilised.

4. Root Causes of the Gap and Pathways Forward

The gap between academic strength and industry readiness is not due to a lack of talent. The challenge lies in structural misalignment between how education systems are designed and how modern industries operate.

Root Causes

The primary cause is the strong emphasis on theoretical learning without sufficient application. Students are trained to understand concepts, solve structured problems, and perform well in examinations. However, real-world environments rarely present problems in well-defined formats [1]. Without exposure to such conditions, even strong theoretical knowledge becomes difficult to apply.

A second issue is limited integration between academia and industry. Many students complete their education with minimal exposure to real business environments, client expectations, or operational trade-offs. A third factor is curriculum misalignment, where subject combinations do not effectively intersect with current market demand.

Finally, there is a lack of focus on decision-making under uncertainty. Academic environments often emphasise arriving at correct answers, whereas industry requires making decisions with incomplete information and probabilistic outcomes, which is the very core of applied statistical reasoning.

Pathways Forward

One effective pathway is the integration of industry-linked projects into academic programmes. Even small-scale collaborations such as short-term projects, mentorship initiatives, or internship opportunities can significantly improve industry readiness by exposing students to real constraints while still in a learning environment.

A second approach is outcome-based curriculum evaluation: tracking graduate employment trends and aligning subject combinations with industry demand, creating a dynamic feedback loop that keeps education relevant. Universities must continuously assess which skill intersections are in demand and adapt accordingly [3].

A third area is structured exposure to modern tools, including LLMs and AI-based systems, not to train students on a specific tool, but to develop adaptability: the ability to combine strong analytical thinking with the capacity to learn and apply new technologies as they emerge. Beyond these, there is a strong case for introducing dedicated modules on critical thinking and decision-making under uncertainty, taught explicitly within a statistical context. Currently, these skills are expected to develop implicitly through exposure. Making them a formal part of the curriculum, with real-world case studies and industry scenarios, would better prepare students for the ambiguous, high-stakes decisions they will face in practice. A graduate who has been trained to reason under uncertainty is far better equipped than one who has only ever solved problems with complete information and a known answer. Equally important is formal training in how to use AI tools effectively within professional and corporate environments. This goes beyond technical familiarity. Students need to understand how to apply tools such as large language models and data platforms in real workplace workflows, interpret their outputs critically, and recognise their limitations. This is a skill that is rapidly becoming a baseline expectation across industries, and one that universities are currently underpreparing students for. Perhaps the most impactful pathway of all is formalised industry enrolment programmes, meaning structured partnerships between universities and companies that create a consistent pipeline of real opportunities for students. Unlike ad hoc internships, these programmes would establish ongoing relationships where companies co-design project briefs, offer mentorship, and provide clear pathways to employment. This benefits both sides: students gain applied exposure while still learning, and companies gain early access to analytically strong talent they have helped shape. Sri Lanka has the intellectual raw material. What is needed is the structural connection between where that talent is developed and where it is needed.

A further critical foundation is computer science. Statistics in the modern world does not exist in isolation; it runs inside software systems, data pipelines, and production environments. A statistician who lacks a working knowledge of programming, system architecture, and computational thinking will find themselves dependent on others to implement what they understand theoretically. This dependency limits their effectiveness in fast-moving industry environments. Computer science is not a separate discipline for statisticians to avoid. It is the infrastructure through which statistical thinking becomes real-world impact.

Equally important is the ability to work across domains. A statistician trained only within a single field, whether economics, biology, or engineering, carries a narrow toolkit into a world that demands flexibility. The most valued practitioners in industry are those who can move between domains: understanding the language of healthcare one day and logistics the next, applying the same statistical rigour to entirely different problems. This multidisciplinary mobility is not built through specialisation alone. It requires deliberate exposure to diverse problem contexts, cross-functional teams, and industries beyond the one a student was trained in.

