ARTICLE TOPIC:
“Errors in Numerical Computing”

ABSTRACT:

In the world of mathematics, there is a popular concept that assists in focusing on the algorithms that are used to solve hurdles in continuous mathematics. The practice is a recognized territory for engineers and those who work on physical science, but now it's starting to escalate further into indulgent arts areas as well. The practice of numerical analysis includes various Errors. Specific errors are being overcome and applied to attain mathematical conclusions.

INTRODUCTION:

Error — is a term that refers to how far an answer is from the true value. The thing that mesmerizes the most about Mathematics is that, though known as a field of preciseness and accuracy, it’s never fully accurate in such cases mostly, when used in a physical devices such as Computer Machines. They have their challenging battle against errors but somehow endures them. There are mainly two types of errors i.e. 1) ***Absolute Error*** and 2) ***Relative Error***. However, Errors can also be expressed in terms of significant figures, or digits of accuracy.

Error can also propagate, this phenomenon is known variously as ***Dynamic Error***, ***Propagating Error*** or ***Multiplicative Error***. The amount of error that occurs in each individual step of a certain procedure is known as ***Local Error.***

SOURCES OF ERRORS:

Errors arise from multiple sources that include, Modeling Assumptions, Truncations, and Computer Arithmetic. These can be briefly described as under:

- **Modeling Assumptions:**

  The real world is complicated and any description related to mathematics isn't guaranteed to be perfect. In particular, the idea for modeling is to establish a rational and controlled approximation that serves your motives with nominal complexity. This difference and approximation may be intended and useful, but it is still a source of error, and you need to be aware of it.

- **Truncations:**

  The approximation that is inherent in numerical algorithms are known as Truncations. Consider procedures that are based on a kind of series. If you only use the first "n" terms of the series, you have "truncated" the series (and the procedure). This truncation of the series generates error for the further calculation.
  For example, a three-term Taylor series approximation to $f(x) = e^x$ near $x = 0$, which is $p_2(x) = 1 + x + x^2/2$, involves a truncation error of $x^3/6 + x^4/24 + \ldots$.

- **Computer Arithmetic:**

  As computers have limited words width, so their accuracy is finite. These systems contain bounds which can be unfavorable if exceeded and this finiteness becomes a source of establishing error.
  For instance, if we evaluate 50! on our regular calculator, the exact behavior of the error will depend on whether the calculator rounds or chops numbers to get them to fit into its finite-precision world.

CONCLUSION:

Understanding where errors come from is not just an academic exercise. Rather, it allows you to figure out if your computation is right. Also, it is important for the one to know that, there is no ‘perfect’ system; thus one should know about imperfection and not become one of its casualties. While performing any kind of simple or complex calculation, finding out and handling errors efficiently is one of the key of its success.