National Winter School for Women in AI/ML and Computational Biology - 2024 (NWSW - 2024): A Report

As part of the ***Centenary Celebrations of our Founder Chancellor Bhagawan Sri Sathya Sai Baba,*** The Centre for Excellence in Mathematical Biology (CEMB) of Sri Sathya Sai Institute of Higher Learning (SSSIHL) along with Department of Mathematics and Computer Science (DMACS) and Department of Biosciences (DBIO) organized a six day in-person winter school titled "***National Winter School for Women in AI/ML and Computational Biology - 2024 (NWSW - 2024)***" from 2 - 7 December 2024, at the Prasanthi Nilayam Campus.

This National Winter School for Women (NWSW-2024) was a thoughtfully designed in-person program and is aimed at empowering women in the interdisciplinary fields of Artificial Intelligence/Machine Learning (AI/ML) and Computational Biology. Conducted over six days, this initiative provided a comprehensive foundation in Mathematical Biology, Bioinformatics, Python programming, AI/ML, and Deep Learning. Tailored for beginners, the Winter School featured expert-led theoretical sessions and hands-on practical training to bridge the gap between computational techniques and biological systems.

The Co-convenors presented a card to the Founder Chancellor, Bhagawan Sri Sathya Sai Baba, at His Divine Sannidhi in Sai Kulwant Hall as a token of their gratitude and dedication to the event. They earnestly prayed to Swami, seeking His blessings for the program's success and His guidance to ensure it aligns with His teachings and intent, making it impactful for all participants. The gesture concluded with a silent prayer of gratitude and reverence, invoking blessings for the growth and learning of everyone involved.

Structure and Schedule

By equipping participants with essential skills and knowledge, it aimed to foster confidence and competence in these cutting-edge domains. The program was structured to include a combination of morning lectures for theoretical insights and afternoon sessions for hands-on training. Each day focused on a specific theme, gradually building participants' knowledge and skills.

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Day 1: Foundations in Mathematics and Biological Systems

Morning Session:

- The sessions started with Fundamentals of Differential Calculus and Ordinary Differential Equations (ODEs) delivered by Dr. N. B. Gayathri, DMACS-SSSIHL. The participants explored the application of these mathematical concepts in modeling biological systems.
- Dr. Ramya E. M., DBIO-SSSIHL laid the groundwork for understanding the dynamics of biological systems.

Afternoon Session:

- A practical workshop on Python programming was conducted by Dr. Y. Lakshmi Naidu, Dr. N. B. Gayatri, and Mr. D. Bhanu Prakash, Doctoral Scholar from SSSIHL. This session introduced participants to Python's fundamentals, equipping them with the tools to tackle computational problems effectively.








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Day 2: Disease Modeling

Morning Session:

- Dr. D. K. K. Vamsi, Coordinator, CEMB-SSSIHL introduced participants to the basics and advanced concepts of disease modeling. The session demonstrated how mathematical and computational frameworks can be used to understand and predict the dynamics of diseases.

Afternoon Session:

- The participants engaged in hands-on exercises led by Dr. D. K. K. Vamsi and Mr. D. Bhanu Prakash, Doctoral Scholar from SSSIHL. This session provided practical insights into the real-world application of disease modeling techniques.

Day 3: Linear Methods in AI/ML

Morning Session:

- Mrs. Divya Sai J, an AI Data Scientist at Shell Technology Centre, Bangalore, presented an introduction to AI and ML with linear methods in machine learning. Topics included regression and classification, emphasizing their relevance in analyzing and interpreting data.

Afternoon Session:

- In a hands-on session led by Mrs. Divya Sai J, participants practiced implementing linear methods in AI/ML using computational tools. This practical approach reinforced theoretical concepts through application.

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Day 4: Nonlinear Methods and Unsupervised Learning in Machine Learning

Morning Session:

- Dr. M. S. Srinath from DMACS, SSSIHL introduced nonlinear methods and unsupervised learning techniques in machine learning. The participants gained insights into clustering, dimensionality reduction, and the analysis of complex datasets.

Afternoon Session:

- Guided by Dr. M. S. Srinath and Mr. Rithwik Chandra Pandey, participants explored practical applications of nonlinear methods and unsupervised learning. This session focused on implementing these techniques to analyze real-world datasets.

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Day 5: Introduction to Deep Learning (DL)

Morning Session:

- Prof. B. V. Rathish Kumar from IIT Kanpur provided an introduction to deep learning. in this session. The participants were introduced to the architecture and functioning of neural networks, along with their applications in solving diverse computational problems.

Afternoon Session:

- The participants had a fun-filled local excursion to the Indoor Stadium, Chaitanya Jyoti Museum, and the Hill View Stadium. Later that day, they participated in the evening prayer session at the Sai Kulwant Hall.