5. What Industry is Doing: Bridging the Gap in Practice

From an industry perspective, addressing this gap cannot be left solely to educational institutions. At Redot Global, our approach begins with hiring for potential rather than complete preparedness. The candidates I have hired, particularly from Sri Lankan government universities, demonstrate strong analytical thinking and solid theoretical foundations. Rather than expecting them to arrive industry-ready, we treat the first phase of their journey with us as a continuation of their development, one that bridges the gap between what they know and how to apply it. The foundation of this approach is learning through real projects. From early on, engineers are exposed to live client work where they must operate within actual constraints: deadlines, limited resources, evolving requirements, and stakeholders who need answers in plain language. There are no clean datasets, no pre-defined problem statements, and no single correct answer. This environment forces the transition from theoretical understanding to practical execution, where every decision has a direct consequence and uncertainty is the norm rather than the exception. As they progress, team members are placed in situations that demand decision-making under uncertainty. They are required to balance trade-offs between speed and quality, cost and performance, short-term delivery and long-term sustainability, often with incomplete information and tight timeframes. This is where statistical thinking stops being a subject and becomes a working tool. The ability to estimate probabilities, weigh risks, and commit to a course of action based on available evidence is exercised daily, not theoretically. Cross-functional collaboration is built into how work is structured. Engineers do not operate in isolation; they interact with business teams, clients, and operational stakeholders across different functions and, in many cases, across borders. This exposure develops something that no statistics course can fully teach: the ability to translate a technical insight into a decision that a non-technical stakeholder can act on. Communication, context, and credibility all become part of the professional toolkit. Over time, what emerges is not just technical competence but statistical confidence: the ability to commit to a decision based on available evidence, knowing it may be imperfect, and to refine it as new information arrives. In practice, we have seen engineers who initially struggled with real-world constraints develop into capable, independent practitioners within six to twelve months, as professionals who approach ambiguous problems with structure rather than anxiety. This is not unique to Redot Global. Every organisation that hires statistical talent has both an opportunity and a responsibility to bridge this gap actively, rather than waiting for graduates to arrive fully formed. Industry cannot outsource this entirely to universities. The classroom builds the foundation, but the profession builds the practitioner.

6. Conclusion

In today's world, data is abundant, yet effective decision-making remains a challenge. The difference lies not in access to information, but in the ability to interpret it correctly and act under uncertainty. This is where statistics plays a fundamental role: not as a theoretical subject, but as a practical framework for reasoning, judgment, and action.

Across real-world systems, from AI-driven platforms to everyday business operations, statistical thinking underpins how decisions are made. The gap between academic strength and industry readiness is real, but it is not inevitable. In Sri Lanka, the raw material is exceptional, with students demonstrating strong analytical foundations, disciplined thinking, and genuine intellectual capability [2]. What is missing is not talent, but structured exposure: to real problems, to decision-making under uncertainty, to cross-functional environments where data must be translated into action.

Closing this gap requires concrete steps from both sides. Universities must move beyond teaching statistics as a collection of techniques and begin teaching it as a way of thinking, introducing dedicated modules on critical thinking, decision-making under uncertainty, and the practical use of modern AI tools in professional settings [1]. Formalised partnerships with industry must replace ad hoc internships, creating consistent pipelines that benefit both students and employers. Industry, in turn, must take responsibility for continuing this development, investing in potential, not just rewarding readiness.

Sri Lanka has the capability to produce not just statistically literate graduates, but genuinely data-driven professionals who can operate at the highest levels of global industry. Realising that potential requires educators, institutions, and industry leaders to act together, guided by the same evidence-based, outcome-oriented mindset that statistics itself demands of us.

Looking ahead, the most critical skill in the coming years will not be the ability to perform technical tasks in isolation. AI tools are rapidly automating much of that execution. The true differentiator will be the professional who can take technical knowledge, combine it with sound judgment, and use modern AI capabilities to drive decisions in the right direction. Statistics, at its core, is precisely this skill: not a tool for computation, but a framework for thinking clearly and deciding confidently under uncertainty. Those who develop this ability will not be replaced by AI. They will be the ones directing it.

"The future belongs not to those who simply understand data, but to those who can translate it into decisions under uncertainty."

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Linear vs Nonlinear Models in Time Series Analysis

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Introduction

The study used a standard linear time series model but did not investigate nonlinear dynamics in the data. Ignoring nonlinear interactions may result in poor forecasting and insufficient model definition. Comments like these are common during the peer-review process for empirical research that uses time-series analysis. Many researchers use standard linear models without first testing for nonlinearities in the data-generating process. Time series analysis is essential when modeling periodic variables such as stock prices, economic indicators, exchange rates, and ecological data. The linear model has traditionally been used as a foundation for time series modeling due to its simplicity and ease of comprehension. Nevertheless, real-world data frequently exhibits complicated nonlinear patterns. As a result, a thorough understanding of the differences between linear and nonlinear time series models is required for model selection and enhanced forecasting precision.

