Deepak Singla
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ACADEMIC DETAILS

Degree/Examination	Institute	Year	GPA/Marks%
Bachelor of Technology in Electrical Engineering(Power and Automation)	Indian Institute of Technology, Delhi	2014-2018 (Expected)	8.138/10
Central Board of Secondary Education	BCM School, Ludhiana	2014	92.6/100
Central Board of Secondary Education	BCM School, Ludhiana	2012	10/10

RESEARCH INTERESTS

- Brain Machine Interfaces, Cognitive Neuroengineering

B.TECH PROJECT

- **Title:** Deep Learning Techniques for Household Load Forecasting
  (Guide: Dr Nilanjan Senroy, Electrical Engineering, IIT Delhi, July'17- Nov'17)
  - Compared variety of deep learning architectures such as Sequence-to-Sequence (S2S) with/out Attention, Convolutional Neural Networks with conventional Artificial Neural Networks for very short term load forecasting.
  - Benchmarked the newer techniques with ANNs where S2S with Attention performed the best at minute resolution and CNNs at the hour resolution for predicting load at next time step from previous 50 time steps.
  - Included input features such as date and time stamp along with active power for >200,000 measurements.

  Link to thesis: `www.github.com/singlakdeepak/Wiki/blob/master/btp-thesis.pdf`

MAJOR PROJECTS

- **Region of Interest(ROI) based Toolbox for Functional Connectivity Analysis in a fMRI scan** (Independent Study)
  (Guide: Dr Rahul Garg, Computational Science & Engineering, IIT Delhi, July'17- Present)
  - Reduced the preprocessing time of fMRI scans by 8x using Python NiPype library and incorporated the essential features such as BET, Slice Time Correction, Spatial Smoothing, Bandpass Filtering, Registration etc.
  - Completed the entire GUI front-end using QT-Creator and implemented optimized t-test and FDR correction for hypothesis testing on Pearson correlations (between ROIs) within and between the groups.
  - Validated the furnished toolkit on previous studies using region based connectivity analysis.
- **Gene Expression Imputation using Deep Learning** (Summer Research Project)
  (Guide: Dr Arjun Krishnan, CMSE, Michigan State University, USA, May'17- July'17)
  - Implemented various regression models including but not limited to Lasso, Ridge, Support Vector Regression, XGBoost based learning and Denoise Autoencoder based networks using Tensorflow on HPC.
  - Applied the Approximate Nearest Neighbor techniques, Annoy for duplicates removal, came up with KMeans clustering initialization techniques and did the Spearman correlation analysis among datasets.
  - Played around with the big human genome datasets and series, GPL570 and GPL96 and showed the increase in accuracy by over 3% of Autoencoder based networks over state of the art artificial neural networks.
  - Currently working remotely on compiling the imputed expression levels for different batch sizes and models.

  **Received a letter of recommendation for great work and publication currently in progress.*
- **Visible Light Communication System using different modulation techniques** (Summer Research Project)
  (Guide: Dr Manan Suri, Electrical Engineering, IIT Delhi, May'16- Dec'16)
  - Studied and evaluated the basic light fidelity circuit for low speed data transmission.
  - Exploited the intricacies of Arduino Nano microcontroller and employed Frequency Shift Keying(FSK) and On-Off Keying(OOK) modulations so as to reduce possible flickering of light during data transmissions.
  - Explored possible ways of increasing data rates and brainstormed on its applications in government transport.
- **Estimating light source directions from an image** (Course Project)
  (Guide: Dr Subhashis Banerjee, Computational Science & Engineering, IIT Delhi, Oct'17- Nov'17)
  - Estimated the lights directions assuming Lambertian surface and azimuthal angles given by contour voting (fuzzy clusters formation) of pixels at silhouette.
  - Increasing the size of silhouette reduced the error by 5x for many of the images and averaged azimuthal and zenith of light angles obtained for different objects in the image to get minimum absolute error.
- **Learning Visual Similarity and Classification with Convolution Neural Networks** (Course Project)
  (Guide: Dr Raghavendra Singh, IBM, Aug'16- Sep'16)
  - Constructed the Siamese GoogleNet in Caffe and learnt the pose invariance on apparel dataset by minimizing within group and maximizing between group distances for the classes.
  - Augmented data by cropping, rotating the images and merged the classes in order to reduce imbalance.

