Deep Patel

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Education

University of Wisconsin-Madison (UW-Madison) — Madison, WI, USA
Ph.D, Department of Computer Sciences; ***CGPA: 3.71/4*** — *Sept 2023 – Present*

Indian Institute of Science (IISc) — Bengaluru, India
Ph.D, Department of Electrical Engineering (Discontinued); ***CGPA: 8.5/10*** — *May 2021 – Aug 2023*

Indian Insitute of Science (IISc) — Bangalore, India
M.Tech (Research), Department of Electrical Engineering; ***CGPA: 7.7/10*** — *Aug 2018 – April 2021*

Pandit Deendayal Petroleum University — Gandhinagar, India
B.Tech in Electrical Engineering; ***CGPA: 8.29/10*** — *July 2012 – Jun 2016*

Research Experience

Solving Min-Max Games with Two-Layer Neural Networks — UW-Madison
PhD Thesis Advisor: Prof. Manolis Vlatakis — *November 2024 – May 2025*

- Proved sufficient conditions on random initializations of two-layer neural networks for solving input min-max games which model phenomenon such as generating adversarial examples.
- Provided the first (sufficient) overparameterization condition for two-layer neural networks in order to solve separable hidden-strongly-convex-strongly-concave min-max games with two-layer neural networks.
- **Spotlight at NeurIPS 2025**

Teaching Version Space Learners under Limited Budget — UW-Madison
Collaborators: Shubham Bharti & Prof. Jerry Zhu — *February 2024 – January 2025*

- Proposed algorithms for teaching version space learners under a limited-budget (smaller than the Teaching Dimension) for hypothesis classes such as axis-aligned rectangles and homogeneous linear classifiers.
- Proposed algorithms consist of (a.) optimizing an upper bound on the teaching objective by minimizing the VC dimension of the hypothesis class under a finite budget, and (b.) modelling the worst-case learner risk using function approximators like *linear datamodels* and derive a closed-form solution for finding optimal teaching sets.
- **Work submitted and under review currently.**

Robust Supervised Learning under Label Noise — IISc, Bangalore
Thesis Advisor: Prof. P S Sastry — *April 2019 – August 2023*

- Investigated the role of loss functions in reducing the degree of 'memorisation' in neural networks for better generalisation under label noise. Published this work in PAKDD 2021.
- Devised a novel sample reweighting scheme that relies on mini-batch statistics alone for robustness to label noise. These statistics capture the learning dynamics to control the degree of memorisation for better generalisation under label noise. (Published extended version of this work in IEEE/CVF WACV 2023)
- Devised a novel noise rate estimation algorithm that uses statistics of training samples whose predicted posterior probabilities fall below or above certain computed class-specific thresholds. Our method does not rely on the widely used 'anchor point' assumption or costly dual-stage and regularization schemes.

Disease Onset & Severity Prediction for ALS & Parkinson's — IISc, Bangalore
Project Advisor: Prof. Prasanta Kumar Ghosh — *Sept 2017 – July 2018*

- Designed and created a dataset comprising of speech samples from patients with Amyotrophic Lateral Sclerosis (ALS) & Parkinson's disease (PD)
- Investigated utility of a variety of speech tasks using the corresponding audio & articulatory data for automated disease onset and severity prediction of ALS & PD
- Published two papers based on this work – ICASSP 2018 and Interspeech 2019

Publications

Bharti, S., **Patel, D.**, and Zhu, J., '*Optimal Dataset Design for Nurture-then-Nature Teaching*' [**Under Review**]

Patel, D.*, Jayram, C.*, Gandreti, S., Sastry, P. S., '*Estimating Label Noise Rates with Class-specific Thresholds*' [**Under preparation**]

Patel, D. and Vlatakis, E., '*Solving Neural Min-Max Games: The Role of Architecture, Initialization, and Dynamics*' in **NeurIPS 2025 (Spotlight)** [paper] [video (5 mins.)]

Patel, D., and Sastry, P. S., '*Adaptive Sample Selection for Robust Learning under Label Noise*' in **IEEE/CVF WACV 2023** [paper] [video (old)] [video (new)]

Patel, D., and Sastry, P. S., '*Memorization in Deep Neural Networks: Does the Loss Function Matter?*' in **PAKDD 2021** [paper] [video]

B. N., Suhas, **Patel, D**, et al., '*Comparison of Speech Tasks and Recording Devices for Voice Based Automatic Classification of Healthy Subjects and Patients with Amyotrophic Lateral Sclerosis*' in **Interspeech 2019** [paper]

Illa, A., **Patel, D**, et al., '*Comparison of speech tasks for automatic classification of patients with amyotrophic lateral sclerosis and healthy subjects*' in **ICASSP 2018** [paper]