Linear vs Nonlinear Time Series Models
Linear Time Series Models

A linear time series model assumes that the current value of a series can be written as a linear function of random error terms and previous observations. There is an additive and proportional relationship between the variables in these models. The famous Box-Jenkins methodology, created by George Box and Gwilym Jenkins, established the foundation for linear time series modelling.

Statistical Formulation of a Linear Model

The Autoregressive model, or AR(p), is one of the most widely used linear models:

$$y_t = c + \phi_1 y_{t-1} + \phi_2 y_{t-2} + \cdots + \phi_p y_{t-p} + \varepsilon_t$$

where,

$\phi_i =$ autoregressive parameters

$y_t =$ value of the series at time t

$c =$ the constant term

$\varepsilon_t =$ random error term

This formulation shows how the current observation is determined by a linear combination of previous findings.

Ex: Consider thinking about how to model the rise in GDP. The growth rate from the previous year might affect the growth rate for this year:

$$y_t = c + \phi_1 y_{t-1} + \varepsilon_t$$

People often use linear time series methods to model these kinds of relationships.

Nonlinear Time Series Models

The relationship between historical observations and the current value can be nonlinear in a nonlinear time series model. These models are helpful when a time series' dynamics vary according to several regimes or situations.

When time series data show the following, nonlinear models are frequently suitable:

- Asymmetrical behaviour
- Structural breaks
- Threshold effects and regime switching

Howell Tong's Threshold Autoregressive (TAR) model is a significant nonlinear model.

Statistical Formulation of the TAR Model

$$y_t = \begin{cases} \alpha_1 + \beta_1 y_{t-1} + \varepsilon_t, & \text{if } \; y_{t-d} \leq r \\ \alpha_2 + \beta_2 y_{t-1} + \varepsilon_t, & \text{if } \; y_{t-d} > r \end{cases}$$

where,

$\alpha_1, \alpha_2 =$ regime-specific intercepts

$\beta_1, \beta_2 =$ regime-specific parameters

$r =$ threshold value

$d =$ the delay parameter

This approach enables different dynamic behaviors depending on whether the series reaches a certain threshold.

Ex: Financial market stock returns might show different patterns during stable periods and financial crises. A nonlinear model does a better job of capturing these shifting dynamics than a simple linear model.

