MANIPAL UNIVERSITY
JAIPUR

PRATHAM

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Physics Research Advancements by Thoughtful Humankind and their Achievements Miscellany

Quarterly Newsletter

PRATHAM

We are thrilled to introduce **PRATHAM**, our newly launched newsletter dedicated to celebrating the vibrant community and groundbreaking research within our Physics department. The name "**PRATHAM**" meaning "first" in sanskrit, symbolizes our commitment to pioneering knowledge and innovation in the field of physics.

In each edition of **PRATHAM**, you will find a wealth of information designed to inspire and engage. Our newsletter will feature in-depth articles highlighting cutting-edge research conduct by our faculty and students. Stay tuned for profiles on faculty members who are making significant contributions to their fields, as well as interviews with graduate students who are pushing the boundaries of scientific inquiry.

In addition to research highlights, **PRATHAM** will keep you informed about upcoming seminars, workshops, and guest lectures. We believe that collaboration and knowledge-sharing are essential components of academic growth, and we encourage everyone to participate in these events. Whether you are looking to deepen your understanding of complex topics or network with professionals in the field, our events are designed to enrich your academic experience.

PRATHAM will include a section dedicated to student achievements, showcasing awards, publications, and notable projects. Recognizing the hard work and dedication of our students is vital, as they are the future of physics. We invite you to share your accomplishments with us so we can highlight your success in future editions.

PRATHAM is not just a one-way communication channel, we want to hear from you! We encourage readers to submit articles, research updates, or even personal reflections related to physics. This newsletter is a platform for everyone in our department, and we welcome your contributions.

Join us in celebrating Physics! **PRATHAM** is your gateway to the latest happenings in the Physics Department. Together, let's explore, learn, and inspire.

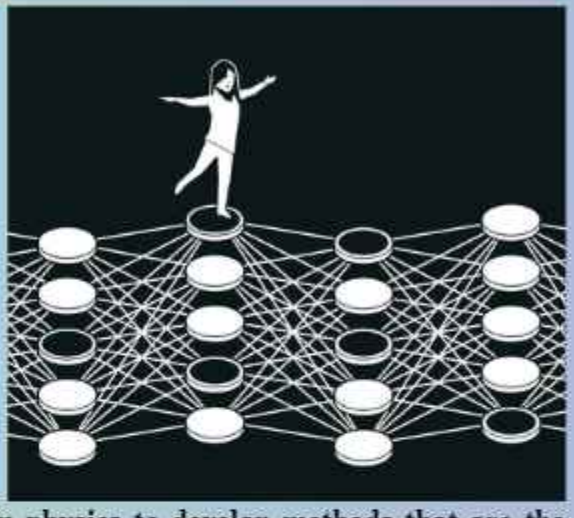
Thank you for being a part of our community. We look forward to share our stories with you!

Student Editorial Board
Ms. Jyoti Kumari, Research Scholar
Ms. Khushabu Shekhawat, Research Scholar
Mr. Mahesh Malpani, Research Scholar

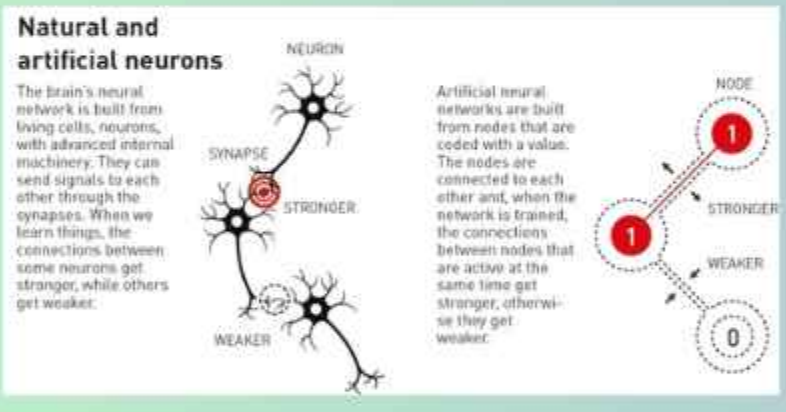
Faculty Advisor
Dr. Manoj Kumar Saini
Assistant Professor

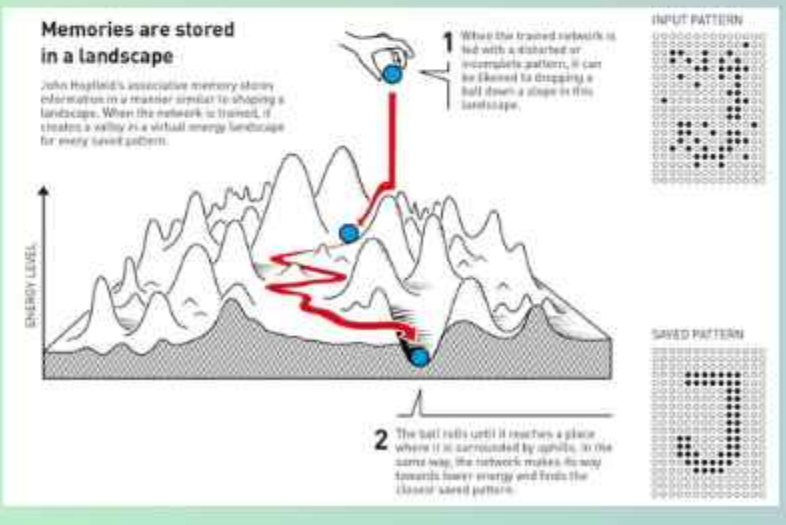
PRATHAM

Noble P-ize Winners 2024



This year's two Nobel Laureates in Physics have used tools from physics to develop methods that are the foundation of today's powerful machine learning. John Hopfield created an associative memory that can store and reconstruct images and other types of patterns in data. Geoffrey Hinton invented a method that can autonomously find properties in data, and so perform tasks such as identifying specific elements in pictures.





John Hopfield invented a network that uses a method for saving and recreating patterns. We can imagine the nodes as pixels. The Hopfield network utilises physics that describes a material's characteristics due to its atomic spin – a property that makes each atom a tiny magnet. The network as a whole is described in a manner equivalent to the energy in the spin system found in physics, and is trained by finding values for the connections between the nodes so that the saved images have low energy. When the Hopfield network is fed a distorted or incomplete image, it methodically works through the nodes and updates their values so the network's energy falls. The network thus works stepwise to find the saved image that is most like the imperfect one it was fed with.

Geoffrey Hinton used the Hopfield network as the foundation for a new network that uses a different method: the Boltzmann machine. This can learn to recognise characteristic elements in a given type of data. Hinton used tools from statistical physics, the science of systems built from many similar components. The machine is trained by feeding it examples that are very likely to arise when the machine is run. The Boltzmann machine can be used to classify images or create new examples of the type of pattern on which it was trained. Hinton has built upon this work, helping initiate the current explosive development of machine learning.