One-Week Hands-On Training Program on "STUTI on Mathematics for Machine Learning" (19th September – 25th September, 2022)

The Department of Science and Technology, Government of India, has given the responsibility to IIT (ISM) Dhanbad to build human resources and its knowledge capacity using open access science and technology infrastructure through the scheme ***"Synergistic Training Program Utilizing the Scientific and Technological Infrastructure (STUTI)"***. Thus, under the DST-STUTI programme of IIT (ISM) Dhanbad, a one-week hands-on training program on ***"STUTI on Mathematics for Machine Learning"*** was organized from 19th September to 25th September, 2022 at DST-Centre for Interdisciplinary Mathematical Sciences, Institute of Science, Banaras Hindu University, Varanasi.

This training program was coordinated by Prof. Bankteshwar Tiwari, DST-Centre for Interdisciplinary Sciences, BHU Varanasi and Prof. S. P. Tiwari, Department of Mathematics and Computing, IIT (ISM) Dhanbad. This program includes thirty participants (Faculty/Research Scholar) from various universities/colleges in India.

Highlights of the Day-1 (Dated: 19th September, 2022)

Before formal inauguration of the program the participants were provided a welcome kit that included a note pad, a power kit, and a program pamphlet. Then the training program was inaugurated by Prof. Anil Kumar Tripathi, Director, Institute of Science, BHU Varanasi and the chief guest of the function was Prof A.K. Srivastava, Ex-Director, Institute of Science, BHU Varanasi. The local Program Coordinator Prof. Bankteshwar Tiwari, DST-Centre for Interdisciplinary Sciences, BHU Varanasi welcomed all the participants and speakers where as external Program Coordinator Prof. S. P. Tiwari, Department of Mathematics and Computing, IIT (ISM) Dhanbad explored with a brief introduction to the program's purpose and significance. The introduction energized the participants interest in science and engineering. Following that, two consecutive lectures were scheduled. The first lecture (from 09:45 AM to 11:45 AM) was based on the basics of linear algebra and was delivered by Prof. Ajit Kumar, ICT Mumbai. The second lecture (from 11:45 AM to 01:45 PM) was based on the basics of the probability theory and was delivered by Prof. G. P. Singh, BHU Varanasi.

Next, after the lunch break, a practical demonstration (from 02:30 PM to 05:30 PM) on basics of linear algebra through Sagemath, an open sourse software, was provided by Dr. Ajit Kumar, ICT Mumbai.

Highlights of the Day-2 (Dated: 20th September, 2022)

On the second day, two lectures (the first lecture was from 09:00 AM to 11:00 AM and the second lecture was from 11:15 AM to 01:15 PM) were conducted. These lectures were based on the basics of linear algebra and were delivered by Dr. Ajit Kumar, ICT Mumbai

Next, after the lunch break, a practical demonstration (from 02:15 PM to 05:15 PM) on machine learning was provided by Dr. B. S. Kushvah, IIT (ISM) Dhanbad.

Highlights of the Day-3 (Dated: 21st September, 2022)

On the third day, two lectures were delivered. The first lecture (from 09:00 AM to 11:00 AM) was based on calculus and machine learning and was taught by Dr. B. S. Kushvah, IIT (ISM) Dhanbad. The second lecture (from 11:15 AM to 01:15 PM) was based on the linear regression and was taught by Dr.Ruchika Sehgal, IIT (ISM) Dhanbad.

Following the lunch break, a practical demonstration (from 02:15 PM to 05:15 PM) on calculus and machine learning was provided by Dr. B. S. Kushvah, IIT (ISM) Dhanbad.

Highlights of the Day-4 (Dated: 22nd September, 2022)

On the fourth day, two lectures were given. The first lecture (from 09:00 AM to 11:00 AM) was focused on the gradient descent and was delivered by Dr. Ruchika Sehgal, IIT (ISM) Dhanbad. The second lecture (from 11:15 AM to 01:15 PM) was focused on the basics of probability theory and was delivered by Dr. G. P. Singh, BHU Varanasi.

Next, after the lunch break, a practical demonstration (from 02:15 PM to 05:15 PM) on gradient descent was provided by Dr. Ruchika Sehgal, IIT (ISM) Dhanbad.

Highlights of the Day-5 (Dated: 23rd September, 2022)

Similarly, on the fifth day, two lectures (the first lecture was from 09:00 AM to 11:00 AM and the second lecture was from 11:15 AM to 01:15 PM) on Basics of SVM and SVD were delivered by Dr. S. K. Gupta, IIT Roorkee.

Next, after the lunch break, a practical demonstration (from 02:15 PM to 05:15 PM) on Inverse problem and Macine learning was provided by Dr. Manoj Kumar Singh, BHU Varanasi.

Highlights of the Day-6 (Dated: 24th September, 2022)

On the sixth day, two lectures were given. The first lecture (from 09:00 AM to 11:00 AM) entitled 'Data mining: some preliminary concepts' was delivered by Dr. S. K. Upadhyay, BHU Varanasi. The second lecture (from 11:15 AM to 01:15 PM) was based on the statistical machine learning and was taught by Prof. Anil K Ghosh, Indian Statistical Institute, Kolkata.

Next, after the lunch break, some practical demonstrations (from 02:15 PM to 05:15 PM) on diagonalization, SVM and SVD was provided by Dr. S. K. Gupta, IIT Roorkee.

Highlights of the Day-7 (Dated: 25th September, 2022)

Similarly, on the seventh day (the last day of the training program), two lectures (the first lecture was from 09:00 AM to 11:00 AM and the second lecture was from 11:15 AM to 01:15 PM) were conducted based on the statistical machine learning, multilayer perceptron, and dimensionality reduction techniques. These two lectures were delivered by Prof. Anil K ghosh, Indian Statistical Institute Kolkata and Prof. R. K. Agarwal, JNU New Delhi.

Next, after the lunch break, a practical demonstration (from 02:15 PM to 05:15 PM) on the multilayer perceptron and dimensionality reduction techniques was provided by Prof. R. K. Agarwal, JNU New Delhi.

Following that, the certificate distribution ceremony took place, with Prof. R. K. Agarwal, JNU New Delhi as chief guest and Prof Umesh Singh, Ex-Coordinator, DST-Centre for Interdisciplinary Sciences, BHU Varanasi as the president of the Valedictory function. A few participants were called to comment on the feedback of the program, although a formal feedback form had already been circulated among participants and collected before the Valedictory function. It can be observed from the feedback form that almost all participants were extremely benifitted from the program and very happy with the arrangement made during the training program. In general participants enjoyed the accommodation and food during their stay at Varanasi. Some of them have also requested to continue such program at the Centre.

Throughout the training program, a formal healthy discussion environment was established for the exchange of scientific and technological knowledge.

Prof. Sagar Pal Coordinator DST-STUTI	Prof. Ravi Kr. Gangwar Co-coordinator DST-STUTI	Prof. S. P. Tiwari Program Coordinator IIT(ISM) Dhanbad