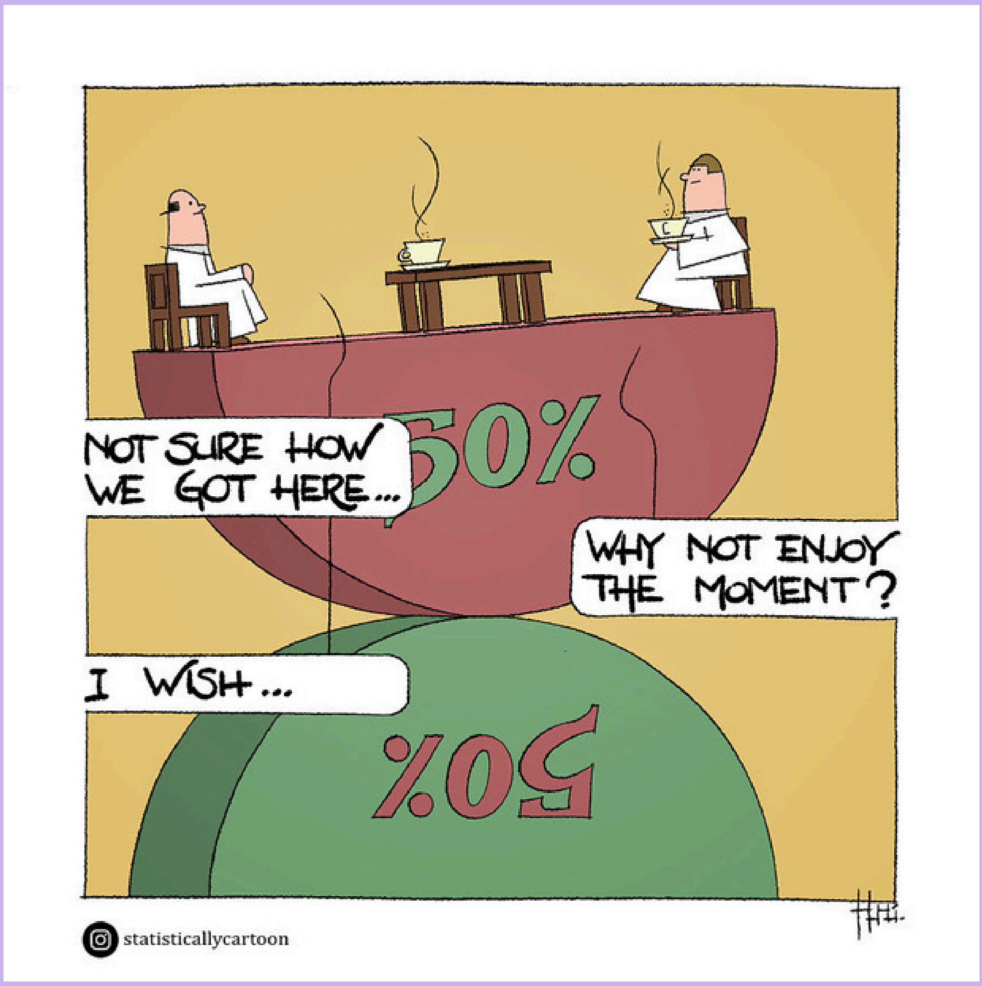
Linear time series models are important for statistical modelling because they are easy to understand and use. Researchers should investigate nonlinear modelling approaches and underlying structure of different real-world time series that show nonlinear behaviour in order to improve forecasting and the reliability of empirical findings.

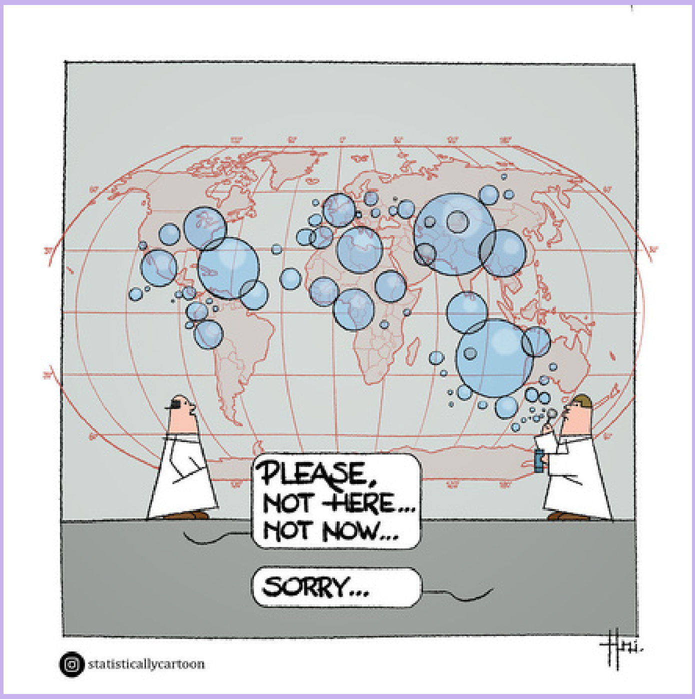
References

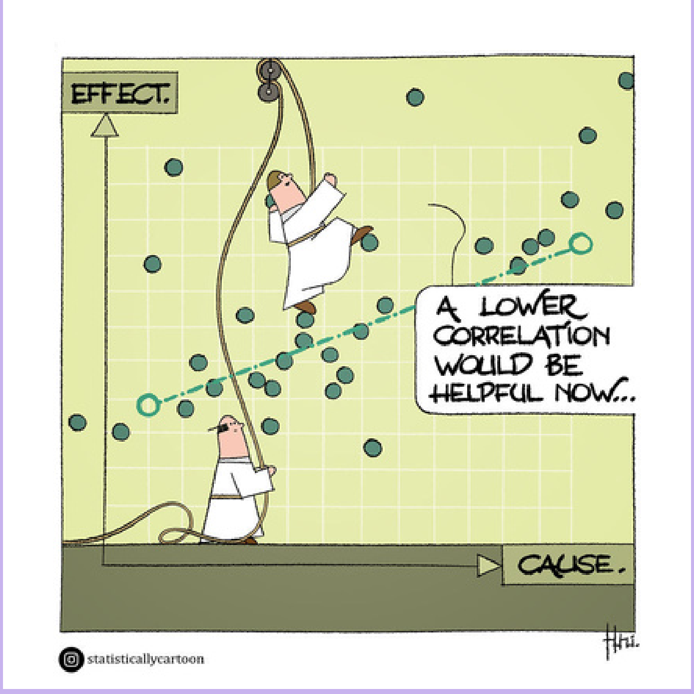
1. George Box & Gwilym Jenkins (1976). Time Series Analysis: Forecasting and Control. Holden-Day.