Talks and Presentations

Adaptive Sample Selection for Robust Learning under Label Noise — Oral/Poster
EECS Symposium (2021), IISc / Online Asian Machine Learning School, ACML 2022 — *May 2021/December 2022*

Teaching Experience

Teaching Assistant for (at UW-Madison): *Design and Analysis of Psychological Experiments II* (Spring 2025, Department of Psychology), *Programming for Human Behavioral Data Science* (Fall 2025/Fall 2024, Department of Psychology), *Basic Statistics for Psychology* (Fall 2023/Spring 2024, Department of Psychology). Responsibilities included creating/evaluating assignments and exams, hosting weekly office hours, conducting weekly lab hours for coding demonstrations/teaching supplementary statistics material.

Teaching Assistant for (at IIT, Bombay): *Optimization From Fundamentals* (Spring 2023, Systems and Control Engineering). Responsibilities included conducting weekly tutorial sessions for problem-solving

Teaching Assistant for (at IISc): *Introduction to Causal Inference* (Spring 2023, EE Department), *Random Processes* (Fall 2022, ECE Department), *Stochastic Modeling & Applications* (Fall 2021/2020/2019, EE Department), *Pattern Recognition & Neural Networks* (Spring 2023, ECE Department; Spring 2020, EE Department). Responsibilities included scribing lectures, conducting tutorial sessions for problem solving; weekly office hours; designing and evaluating assignment/exam questions for classes of $\geq$70 students.

Work Experience

Reliance Industries Ltd. (RIL) — Jamnagar, Gujarat
Graduate Engineer Trainee — *Aug 2016 – Sept 2017*

- Observation of electrical commissioning and maintenance activities at a Low Density Polyethylene Manufacturing (LDPE) Plant, RIL J3 Project

Academic Achievements & Honours

Prime Minister's Research Fellowship, Government of India (Aug 2022 – Aug 2023; Declined and joined UW-Madison)

Ministry of Education, Government of India, Scholarship Holder (Aug 2018 – Oct 2021)

All India Rank 921 (out of 1,25,859 candidates) in Graduate Aptitude Test in Engineering (2016)

Silver Medal (University rank 2 out of 60 students) for academic performance in undergraduate program

Relevant Coursework

Optimization & Probability: Stochastic Modelling & Applications, Linear & Non-Linear Optimization, Convex Optimization, Detection & Estimation Theory, Information Theory, Probability Theory

Learning & Games: Theoretical Foundations of Reinforcement Learning, Theoretical Foundations of Machine Learning, Algorithmic High-Dimensional Robust Statistics, Machine Learning, Online Prediction & Learning, Game Theory

Signal Processing: Compressive Sensing & Sparse Signal Processing

Mathematics: Linear Algebra, Real Analysis, Topology, Introduction to Algebraic Topology, Computational Topology

Others: Human-Computer Interaction, Theory of Programming Languages

Programming Skills

Languages: Python, **Software & Tools:** LaTeX, MATLAB, TensorFlow, PyTorch

Leadership & Community service

EE Summer School IISc, Bangalore

Core Team Member *May 2022 – July 2022*

- Co-organized the inaugural department summer school for outreach about ongoing research.
- Designed the selection process & lecture/lab-visit programmes; and facilitated travel–accommodation reimbursements

EMPATHS IISc, Bangalore

Team Member & Department Representative *June 2020 – Present*

- Organized and moderated events related to mental health awareness and sensitization for the campus community
- Acting as an intermediary between students and mental health professionals for easier access to counselling services

NoteBook Drive (NBD) IISc, Bangalore

Core Team Member *June 2019 – Present*

- Organized annual stationery distribution & door-to-door surveys in rural areas for providing financial support to underprivileged kids from local government schools
- Organized a weekly programme, Science Mentorship, wherein local government school kids are taught science and maths via interactive experiments and to inculcate scientific temperament

GujaratCovidSupport.org Ahmedabad

Volunteer *April 2021 – July 2021*

- Verified CoViD-19 related resources and maintained a database for the same. (Worked with the team led by Kumar Manish)

Languages

English, Gujarati, Hindi, and Kannada (beginner proficiency)

References

- Prof. Manolis Vlatakis, Assistant Professor, UW-Madison, USA (mail to: `vlatakis@wisc.edu`)
- Prof. P S Sastry, Professor, IISc, Bangalore (mail to: `sastry@iisc.ac.in`)
- Prof. Prasanta Kumar Ghosh, Associate Professor, IISc, Bangalore (mail to: `prasantg@iisc.ac.in`)
- Prof. Muthuvel Arigovindan, Associate Professor, IISc, Bangalore (mail to: `mvel@iisc.ac.in`)