PRANJAL RAI

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EDUCATION

Indian Institute of Technology Delhi *2018 - Present*
Bachelor of Technology Overall GPA: 7.845/10
Department of Electrical Engineering

St. Andrews Scots Sr. Sec. School, Delhi *2017*
Senior School Certification (Class 12) Percentage: 94%
Central Board of Secondary Education

St. Andrews Scots Sr. Sec. School, Delhi *2015*
Secondary School Certification (Class 10) Overall GPA: 10/10
Central Board of Secondary Education

SELECTED PUBLICATIONS AND PATENTS

1. Rajinder S. Deol, Nitika Batra, Pranjal Rai, Henam Sylvia Devi, Bhaskar Mitra and Madhusudan Singh, *Electrically Annealed and Densified Solution-Deposited Piezoelectric Thin Films*, 2019 MRS Fall Meeting and Exhibit: Symposium FF04.05.16

2. Rajinder S. Deol, Nitika Batra, Pranjal Rai and Madhusudan Singh, *Electric Field Induced Annealing of Inorganic thin films for Densification*, Indian Provisional Patent Application No. 201911049331 filed on November 30, 2019

RESEARCH EXPERIENCE

Device to predict ECG from retinal vasculature analysis Jan 2020 - Present
Computer vision and Embedded systems design project under Prof. Kolin Paul *IIT Delhi*

- Designed a hand-held device which can be integrated with an ophthalmoscope to capture retinal images and predict ECG. Used a Raspberry Pi processor for triggering image capture and processing the images. Processing involved measuring the time varitation of vascular diameters and using it to predict ECG.
- Modeled and 3D-printed the parts of the device. Segmented the blood vessels using morphological transformations and automatic thresholding and achieved 96% accuracy on the DRIVE dataset. Implemented the Zhang Seun's thinning algorithm to find the vascular centerlines.
- Segmented the optical disc using template matching and K-Means clustering. Linearly interplolated pixels normal to the centerlines and used K-Means clustering to cluster the pixels as vascular and non-vascular. Computed the vessel widths with respect to the optical disc diameter and used the time variations to predict ECG.

Flexible piezoelectric sensors and electric field induced annealing July 2019 - Dec 2019
Research project in Flexible electronics under Prof. Madhusudan Singh *IIT Delhi*

- Developed novel flexible KNN(Potassium-Sodium-Niobate) based tactile sensors. Optimized the KNN layer deposition process and characterized the sensors using PFM(Piezoelectric Forced Microscopy).
- Developed an electric field based annealing method for inorganic ceramics and calculated the volume reduction using AFM (Atomic Forced Microscopy) and SEM(Scanning Electron Microscopy).
- Presented a poster of the findings at MRS fall 2019 conference, held in Boston, Massachuettes. Filed a provisional patent for the invention of the novel electric field assisted annealing method.

PROJECTS

Fetal head segmentation and circumference measurement April 2020
Individual project on Computer vision and Deep learning

- Implemented and trained a U-Net model with ResNet inspired residual connections for the segmentation of fetal head from ultrasound images. Used the data from the HC18 challenge to train the model.
- Implemented Elliptic Hough transform to fit an ellipse to the segmented images. Achieved an average Dice score of 94% on the test data.

Melanoma prediction using ensamble of FCNN and CNN May 2020
Individual project on Computer vision and Deep learning

- Trained an ensamble of EfficientNet-B7 and a 500-250 Fully connected NN (FCNN) for the prediction of Melanoma from lesion images and patient information. Used the data from the SIIM-ISCI challenge.
- Incorporated various image transformations along with painting artificial hairs on the images, to extend the training set. Images along with the tabular data of the patient was used as an input to the model.

3D shapes using Triangulation October 2019
Course project on Data structures and Algorithms *IIT Delhi*

- Implemented a program to approximate, build, modify and analyse 3-D shapes and structures using Graphs, based on the principle of Triangulation. Implemented the graph data structure in Java.
- Implemented Dijkstra's algorithm to find out the distance between the closest connected components of the 3-D shape along with other features like mesh-type, nearest neighbors, centroids and diameter.

E-commerce platform August 2019
Course project on Data structures and Algorithms *IIT Delhi*

- Implemented an e-commerce platform using Multithreading and priority queues. Used Reentrant Locks to execute the threads. Implemented the platform in Java.
- Some sellers were given prime membership to sell their items. The items of such sellers were executed with a priority over other sellers using priority queues.

TECHNICAL STRENGTHS

Programming Languages	C++, Java, Python, VHDL, Verilog
Software & Utilities	MATLAB, LaTeX, Git, Autodesk Inventor, Labview
Libraries and APIs	Pytorch, Numpy, Matplotlib, OpenCV, Keras, TensorFlow
Development	HTML, CSS, JavaScript, Android Studio

SCHOLASTIC ACHIEVEMENTS

- Awarded Honorarium for exemplarary research work as a sophomore by Prof. Madhusudan Singh
- Secured All India Rank 385 in JEE Advanced 2018 amongst top 200,000 screened candidates
- Ranked in National Top 0.2% (amongst 1,200,000 candidates) in JEE Mains 2018
- All India Rank 431 in KVPY 2017, was offered the KVPY scholarship by the Goverment of India

RELEVANT COURSES

Signals and Systems, Digital Electronics, Control Systems, Physical Electronics, Electromagnetics, Circuit Theory, Electromechanics, Calculus, Linear Algebra, Differential Equations, Probability and Stochastic Processes, Data Structures, Algorithms, Machine Learning[1], Deep Learning [1], Embedded Systems Design

[1]Completed Online

POSITION OF RESPONSIBILITY

- **Academic mentor:** Guided 80+ first year students and conducted doubt sessions for CML100 course
- **Marketing team head, Rendezvous'19:** Managed the marketing team for North India's largest cultural festival Rendezvous'19. Managed sponsor deals for the four day event
- **Executive, Electrical Engineering Society IIT Delhi:** Organized lectures, workshops, quizzes and gaming events for the club. Organized the annual fresher's party for the students
- **Executive, Electrical Engineering Society IIT Delhi:** Organized astronomy lectures and observation sessions for the students of IIT Delhi along with various quizzes and discussions

EXTRA-CIRRUCULAR ACTIVITIES

- Active volunteer at the **National Service Scheme, IIT Delhi** (NSS). Volunteer of the award winning Climate Crusade group of NSS. Volunteered regularly at blood donation camps.
- Played Drums in the hostel team at Inter Hostel Band competition: Secured 2nd position.
- **Microsoft student partner:** Coordinated with Microsoft to host events at IIT Delhi.
- Played as a batsman in the Inter Hostel Cricket tournament 2019.