2. Howell Tong (1990). Non-linear Time Series: A Dynamical System Approach. Oxford University Press.

STAT COMICS







Source: https://www.boredpanda.com/statistically-insignificant-comics-raf-schoenmaekers/
Accessed date: 25th April 2026

14th Annual General Meeting

The 14th Annual General Meeting of the Institute of Applied Statistics Sri Lanka was held on 5th April 2026 at the Auditorium of the Professional Centre (OPA). All the Life Members were Invited for the occasion. The New Executive Council was appointed at the AGM for the year 2026.

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IASSL Annual Awards Ceremony 2026

The Institute of Applied Statistics Sri Lanka (IASSL) proudly concluded its prestigious Best Research Awards – 2025 competition, recognizing outstanding contributions to the field of Statistics and Applied Statistics. The awarding ceremony was held on 6th April 2026 at the Organization of Professional Associations (OPA) premises in Colombo, drawing together a distinguished audience of academics, researchers, and students.

Conducted annually by IASSL, this competition recognizes and promotes outstanding statistical research carried out by undergraduates, postgraduates, and independent researchers. The 2026 awards considered research completed during 2025, with entries invited under three categories: Undergraduate, Postgraduate, and Open. The competition attracted a strong level of participation in all categories.

Research submitted to the Undergraduate and Postgraduate categories was limited to those who had completed their degree requirements at Sri Lankan universities in 2025. Meanwhile, the Open category considered published research papers that appeared in reputed journals or were presented at recognized conferences between January 1 and December 31, 2025.

The award recipients were recognized at a ceremonial event that celebrated their research achievements and underscored the vital role of statistics in advancing knowledge, supporting evidence-based decision-making, and addressing contemporary challenges across various sectors. The IASSL Best Research Awards continue to provide a valuable avenue for encouraging high-quality statistical research, recognizing emerging talent, and strengthening the culture of research and innovation in Sri Lanka.

Undergraduate Category

Winner
Ms. W. M. N. Sandunika

1st Runner up
Mr. D. J. N. A. Damayantha

2nd Runner up
Mr. K. S. D. Fernando

Postgraduate Category

Winner
Dr. B. R. P. M. Basnayake

1st Runner up
Ms. K. K. A. H. Perera

2nd Runner up
Ms. W. P. J. M. Warnakula

Open Category

Winner
Mr. V. Mithulavan

1st Runner up
Ms. H. N. Kudagama

2nd Runner up
Ms. P. B. W. S. R. Kumarasinghe

Undergraduate Merit Awards

Ms. N. Premnath

Ms. B. Gayathiri

Mr. S. H. R. Anjuka

Ms. A. M. Dilushika

Ms. S. Hettiarachchi

Ms. C. N. N. M. Fernando

Mr. A. K. M. Silva

National Statistics Olympiad 2026

The 11th National Statistics Olympiad, organized by the Institute of Applied Statistics Sri Lanka (IASSL), was successfully conducted on 11 January 2026 at the University of Sri Jayewardenepura. The Olympiad serves as a key initiative of the Institute to foster interest in statistics among school and university students throughout Sri Lanka. As one of the flagship outreach programs of IASSL, the competition aims to enhance statistical awareness, encourage analytical thinking, and promote the application of statistical knowledge among the younger generation.

At the IASSL Annual Awards Ceremony held on 5 April 2026 at the auditorium of the Professional Centre (OPA), medals and certificates were awarded to all prize winners and merit award recipients in both the junior and senior categories.

