

# MANIRATNAM MANDAL

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## EDUCATION

<b>Ph.D. in Electrical and Computer Engineering</b> <i>The University of Texas at Austin</i>	<b>2020 – 2024</b> GPA: 4.0/4.0
<b>M.Tech. in Electrical Engineering</b> <i>Indian Institute of Technology Kanpur, India</i>	<b>2018 – 2019</b> GPA: 10.0/10.0
<b>B.Tech. in Electrical Engineering</b> <i>Indian Institute of Technology Kanpur, India</i>	<b>2014 – 2018</b> GPA: 9.1/10.0
<b>Foundation Masters – Signal, Control, and Robotics</b> <i>Semester Exchange at École Centrale de Nantes, France</i>	<b>2018</b> GPA: 10.0/10.0

## AREAS OF INTEREST

- Image and Video Processing
- Computer Vision (CV)
- Computational Photography
- Vision Models
- Video Engineering
- Image & Video Quality Assessment
- Accessible Media Technology
- Data Science

## RESEARCH AND WORK EXPERIENCE

<b>GRADUATE RESEARCH ASSISTANT</b> <i>Laboratory of Image and Video Engineering (LIVE), UT Austin</i> Supervisor: <i>Dr Alan C Bovik</i>	<b>Jan'20 – Dec'24</b> Austin, Texas
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- **Text Legibility and Quality Assessment for UGC Media** 📺 (Sponsor: **YouTube**)
  - Created and analyzed **unique** subjective **datasets** for assessing text legibility and quality in visual media.
  - Developed **SOTA** deep learning **models** for text-in-image legibility and text-in-video quality prediction.
- **Subjective Portrait Region Cropping for UGC Video** 📺 (Sponsor: **YouTube**)
  - Developed the **largest** subjective **video cropping database**, advancing aspect ratio transformation research.
  - Conducted in-lab human study to analyze subjective video cropping techniques for portrait content creation.
- **Image Quality Assessment for Visually Impaired UGC** 📺 (Sponsor: **Meta AI**)
  - Created the **largest dataset** for image quality and distortion analysis for visually impaired UGC.
  - Developed a **multi-task scalable model** and real-time applications to provide quality and distortion feedback.
- **Video Quality Assessment for UGC Media** 📺 (Sponsor: **Meta AI**)
  - Created the **largest UGC** video quality database and conducted the largest subjective VQA study to date.
  - Developed a **SOTA blind video quality predictor** capable of generating spatial and temporal quality maps.

<b>RESEARCH INTERN</b> <i>SMI Lab, Samsung Research America</i>	<b>Jun'22 – Aug'22</b> Plano, Texas
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- Designed an in-lab **Video Quality of Experience Study** involving real-time ratings for streaming applications.
- Analyzed video quality metrics for assessing **spatio-temporal anomalies** generated during data transmission.
- Assisted in modeling QoE anomalies prediction from Network Layer statistics.

<b>UNDERGRADUATE RESEARCHER</b> <i>Computer Vision Laboratory, IIT Kanpur</i> Supervisor: <i>Dr K S Venkatesh</i>	<b>Jul'18 – Jun'19</b> Kanpur, India
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- Proposed a novel method of **quasi-orthographic surface imaging** and analyzed it on generated topographies.
- Designed algorithms to compute imaging surfaces, derive bounds on imaging distance, and optimize capture points.
- Developed and compared sequential and batch filling algorithms for efficient surface reconstruction.




<b>RESEARCH INTERN</b> <i>Checko, IIT Kanpur</i>	<b>Jul'18 - Sep'18</b> Kanpur, India
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- Developed 3D tag **counterfeit detection** pipeline based contrast gradients, reflection patterns, and print features.
- Implemented advanced **encryption** and **watermarking** techniques across Frequency, DCT, and Wavelet domains.