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Day 6: Bioinformatics and Case Studies

Morning Session:

- Dr. K. N. Naresh from DBIO, SSSIHL and Dr. Deepak Roshan V G from Malabar Cancer Centre, Kannur, introduced the field of bioinformatics. The participants learned about various online tools and resources used to analyze biological data and how to apply bioinformatics techniques to real-world problems, such as cancer research.

Afternoon Session:

- In the concluding session, participants engaged in hands-on exercises involving bioinformatics tools and case studies. Led by Dr. K. N. Naresh and Dr. Deepak Roshan V G, this session demonstrated the practical applications of bioinformatics in addressing biological research questions.

Click here for Flyer of NWSW-2024

Click here for Detailed Schedule of NWSW-2024

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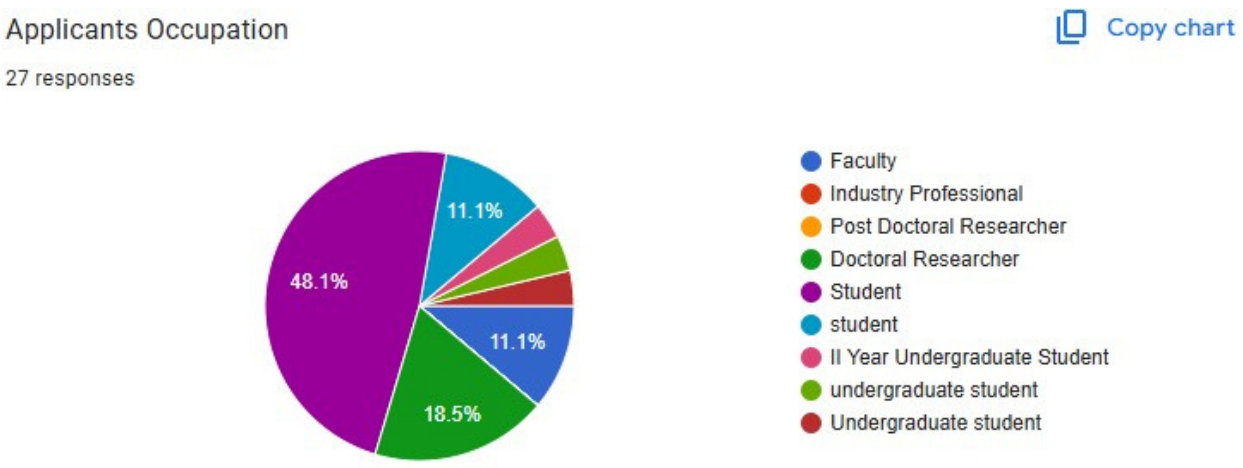
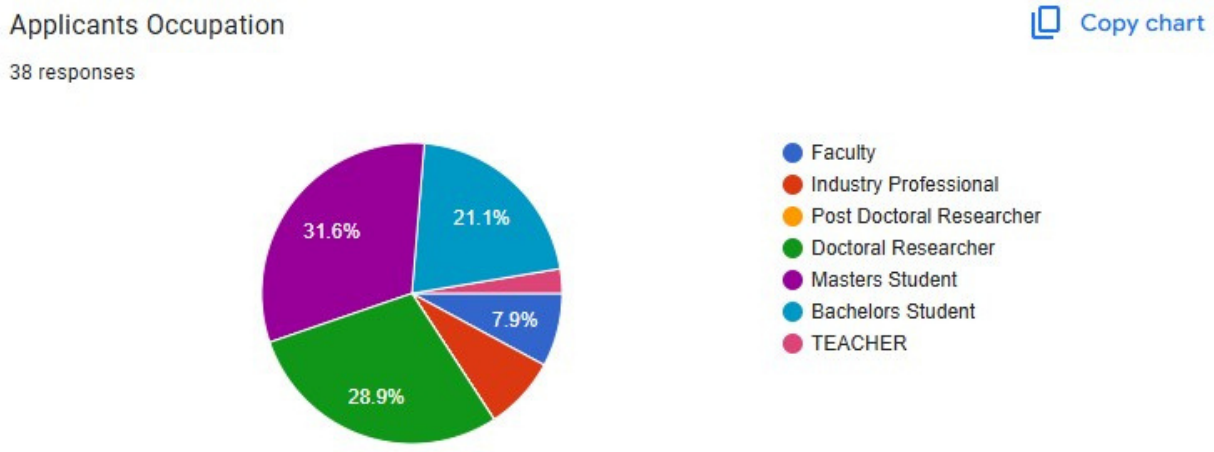
Participants Profiles for NWSW-2024

Number of Participants - 65 (27 from SSSIHL and 38 from other Institutions spread across India)

The participants for NWSW-2024 included faculty, industry professionals, post-doctoral & doctoral research scholars, post graduate and graduate students who were spread across different parts of India.