National Statistics Olympiad 2026

Junior Level Winners

1st place
D.S. Liyanage
Bandarawela Central College

2nd place
E.A.V.T. Edirisooriya
Ananda College, Colombo 10

3rd place
D.N.J. Bastiansz
St. Bridget's Convent, Colombo 07

Gold Awards

- D.S. Liyanage

Silver Awards

- E.A.V.T. Edirisooriya
- D.N.J. Bastiansz
- N. Satheeswaran
- S. Gajhanesh
- M.V.N. Salochana

Bronze Awards

- K.D.L.T. Amalsha
- S. Sriskanthakumar
- R. Ramesh
- J. Disanth
- W.P.S.D. Karunarathna
- D.M.D.C. Karunarathna
- S.M.S.P. Sathkumara
- N.F.R. Simrah

Senior Level Winners

1st place
D.T.P. Wanniarachchi
University of Moratuwa

2nd place
J.D.D.P. Nanayakkara
University of Moratuwa

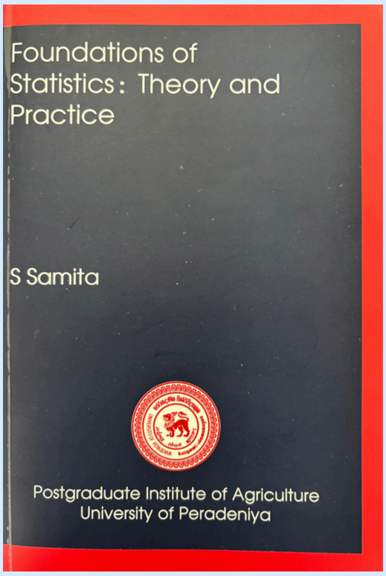
3rd place
W.A.A.C. Bandara
University of Moratuwa

Gold Awards

D.T.P. Wanniarachchi	A.D.S.K. Pigera
J.D.D.P. Nanayakkara	Y.V. Gunawardana
W.A.A.C. Bandara	H.A.S.V. Seneviratne
S. Obeysekera	K.A.P.R. Kaluarachchi
R.P.A. Dananjaya	I.A. Gunawardena
W.A.C. Nirodha	M.M. Raigamkoralage
D.M.O.R. Gamage	I.G.S. Gunathilake

Members' Achievements

Books



Title of the textbook: Foundations of Statistics: Theory and Practice

Author: Prof. S. Samita, Senior Professor, University of Peradeniya.

Publisher: Postgraduate Institute of Agriculture, University of Peradeniya

This book is written with the aim of fostering statistical thinking among the general public and thereby popularizing the subject. It is specifically intended for undergraduate and graduate students with little prior exposure to statistics, and selected chapters may also benefit G.C.E. A/L Statistics teachers.

While some chapters are lengthy, they are organized into short, example-based sections that are easy to follow. The focus is on conceptual understanding supported by examples, with only the essential mathematics included. The book covers contemporary statistical methods, limited to one-sample and two-sample cases, with a strong emphasis on the application of methods and the interpretation of results.

The book covers topics such as an introduction to statistics, variable classification, measurement scales, summary measures, probability, hypothesis testing, and relationships between variables. Hypothesis testing is discussed separately according to measurement scale, with special emphasis on exact tests for nominal and ordinal data, including detailed explanations of test statistics and probability calculations based on permutation and randomization methods. Each hypothesis-testing method is presented in a structured sequence covering the rationale, software implementation with examples, and interpretation of results. In addition to specific examples, alternative possible outcomes are also discussed.

Practical implementation of the methods is demonstrated using SAS OnDemand for Academics, a free, cloud-based and comprehensive statistical package suitable for teaching and learning statistical analysis, data mining, and forecasting.

The book also provides guidance for extending knowledge beyond its scope, enabling readers to progress to more advanced statistical texts with confidence.

IASSL Collaborations in Jan 2026 - April 2026

Collaboration with the National Innovation Agency (NIA)

Strengthening Sri Lanka's Innovation Ecosystem through Data and Collaboration

The Institute of Applied Statistics, Sri Lanka (IASSL) recently entered into a strategic collaboration with the National Innovation Agency (NIA) to jointly develop the Sri Lanka Innovation Index (SLINDEX) and the Provincial Innovation Index.

