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Neelabh Madan

Education

2024–Present **New York University**, *Courant Department*, NY, USA
Ph.D. in Computer Science *with Prof. Lakshminarayanan Subramaniam*

2018–2022 **Indian Institute of Technology Delhi**, *Hauz Khas*, Delhi, India
B.Tech (Bachelors) in Mechanical Engineering – CGPA: 9.3/10 (Rank: 8/75)
with Minor Degree in Computer Science – CGPA 9.75/10

Publications

*C = Conference, P = Preprint/Submitted — * implies equal/core contribution*

C.1 **A Stitch in Time Saves Nine: A Train-Time Regularizing Loss for Improved Neural Network Calibration**
Ramya Hebbalaguppe*, **Neelabh Madan***, Jatin Prakash*, Chetan Arora
CVPR 2022 (Oral presentation) [Paper]

C.1 **Enhancing Tail Performance in Extreme Classifiers by Label Variance Reduction**
Anirudh Buvanesh*, Rahul Chand*, Jatin Prakash*, Bhawna Paliwal, Mudit Dhawan, **Neelabh Madan**, Manik Varma et al.
ICLR 2024 [Paper]

P.1 **Domain Faithful Deep Learning**
Ananth Balashankar*, Ankit Bhardwaj*,**Neelabh Madan***, Lakshminarayanan Subramaniam
Under review at AISTATS 2025

Scholastic Achievements and Awards

- Received **MacCracken PhD Fellowship (2024-2029)**
- **INOI 2017:** Cleared ZIO and qualified for INOI 2017 (Indian National Olympiad in Informatics)
- Received $20 000 from Micron Technology for winning the International Micron UV Design Challenge
- Received **Engineering Excellence Award** (2023-2024) from Microsoft for outstanding product impact

Research Experience

July'22-July'24 **Microsoft Research**, *eXtreme Classification **(XC)** group*, Bengaluru, India
Pre-Doctoral Research Fellow
Advisors: Manik Varma, Amit Sharma
- Worked on Personalized Recommendation by introducing eXtreme classifiers (XC)
- Enhance tail performance of XC models [ICLR 2024]
- Distilling GPT4 to highly-efficient XC models
- Deploying large-scale XC models on Microsoft Audience Network (MSAN) platform

May'22-July'22 **Tata Consultancy Services (TCS) Research**, Noida, India
Research Intern
Advisor: Ramya Hebbalaguppe
- Knowledge Distillation and Calibration

May'21-Aug'21 **Adobe Research (Media and Data Science Research Lab - MDSR)**, Noida, India
Research Intern
Advisor: K Balaji
- Worked on Document Visual Question Answering (DocVQA); Augmented LayoutLMV2 architecture with visual, textual, and layout modalities for a high-level understanding of documents.

Jul'21-July'22 **Indian Institute of Technology**, Delhi, India
Undergraduate Student
Advisors: Chetan Arora, Arnob Ghosh
- Worked with Prof. Chetan on "A Stitch in Time Saves Nine" as a project work [Accepted CVPR 2022 (ORAL)]
- Investigated, with Prof Arnob, the consequences of partial and full information on Contextual Multi-Armed Bandit as part of B.Tech Thesis; Studied the effect of various non linear loss functions on NeuralUCB algorithm

Real World Deployments

Jul'22-July'24 **Improved Personalized Ad Recommendation using XC models on MSAN**, *(Microsoft Research)*

- Modeled Personalized Ad recommendation as an XC task; trained large eXtreme Classifier models to improve performance over previously deployed Siamese style models on Microsoft Audience Network (MSAN) platform.
- Achieve **200-400% gains** in offline recall metrics, which resulted in **20+ mainstreamings**, generating approx. 200$ revenue for Microsoft and higher click-through-rates (CTR)
- Deployed models were able to predict ads, extending beyond just lexical matches; **Extended Ads coverage to approx 1 Billion Ads** by training classifiers on meta-clusters of Ads
- Received the **Engineering Excellence Award** for the Financial Year of 2023-2024

Selected Research Projects

Aug'24-Present **Learning Domain Faithful Deep Learning Models**, *(New York University)*
Advisors: Prof. Lakshminarayanan Subramaniam , Ananth Balashankar *(Google)*
Under Review AISTATS 2025

- Aimed at incorporating domain expertise and rules into deep neural networks (DNNs) by leveraging domain-specific declarative knowledge by implementing modular components for regularization and data augmentation
- Achieved significant improvements on synthetic datasets and real-world tasks, including MIMIC-III medication recommendation and reinforcement learning.

Sept'23-July'24 **Data Distillation for Sequential Recomendation using LLMs**, *(Microsoft Research)*
Advisors: Amit Sharma, Manik Varma

- Used LLM (GPT-4) to distill down a smaller LM to summarize long sequential user histories (made up of events such as bing searches, websites visited, etc) into shorter text representation for personalized recommendation.
- Shorter yet diverse textual representation of long user histories enables retention of multiple intent in the user embedding generated by BERT like encoders. This is an improvement over previously used methods that embed-then-aggregate individual user events.

Dec'22-May'23 **Enhancing XC models on tail labels**, *(Microsoft Research)*
Advisors: Manik Varma — [ICLR 2024]

- XC models (consisting of one-vs-all linear classifiers) are notorious for sub-par performance on labels that do not have enough training points (tail labels). Siamese models, however, have superior performance on tail labels
- Exploiting the above, we proposed a framework that improves tail performance of XC classifiers by distilling tail-robust encoders in the form of soft-label targets, resulting in SOTA (upto 5% absolute increase in metrics)

July'21-May'23 **Uniting Knowledge Distillation (KD) with Calibration**, *(Indian Institute of Technology Delhi)*
Advisor: Prof. Chetan Arora

- Proposed a simple framework to calibrate models by distilling calibrated teachers in order to get calibrated students. These calibrated students produced have SOTA calibration as compared to previous methods.
- Explored KD with the lens of calibration and verified that only certain teachers can distill calibrated students. Additionally, we showed that even distilling from smaller teachers can lead to calibration in larger students.

July'21-May'23 **Calibration of deep neural networks**, *(Indian Institute of Technology Delhi)*
Advisor: Prof. Chetan Arora — [CVPR 2022 ORAL]

- Proposed a novel trainable calibration method that calibrates all predicted classes (unlike other methods that focuses only on the maximum one). Introduced an auxiliary loss term that can be used in a modular manner.
- MDCA (proposed auxiliary loss) performs better or on par with the then SOTA methods (Focal Loss, Label Smoothing, etc.) by reducing both top-class (ECE) and multi-class (SCE) miscalibration metrics.

Teaching

Jan-Jul'2020 **Introduction to Computer Science**, *Academic Mentor*

Extra Curricular

Sports Secured **3rd Position (2019) and 1st Position (2020)** at **Inter Hostel Football Championship**
Won the overall General Championship, IITD (2020)

Music Played **Sitar** and performed in **School Orchestra** for 4 years

Coding Team Member at **Algorithms and Coding Club, IITD** and a regular competitive programmer

Robotics Participated in DD ABU ROBOCON **(2019)**, DD ABU ROBOCON **(2020)**, DD ABU ROBOCON **(2021)**
Won the **International Micron UV Design Challenge** against **MIT** and **Georgia Tech (2020)**

Leadership **Overall Coordinator (Robotics Club):** Supervised 150 members and revised Club structure | Lead the club through collaborations with Innovation Hub for Cobotics (IHFC), Lumos Labs and Tech Analogy and organised robotics workshops and talks.
Organised 6 freshmen summer projects on various fields of robotics. View Control Simulator Project