- **Face Recognition using various techniques of Pattern Classification** (Course Project)
  (Guide: Dr Sumantra Dutta Roy, Electrical Engineering, April'16)
  - Implemented the classification techniques namely Correlation, Eigenfaces using PCA and FisherFaces.
  - Compared the end results under variation in Facial Expression, Eye Wear and illumination and found FLD better than PCA technique due to greater between- class scatter.
- **Single Subject Analysis using General Linear Model** (Course Assignment)
  (Guide: Dr Rahul Garg, Computational Science & Engineering, IIT Delhi, April'17)
  - Compiled Slice Time Correction, Spatial Smoothing and High Pass Filtering on a fMRI visual area task.
  - Performed hypothesis testing for finding activated voxels and compared the zstat result with FSL software using scatter plots and regression analysis to get coefficient of determination of 80%.
- **Analysis of Data Converter Non-Idealities** (Course Assignment)
  (Guide: Dr Shouribrata Chaterjee, Electrical Engineering, IIT Delhi, February'17)
  - Computed differential and integral non-linearities of 8 bit flash ADC and two step 8 bit ADC on Octave.
  - Played around by adding the amplification block and adding non ideality in current cell DAC.
- Programmed Stauffer Grimson Algorithm for Background Segmentation in a live video using OpenCV library and applied KMeans and Expectation Maximization for training and classification on the frames. *(Jan'16)*
- Designed a coprocessor for arduino using FPGA for summation of 500 long integers and compared accuracy and speed of the algorithm running on a Arduino vs FPGA. *(April'17)*

SCHOLASTIC ACHIEVEMENTS

- Ranked among top 0.065%(AIR-848) at national level in the JEE- Advanced 2014, an exam organized by IITs.
- Secured State Rank-2 and National Rank- 121 in National Science Olympiad (NSO)-2014 organized by SOF.
- Recipient of the scholarship of INR 2000/semester from State Bank of Patiala, India for good academic performance.
- Awarded Outstanding Contribution,'16-'17 for sustained contribution to Electrical Engineering Society, IIT Delhi.

RELEVANT COURSES & TECHNICAL SKILLS

- **Courses:** Functional Brain Imaging, Computer Vision, Deep Learning, Machine Learning, Data Converters, Communications Engineering, Analog Electronics, Digital Electronics, Data Structures, Probability & Stochastics
- **Languages** (Python,Java,C,C++,O-Caml,MATLAB,Octave,Lex), **Libraries** (Tensorflow,Caffe,Theano,Keras), **Tools** (FSL,QT-Creator,Google Cloud Platform,Eclipse,Jupyter,VIM Editor,LaTeX,Autodesk,Office)

POSITIONS OF RESPONSIBILITY

- **Secretary, Electrical Engineering Society(EES), IIT Delhi** (April,2016 - April,2017)
  - Awarded 'Outstanding Contribution' for sustained contribution in all activities during 2015-17.
  - Conceptualized and implemented the problems for decrypting competition, 'Cryptex' held in Tryst'17.
  - Designed problem statement of Air Traffic Control and conducted a Digital Design Workshop on it.
  - Organized a hands-on workshop on Embedded Circuits and IoT by Texas Instruments.

EXTRA-CURRICULAR ACTIVITIES

- **Community Engagement through AINA (An Initiative for National Advancement), IIT Delhi**
  - Coordinated the Srijan Teaching Project during the period May 2016- April 2017.
  - Participated in *Manthan* discussions on issues related to national development and public policies.
  - Participated in three Swadesh trips, Mysore and Sindhudurg, Goa, Lucknow, an experiential trip organized by AINA that included visits to several villages, interaction with local community and understanding of ground level developmental issues.
- Listening to music, Reading novels, Adventure & Tourism.