The agreement was formally signed by Dr. Chitraka Wickramarachchi, Chairperson – Research & Development of IASSL, and Dr. Muditha Senarath-Yapa, Chief Innovation Officer of NIA, marking an important milestone in strengthening Sri Lanka's innovation ecosystem through data-driven approaches and institutional collaboration.

The initiative aims to establish a comprehensive national and provincial innovation index framework aligned with internationally recognised standards such as the Global Innovation Index. Through this collaboration, the institutions seek to measure and benchmark innovation performance across provinces, identify regional strengths and development gaps, and support evidence-based policy formulation and strategic investment decisions.

The development of SLINDEX is expected to provide valuable insights into regional innovation capacity while encouraging stronger collaboration among academia, industry, and government institutions. The initiative will also support the emergence of regional innovation clusters that contribute to inclusive and sustainable economic growth.

As a strategic national tool, SLINDEX will assist policymakers and stakeholders in understanding innovation trends and opportunities across Sri Lanka, while contributing toward the country's long-term vision of becoming a more competitive and innovation-driven economy.
This partnership reflects IASSL's continued commitment to advancing applied statistical research and transforming data into meaningful insights that support national development initiatives.

Statistics and Probability Teacher Training Programme for Northern Province Teachers

The Institute of Applied Statistics, Sri Lanka (IASSL), in collaboration with the Ministry of Education, Higher Education and Vocational Education (MOE) successfully conducted a Statistics and Probability Teacher Training Programme on 26–27 March 2026 at Drieberg College, Chavakachcheri, Jaffna.

The programme was attended by nearly 100 G.C.E. Advanced Level Combined Mathematics teachers from schools across the Northern Province. The primary objective of the programme was to enhance teachers' knowledge and pedagogical skills in Statistics and Probability, thereby strengthening the quality of mathematics education in the region. The training sessions were facilitated by Prof. T. Sivananthawerl and Retired Prof. S. Sivarajasingham, with coordination by Mr. Navaneethan on behalf of the Northern Province.

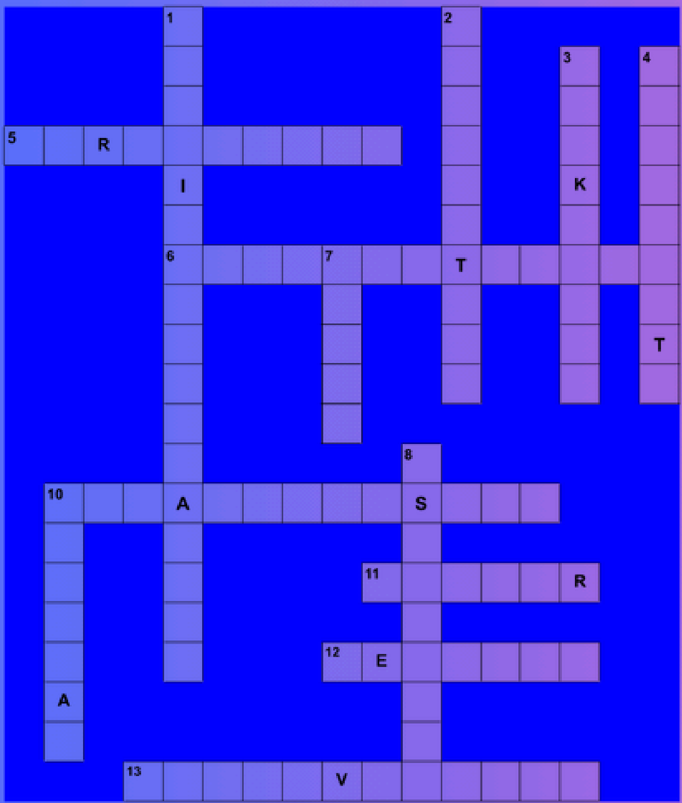
The IASSL delegation comprised Dr. R. M. Silva (President), Mr. H.A.C.S. Hapuarachchi (Chairperson, Statistical Promotion Committee), Dr. D.C. Wickramarachchi (Chairperson, Research and Development Committee), Prof. S. Samita, Dr. A.P.G.S. Silva, and Mr. D.C.A. Gunawardene, Mr. S.D. Jasotharan (Life Member), representing the Council of the Institute. In addition to the training programme, the delegation engaged in a series of productive discussions with key academic and administrative stakeholders in Jaffna. A courtesy visit was made to the Faculty of Science, University of Jaffna, where discussions were held with the Dean of the Faculty. The delegation also visited the Department of Mathematics and Statistics, where valuable interactions took place with academic staff and Statistics Honours undergraduate students regarding opportunities for academic collaboration and the advancement of statistical education and research.