## RELEVANT PUBLICATIONS

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### CONFERENCES

- M. Mandal, N. Birkbeck, B. Adsumilli, and A. C. Bovik, “*LegiT: Text Legibility for User-generated Media*,” IEEE International Conference on Image Processing (**IEEE ICIP**), **2024 (Oral Presentation)**. 
- C. Lee, M. Mandal, N. Birkbeck, Y. Wang, B. Adsumilli, and A. C. Bovik, “*Subjective Portrait Region Cropping on Landscape Video Study*,” IEEE International Conference on Image Processing (**IEEE ICIP**), **2024**. 
- Z. Ying, M. Mandal, D. Ghadiyaram, A. C. Bovik, “*Patch-VQ: ‘Patching up’ the Video Quality Problem*,” IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**), **2021 (Oral Presentation)**. 

### JOURNALS

- M. Mandal, N. Birkbeck, B. Adsumilli, and A. C. Bovik, “*Quality Prediction of Embedded and Overlaid Text in User-Generated Visual Content*,” IEEE Transactions on Image Processing (**IEEE TIP**), **2024** (under review).
- M. Mandal, D. Ghadiyaram, D. Gurari, and A. C. Bovik, “*Helping Visually Impaired People Take Better Quality Pictures*,” IEEE Transactions on Image Processing (**IEEE TIP**), vol. 32, pp. 3873–3884, **2023**. 

### THESES

- Maniratnam Mandal, “*No-reference Image and Video Quality Assessment for User-generated Media*,” **Ph.D. Dissertation**, (The University of Texas at Austin, 2024).
- Maniratnam Mandal, “*Optimum Methods for Quasi-Orthographic Surface Imaging*,” **M.Tech. Thesis**, (Indian Institute of Technology Kanpur, 2019). 

## TEACHING EXPERIENCE

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### TEACHING ASSISTANT

2018 – 2019

Department of Electrical Engineering, IIT Kanpur

- Worked as a TA for courses – **Introduction to Electronics**, **Image Processing**, and **Solid State Devices**.
- Responsible for assistance in course tutorials, guidance in course projects, and grading assignments and exams.

### VOLUNTEER MEMBER

2018 – 2020

English Proficiency Program, IIT Kanpur

- Management of the courses – **English Proficiency and Scholarly Communication** and **Practical English: Learning and Teaching** (online).
- Responsible for creating video lectures, and crafting and grading of assignments.







## AWARDS

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- Awarded **Outstanding TA Award** by Dept. of Electrical Engineering, IIT Kanpur, **2019**.
- Awarded **Academic Excellence Award** by IIT Kanpur for **consecutive academic years 2014 – 18**.
- Recipient of **Erasmus+ EU scholarship** for semester exchange in France, **2018**.
- Awarded **Kishor Vaigyanik Protsahan Yojana (KVPY)** scholarship by DST, Govt. of India, **2013**.

## SELECTED COURSEWORK

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ENGINEERING	Digital Video; Image Processing; Advanced Computer Vision; Vision Systems; Computer Programming and Data Analysis; Data Mining; Embedded and Cyber-physical Systems; Statistical Machine Learning; Digital Signal Processing; Speech Signal Processing
MATHEMATICS	Probability and Statistics; Linear Algebra; Complex Analysis and Differential Equations; Convex Optimization; Statistical Signal Processing
CERTIFICATIONS	Machine Learning  (Stanford Online); Introduction to Neural Networks and PyTorch  (IBM); Deep Learning Specialization  (Deeplearning.ai); TensorFlow Developer Specialization  (Deeplearning.ai); Generative Adversarial Networks (GANs) Specialization  (Deeplearning.ai); Introduction to Image Generation  (Google)

## TECHNICAL SKILLS

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PROGRAMMING	Python, MATLAB, Javascript, HTML, CSS, Git, Bash, L <sup>A</sup> T <sub>E</sub> X
TOOLS	TensorFlow, PyTorch, Scikit-Learn, Scikit-image, Scikit-video, OpenCV, Darts