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Highlights and Outcomes

The National Winter School for Women (NWSW-2024) achieved the following objectives:

1. **Skill Development:** The program provided a foundational understanding of AI/ML and Computational Biology, with an emphasis on hands-on training.
2. **Interdisciplinary Approach:** Participants gained insights into the integration of biological sciences with computational techniques, preparing them for future research or professional endeavors.
3. **Expert-Led Sessions:** Renowned academics and industry professionals offered their expertise, ensuring the delivery of high-quality content.
4. **Inclusive Learning:** Designed for beginners, the program created an inclusive environment that encouraged active participation and learning.

Feedback from Participants on Certificate Program

- The sessions were excellent, and I gained significant insights even into topics I was already familiar with. There were no drawbacks; I thoroughly enjoyed the entire program. The hands-on sessions allowed me to visualize and apply what I had learned. Thank you for organizing this wonderful NWSW-2024.
- Being completely new to AI and ML, this workshop helped me grasp the basic concepts of what AI and ML are and how they function. It was a valuable exposure for me. I extend my gratitude to SSSIHL for organizing this event. Also, the lunch and refreshments were excellent.
- The workshop was highly fruitful, as it was my first exposure to mathematical modeling and artificial intelligence. As a beginner, I am very satisfied with the content provided by the faculty. I am deeply grateful for their expertise and commendable hospitality. Thank you for this incredible opportunity.
- I am delighted to have attended this wonderful workshop. Staying in such a spiritual environment was a unique and blessed experience. The six days were immensely satisfying, including the accommodation, classrooms, food, hands-on sessions, lectures, and the coordinators' kindness. Thank you for this blissful opportunity. I look forward to more workshops like this and hope to return to Puttaparthi soon.
- The session was outstanding. As a research scholar in mathematical modeling in ecology and epidemiology, the workshop was extremely relevant and beneficial. Being in the early stages of my research, it provided great clarity and direction. The faculty members were exceptionally skilled, humble, and supportive. A suggestion: It would be helpful if SSSIHL could organize such workshops just before the admission deadlines for research programs. This would allow students to explore research areas with faculty guidance and apply for relevant programs.
- The program was excellent, conducted in a peaceful and serene environment. It was a wonderful experience and opportunity where I learned a lot. Most importantly, I learned about Swami through this program. Thank you once again for this incredible opportunity.
- The workshop provided an excellent overview of AI and ML applications within the limited timeframe. It helped me familiarize myself with the basics, serving as a stepping stone for deeper learning. The faculty members were patient, approachable, and encouraged meaningful interactions among participants. I look forward to attending more such events in the future.
- As a student with a life sciences background, this Winter School was an eye-opener, introducing me to computational and mathematical biology. It provided great exposure to AI/ML concepts. The hands-on sessions were particularly valuable, allowing us to explore practical applications instead of just theoretical learning.

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Feedback from Participants on Certificate Program

- I am deeply grateful for the Grace and Blessings of Beloved Bhagawan Baba for this wonderful opportunity. The sessions were highly interactive, and the resource persons shared their immense knowledge while making us feel at home. Coming from a rural background, I was touched by the love and warmth experienced during this course, which is beyond words.
- This course offered a perfect balance of theory and practice. Lectures by renowned scientists enhanced my understanding of AI, ML, and computational biology, while the hands-on Python sessions boosted my skills and confidence in applying these tools to real-world challenges.
- As a mathematics postgraduate, I found the integration of AI and bioinformatics with mathematical principles highly inspiring. This course has ignited my passion for pursuing research in mathematical biology, with a vision to contribute to societal progress.
- The spiritual ambiance of the campus, combined with the morning and evening prayer sessions, added immense value to the experience. These practices enhanced my concentration, inner strength, and a sense of balance and purpose.
- I express my heartfelt gratitude to my Correspondent Sir and the school management for sponsoring my application, including travel and boarding expenses, which made this incredible experience possible. Special thanks to Dr. Vamsi Sir and the faculty members for their unwavering support and guidance during the course.
- This transformative experience has enriched my knowledge and inspired me to explore innovative ways to integrate AI and ML concepts into my teaching practices. I am deeply grateful for this opportunity and look forward to applying these learnings meaningfully. In summary, the course was inspiring, insightful, enjoyable, and highly participative.

Conclusion

The National Winter School for Women in AI/ML and Computational Biology - 2024 (NWSW-2024) was a resounding success, effectively empowering women in the fields of AI/ML and Computational Biology. By combining theoretical knowledge with practical training, the program provided a robust foundation for participants to explore these rapidly evolving fields. The initiative exemplified a commitment to fostering diversity and inclusion in STEM and highlighted the potential of interdisciplinary approaches in solving complex problems.

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