The delegation further had the privilege of meeting Prof. P. Balasundarampillai, former Vice Chancellor of the University of Jaffna, and exchanged views on the promotion of statistics, higher education, and professional development in Sri Lanka.

Furthermore, discussions were held with Mr. Withyananda Neshan, Deputy Director of the Department of Census and Statistics (DCS), Jaffna District Statistical Branch, located within the Jaffna District Secretariat. The meeting focused on exploring opportunities for future collaboration between IASSL and DCS, particularly in relation to capacity-building and professional training programmes for DCS staff in the district.

This initiative represents an important milestone in strengthening statistical education in the Northern Province while fostering meaningful partnerships among IASSL, educational institutions, and public-sector organizations. The programme further reflects IASSL's continued commitment to promoting statistical literacy, professional development, and collaboration across Sri Lanka.

Puzzle Competition



Please email your submission to appstatsl@gmail.com on or before 20th August 2026.
The draw will be held on the 28th August, 2026.

Correct submissions will be shortlisted and the winners will be selected randomly and announced in the Issue 2 of 2026 IASSL newsletter.

Across

5. In .... sampling, a random starting point is chosen and then every k-th individual is selected in a fixed pattern
6. A study in which no treatment is imposed to observe the response but the researcher only observes what naturally occurs
10. A plot that uses quartiles to compare distributions
11. Statistician associated with a test statistic that divides variation between groups by variation within groups
12. Statistician who pioneered correlation and founded the first university statistics department
13. Involving more than one dependent variable

Down

1. Strong linear association among predictor variables
2. Values that divide the data into 100 equal parts
3. A resampling method that systematically leaves out observations
4. The assumption that data follow a bell-shaped distribution
7. The difference between the minimum and maximum of a dataset
8. A sample-based measure used to infer a population characteristic.
10. A distribution having two distinct peaks

WINNERS FROM ISSUE 3, 2025

- **Janudi Tharushika**
- **Kawya Bandaranayake**
- **Gayathri Lakshani Jayawardena**

NEWS IN BRIEF

Courses conducted by IASSL during JAN - APR 2026

- Qualitative Data Analysis using NVivo Software
- Essential Training in Data Analysis with SPSS
- Certificate Course on Overleaf with ChatGPT Assistance
- Essential Training in Data Analysis with R

Upcoming Courses (MAY-AUG 2026)

- Certificate Course on Structural Equation Modeling (SEM) with SmartPLS
- Certificate Course on Data Analysis Using Power BI
- Certificate Course on Basic Statistics for Managers and Researchers

New Life Members

- **U. P. Kasthuriarachchi**
- **P. D. S. W. Gunasekara**
- **R. A. W. Manupriya**
- **H. G. N. K. G. Kaluarachchi**
- **D. A. T. M. Kumari**
- **N. S. W. Gunasekara**
- **G. A. T. Kaveesha**
- **C. M. T. Fernando**
- **T. R. Abeywickrama**
- **O. V. Kulasekara**
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- **I. M. G. U. K. Herath**
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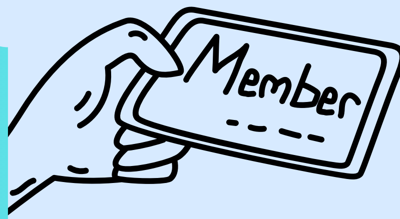

Sri Lankan Journal of Applied Statistics (SLJAS)

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VOLUME 27

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If you have any submissions, comments, suggestions or feedback, please send them to editor@iassl.lk.

WE SINCERELY APPRECIATE ALL WHO CONTRIBUTED TO THIS ISSUE AND PARTICIPATED IN ITS PREPARATION.

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Official Newsletter of the Institute of Applied Statistics Sri Lanka

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