Niraj Kumar Singh

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Objective

Graduate school admission in a masters programme in the field of Computer Science with a specialization in AI, followed by a career in research.

- **Research interests:** Artificial Intelligence, Machine Learning, Reinforcement Learning, and Neuroscience.

Education

- **Indian Institute of Technology, Madras** — Chennai, India
  BS./MS. in Biological Sciences ; **CGPA:** 8.1/10 — Aug 2013 – Jul 2018
  - Major: **Biological Sciences**; Minor: **Management**
  - Key courses: Machine Intelligence and Brain Research (Introduction to : Machine Vision, Machine Learning in Audition, Reinforcement Learning, Natural Language Processing, Linear Algebra for Machine Learning, Neurobiology), Calculus: Function of one and several variable, Differential Equations, Biostatistics, Bioinformatics, Computational Neuroscience, Computational Biology Laboratory, Analysis and Interpretation of Biological Data, Computational Techniques in Biosystems
- **Taipei Medical University** — Taipei, Taiwan
  International Honors Program ; — June 2018
  - Program: Big Data in Healthcare
  - Key courses: Data Driven Decision Making, Data Visualization, Statistics, Text Mining and its applications, Natural Language Processing
- **Hanyang University** — Seoul, South Korea
  Student Exchange Program ; **CGPA:** 8.6/10 — Sept 2016 – Dec 2016
  - Key courses: Leadership workshop, Service Operation Management, Banking Investment and Practice, Accounting

Conferences and Publications

- **A bio-inspired model for object detection using RL[1] & Q-Network** — Chennai, India
  Niraj Singh, Sweta Kumari, V. Srinivasa Chakravarthy, Jitendra Kumar — July 2018
  - In preparation
- **Traffic Sign Detection using a modified Deep Q Neural Network** — Chennai, India
  Niraj Singh, Sweta Kumari, V. Srinivasa Chakravarthy, Jitendra Kumar — July 2018
  - **Conference paper:** International Academic Conference on Engineering, Transport, IT & Artificial Intelligence Budapest
  - **Poster presentation:** The First Annual Conference on Recent Advances in Data Science and AI Chennai, India
- **Detecting organic pollutants in water, with transformed *E. coli*** — Chennai, India
  Aman, Anjani, Anil, Sanjan, Janu Sahana, Saransh, Siva Sai, Niraj KS — Dec 2015
  - **Conference paper:** OYCE international conference, Mumbai India
  - **Poster presentation:** Research Expo at Shaastra 2015, IIT Madras, Chennai, India

Research Experience

- **Modelling bio-inspired attention for traffic sign detection** — Chennai, India
  Prof. Srinivasa Chakravarthy, Computational Neuroscience Lab, IIT Madras — June 2018 – Present
  - Recording human gaze on road video data, using GP3 Eye-tracker and PyGaze python library to analyse human search behaviour.
  - Using road data at two different scales to Q-Network and reinforcement learning to develop a bio-inspired attentional model.

- **Modelling prediction of traffic signs in road video data** Chennai, India
  Prof. Srinivasa Chakravarthy, Computational Neuroscience Lab, IIT Madras June 2018 – May 2018
  - Developed an end to end pipeline using CNN and Q-Network with reinforcement learning for predicting traffic signs in road video data. Demonstrated 2% increase in the accuracy compared to state-of-the-art algorithms, YOLO and Faster-RCNN for traffic sign detection.
  - The project lead to a one-year research collaboration with Continental Automotive, an automotive company, for developing bio-inspired models for traffic sign, pedestrian and traffic light detection to deploy in self-driving cars.
- **Summarizing text in main and supplementary traffic sign** Bangalore, India
  Mr. Jitendra Kumar, Machine Learning Team, Continental Automotive Nov 2017 – Dec 2011
  - Developed a network for image captioning and trained on multi-modal deep network with traffic sign image and text as inputs using LSTM network for summarizing road traffic signs. Filed a patent for the deploying it in the next generation camera in the company.
- **Reducing rejection rate of metal casting using convex optimization** Chennai, India
  Dr. Abhishankar Kumar, Data Science Team, Gyandata Pvt. Ltd June 2017 – July 2017
  - Used cvxopt library for convex optimization and PCR for optimizing the additives and returned sand properties to reduce rejection rate of metal casting in the patented SandMix and SandMan blending model.
  - Developed and deployed computational model for multi-target multi model, which reduced cost of production by 15% per metal casting.

Upper Division Course Projects

- **Computational Neuroscience** Chennai, India
  Prof. V. Srinivasa Chakravarthy, Department of Biotechnology, IIT Madras Aug 2017 – Nov 2017
  - Implemented Hodgkin-Huxley neuron model and Fitzhugh Nagumo neuron oscillator models on MATLAB. Observed variations in action potential when external current was varied, and identified the stable and unstable points.
  - Implemented CNN model for handwritten digit recognition tasks on MNIST dataset and observed weights encoding for edges and corners
- **Deep Learning** Chennai, India
  Dr.Mitesh Khapra, Computer Science Department, IIT Madras Jan 2018 – Feb 2018
  - Wrote python script using NumPy library to execute feedforward and backpropagation algorithm
  - Implemented the code on Fashion MNIST dataset. Achieved an accuracy of 92% and on the task of object classification

Leadership and Volunteering

- **Foodiary** Nagpur, India
  Founder Dec 2015 - Aug 2016
  - Developed a business model for delivering regional homemade food to migrant students while providing job opportunities to housewives. Lead a team of 7 members, to develop a community of unemployed women and elevate them from financially dependence.
  - Got incubated at Lemon School of Entrepreneurship for 3 months and catered to 60 customers consistently during the pilot study.
- **DermiCheck** Coimbatore, India
  Forge Accelerator Jan 2017 - Feb 2017
  - Developed a mobile application for self-diagnosis of skin disease at AI Sandbox hackathon; Achieved 88.7% accuracy by deep neural network [Inception v3 module]
  - Declared winners of the competition with Best Pitch award for novel business and revenue model. Invited to attend the Cybersecurity Conference at Tel Aviv University, Israel;
- **EEG Data Recording** Chennai, India
  Experimental Subject Aug 2018 - Sept 2018
  - Volunteered to record EEG data for understanding the variation in the audio signal processing by the left ear versus the right ear

Skills

- **Languages and Platforms:** Python, C, C++, R, R Shiny, MATLAB, Mathematica, Ocatave, AWS, Linux
- **Softwares:** Tensorflow, Keras, PyGaze, OpenCV, PyTorch, COBRA Toolbox, VMD, GROMACS, PyMOL, Weka, Modeller, Autodock, Cytoscape
- **Simulation and Modelling:** Molecular simulation: de-novo, homology modelling for structural, conformational function of proteins

Achievements & Awards

- Secured All India Rank-82 in GATE 2017, top 1% among 7722 candidates across India
- Secured 2nd position in Manual Robotics at Pragyan, Techical Festival of National Institute of Technology Trichy
- Best Pitch Awardee for the startup idea - Dermicheck among 10 teams from all over India, at Forge Accelerator, Coimbatore
- Secured 4th position in a competition on Fundamental Analysis of 3 automotive companies at Finance Club, IIT Madras