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Editorial

It is indeed a great pleasure and privilege for me to introduce the current issue of the *Mapana Journal of Sciences*. Mapana is a multi-disciplinary journal committed to publishing original and novel research and review articles in the discipline of Science. Mapana provides authors a platform to submit note-worthy research articles in the field of Physical Sciences, Chemical Sciences, Mathematical and Life Sciences.

In the present issue, we have published five articles about Nuclear Physics, Astrophysics and Materials Sciences which present novelty and advancements in the respective fields. We appreciate and acknowledge all the authors for their valuable contribution to the Mapana Journal of Sciences.

Seshavatharam & Lakshminararayana proposed a model for the atomic nucleus which is a combination of bound and free or unbound nucleons. Due to strong interaction, bound nucleons help in increasing nuclear binding energy, and due to electroweak interaction, free or unbound nucleons help in decreasing nuclear binding energy. The authors emphasise the fact that physics and mathematics associated with the fixing of the energy coefficients of semi-empirical mass formulae (S.E.M.F.) are neither connected with residual strong nuclear force nor connected with a strong coupling constant α_s. Since nuclear force is mediated via quarks and gluons, it is necessary and compulsory to study the nuclear binding energy scheme in terms of nuclear coupling constants.

B-Splines as piecewise adaptation of Bernstein polynomials (aka, B-polys) are widely used as Ritz variational basis functions in solving many problems in the fields of quantum mechanics and atomic physics. In the report by Anandaram, a novel approach is reported by using B-spline collocation for solving the 1-D Time Independent Schrodinger Equation (TISE) for a free quantum particle subject to a fixed domain length by using the Python software SPLIPY with different sets of computation parameters. Authors report the use of B-spline collocation enabled the achievement of high accuracies to

the computational work by the application of the Rayleigh Ritz variational method.

Curiosity in the growth of intrinsic conducting polymers (ICP) has increased tremendously because of their electro-chromic properties suitable for applications in batteries, functional electrodes, electrochromic devices, optical switching devices, electronic devices, sensors such as gas, bio, solid-state, humidity, microwave, electromagnetic interference shielding and thermo-electric power. The conducting polymers have two major groups of applications. The first group utilises their conductivity as its main property, while the second group utilises the electro-activity. During the preceding few years, materials, which are synthesised based on vanadium oxides, have extracted considerable responsiveness due to their attractive structures, properties such as electronic property, optical property and magnetic property. These are significant to such diverse domains as lubrication, chemical sensor, catalysis, cathode materials in batteries, minerals and self-lubricating applications. Vanadium redox batteries are used for energy storage, wind farms, thermal switching and sensing and so on. The article by Harshitha and co-investigators investigated the A.C Conductivity and Dielectric Properties Multiphase Polypyrrole/Vanadium OxideNano Composites. The composites may also find applications in micropower generator, thermo-cooling, EMI shielding, humidity and gas sensors which is worth investigating.

Our universe known to be only one so far comprises innumerable galaxies, each consisting of several million to billions of stars with their bolometric luminosity spread over many orders of magnitude. The process of formation and evolution of galaxies is one of the less understood yet, important astrophysical areas of research studied extensively. A minor fraction of these normal galaxies classified as “active galaxies” or “Active Galactic Nuclei” (AGNs) are characterised by their overwhelming luminosity from their compact nuclei and exhibit variability phenomenon. The field of AGNs research is a fast-developing area in current astronomical research. To probe the physical processes taking place at the cores of AGNs, they are studied quasi-continuously in multiple regions of the electromagnetic spectrum. To achieve a better understanding of the physical processes within the active galaxies and their surrounding

Broad Line Regions (BLR), Narrow Line Regions (NLR) and also on how the emissions by active galaxies affect the host galaxy environment, it is essential to study the variability in both line and continuum emissions. Ultraviolet spectroscopy gives an interesting opportunity to study the complex nature of physical processes of active galaxies through the measurement of line and continuum flux variations. Bryan R. Miranda et al in their article attempted spectroscopic studies of active galaxies in the UV region to characterise the UV variability in continuum flux with the associated variability in strong emission lines with occasional absorption lines.

Bernstein polynomials (also known as B-polys) have excellent properties allowing them to be used as basis functions in many applications in physics. Anandaram in his work provides a brief tutorial description of their properties, along with their use in obtaining B-polys, B-splines or Basis spline functions, Bezier curves, and ODE solution curves. Also, an example is described showing their application for solving the fourth-order BVP relating to the bending at the free end of a cantilever. The solution methodology of the 4^{th} order cantilever BVP making use of Bernstein basis polynomials, basis spline functions, and construction of the Bezier curve as the solution profile of the problem under consideration highlights the role these basis functions can play in constituting as an alternate method of solving various types of ODEs and BVPs occurring in many fields of physics.

We are delighted to find the articles are of social relevance and have implemented novel thoughts. Let this journey in pursuit of knowledge be an enriching experience for all the readers.

Manoj Balachandran
Section Editor