## ADDITIONAL PROJECTS

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### KAGGLE COMPETITIONS

- ❑ **Store Sales – Time Series Forecasting** [🔗](#) **2024**
  - Ranked in **top ten** out of 762 teams with a Root Mean Squared Logarithmic **Error of 0.378**.
  - Built and optimized **ensemble models** using **XGBoost**, **LightGBM**, and **TiDE**, leveraging advanced time series techniques, including past covariates, future covariates, and lag features, to improve forecasting accuracy.
- ❑ **Intruder Detection through Webpage Session Tracking** [🔗](#) **2023**
  - Boosted **F1 score** to **0.91** in web-user identification by addressing imbalance with downsampling and weighting.
  - Ranked in **top fifty** out of 5580 teams, achieving **ROC AUC of 0.969**, using **Light AutoML** to train LightGBM, LR, and XGBoost ensembles.
- ❑ **Predicting Domestic Flight Delays** [🔗](#) **2022**
  - Ranked **first** on the leaderboard, achieving **ROC AUC of 0.959**, using a tuned **CatBoost** model.
  - Leveraged Random Forest to generate new features for **binary classification**, improving AUC in a highly imbalanced dataset by utilizing class weights and implementing a custom focal loss function.

### COMPUTER VISION

- ❑ **Combining Compression Techniques for Computer Vision** [🔗](#) **2021**
  - Compared compression efficacy of **quantization**, **pruning**, and **knowledge distillation** for smaller networks.
  - Analyzed the combination of different techniques when applied partially and sequentially to deep networks.
- ❑ **Improving Defensive Distillation using Teacher Assistant** [🔗](#) **2021**
  - Evaluated **distilled models** for different distillation temperatures in terms of accuracy, sensitivity, and robustness.
  - Demonstrated that multi-step distillation improves **robustness against adversarial attacks** in most cases.
- ❑ **Foreground Detection and Background Separation in Videos** [🔗](#) **2020**
  - Explored algorithms based on **PCA**, **GMM**, and **foreground motion estimation** for detecting moving subjects.
  - Developed algorithms based on motion estimation for removing moving objects to extract the static background.
- ❑ **Deep-fake Image and Video Detection Techniques** [🔗](#) **2020**
  - Surveyed different categories of **facial manipulation** in videos and images, and databases available for research.
  - Analyzed both classical and learning-based popular Deep-fake detection techniques.

### GENERAL

- ❑ **COVID-19: Impacts and Insights** [🔗](#) **2020**
  - Modeled death and case projections in target demographics using **time-series analysis** and **LSTMs**.
  - Applied ML techniques to analyze and predict the impact of the pandemic on mental health and well-being.
- ❑ **Comparison of HRTF Pre-processing Techniques** [🔗](#) **2019**
  - Investigated the **perceptual effect** of Head Related Transfer Function (HRTF) pre-processing techniques.
  - Demonstrated using **energy analysis** that lower order SHT coefficients can be used for faster reconstruction.
- ❑ **Robust Optimization in Logistics** [🔗](#) **2019**
  - Studied the **retailer-supplier flexible commitment (RSFC)** problem to manage the supply chain logistics.
  - Implemented and analyzed three algorithms for optimizing the parameters based on uncertainty in demand.
- ❑ **Online Reconstruction from Big Data via Compressive Censoring** [🔗](#) **2018**
  - Studied **Sparsity-aware Censored Maximum Likelihood Estimator (SC-MLE)**, and tested the performance and convergence of the proposed optimization algorithm on sparse online data for real-time processing.

## POSITIONS OF RESPONSIBILITY

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- **INTERNSHIP AND COMPANY COORDINATOR (2015-16):** Managed college placement procedures and involved in creating preparation guides as a member of the **Student Placement Office, IIT Kanpur**.
- **STUDENT GUIDE AND ACADEMIC MENTOR (2015-16):** Member of the **Counselling Service, IIT Kanpur**, responsible for the orientation, and academic and personal guidance of the undergraduate freshmen batch.

## REFERENCES

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Up to three references available on request