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RESEARCH INTERESTS	Computer Vision, Deep Learning, Machine Learning, Reinforcement learning, Document Image Analysis.	
EDUCATION	Jadavpur University, Kolkata, India - B.E Electrical Engineering - Current Status: 3rd year student 2020(Expected) - Current CGPA 8.37 (Top 15%) Sibpur S.S.P.S. Vidyalaya, Howrah, India - Higher Secondary (12 th Standard, WBCHSE) - Aggregate: 92.4% 2016 - Secondary (10 th Standard, WBSE) - Aggregate: 90.5% 2014	
JOURNAL PUBLICATIONS	<ul style="list-style-type: none"> • Ankan Kumar Bhunia, Aishik Konwar, Abir Bhowmik, Ayan Kumar Bhunia, Partha Pratim Roy, “Script Identification in Natural Scene and Video Frame using Attention based Convolutional LSTM Network”, Pattern Recognition, 2018, Elsevier.(I.F.-3.962) (DOI: 10.1016/j.patcog.2018.07.034) [PDF] [GitHub] <u>Highlights:</u> Although attention-based framework is popular in Deep Learning, the most interesting part of our framework is how we use patch-wise attention values twice inside an end-to-end trainable architecture in order to (1) Combine local(patch-wise) and global(full-text line image) feature in a dynamic way. (2) Combine patch-wise classification instead of simple element wise-summation. • Ankan Kumar Bhunia, Alireza Alaei, Partha Pratim Roy, “Signature Verification Approach using Fusion of Hybrid Texture Features”, Neural computing and Applications, Springer. (I.F.-4.213) [arXiv] <u>Highlights:</u> One-class support vector machines (SVMs) are created to obtain two different authenticity scores for a given signature. Finally, a score level classifier fusion based on the average method is performed to integrate the scores that predicts the authenticity of the signature. 	
CONFERENCE PUBLICATIONS	<ul style="list-style-type: none"> • Ankan Kumar Bhunia, Ayan Kumar Bhunia, Prithaj Banerjee, Aishik Konwer, Abir Bhowmick, Partha Pratim Roy, Umapada Pal, “Word Level Font-to-Font Image Translation using Convolutional Recurrent Generative Adversarial Networks”, <i>24th International Conference on Pattern Recognition (ICPR)</i>, 2018. [arXiv] <u>Highlights:</u> A word level image translation model inspired from pix2pix architecture, which is the first of its kind to handle images of varying widths. • Ankan Kumar Bhunia, Ayan Kumar Bhunia, Aneeshan Sain, Partha Pratim Roy, “Improving Document Binarization via Adversarial Noise-Texture Augmentation”, <i>International Conference on Image Processing (ICIP 2019)</i>, IEEE [arXiv] [GitHub] 	

Highlights: A two-stage network is proposed that first learns to augment the document images by using neural transfer technique. The most significant contribution of our framework is that it does **NOT** require any paired data.

- Ayan Kumar Bhunia, Abir Bhowmick, **Ankan Kumar Bhunia**, Aishik Konwer, Prithaj Banerjee, Partha Pratim Roy, Umapada Pal, “Handwriting Trajectory Recovery using End-to-End Deep Encoder-Decoder Network”, *24th International Conference on Pattern Recognition (ICPR)*, 2018. [[arXiv](#)]

Highlights: Our proposed framework employs sequence to sequence model in designing an end-to-end network for a decade old popular problem in document analysis community.

- Aishik Konwer, Ayan Kumar Bhunia, Abir Bhowmick, **Ankan Kumar Bhunia**, Prithaj Banerjee, Partha Pratim Roy, Umapada Pal, “Staff line Removal using Generative Adversarial Networks”, *24th International Conference on Pattern Recognition (ICPR)*, 2018. (Oral) [[arXiv](#)]

Highlights: A new framework for staff-line removal in music-score documents using **GANs** which achieved superior performance in comparison to other conventional approaches on the ICDAR/GREC 2013 dataset.

- Ayan Kumar Bhunia, Abhirup Das, **Ankan Kumar Bhunia**, Sairaj Kishore, Partha Pratim Roy, “Handwriting Recognition in Low-resource Scripts using Adversarial Learning”, *Accepted in (CVPR) 2019* [[arXiv](#)]

Highlights: Word-retrieval is very difficult in low-resource scripts. To deal with the problem **Adversarial Feature Deformation Module (AFDM)** is proposed that learns ways to elastically warp extracted features in a scalable manner, boosting its capability to better learn highly informative features rather than trivial ones

SUBMITTED PAPERS

- Ayan Kumar Bhunia, Subham Mukhejee, Aneeshan Sain, **Ankan Kumar Bhunia**, Partha Pratim Roy, Umapada Pal “Indic Handwritten Script Identification using Offline-Online Multimodal Deep Network”, **Information Fusion**, *Elsevier*.(**I.F.-6.639**) [[arXiv](#)]

RESEARCH PROJECTS

- **Crowd Estimation by Transfer Learning the Depth Information:** The model captures the homogeneous density variations of crowd scenes in spatial domain by acquiring the depth information through Transfer learning (Ongoing) [[PDF](#)]
- **3D handwriting recognition through adversarial domain adaptation:** I focus on taking the help of online 2D handwriting data to recognize the words from 3D handwriting using adversarial domain adaptation algorithms. (Ongoing) [[PDF](#)]
- **Improving Document Binarization using Adversarial Learning:** A huge amount of paired document image data has been created by artificially superimposing realistic noises on ground truths using a novel style transfer algorithm. [[CODE](#)]
- **Struck-out removal from text image using Pix2Pix method:** Removal of various types of noise from a document using a naive image-to-image translation model trained on a synthetically created dataset. [[CODE](#)]

SCIENTIFIC RESEARCH EXPERIENCE	MAY, 2019	Mitacs Globalink Internship		
	TO	<i>Research Intern at University of Manitoba, Canada</i>		
	AUGUST, 2019	● Title: “Flexible deep learning models in computer vision ”		
		● Advisor: Dr. Yang Wang , Associate Professor.		
	JUNE, 2018	Robert Bosch, Bangalore, India		
	TO	<i>Research Intern at Computer Vision Lab, RTC Department</i> [Certificate]		
	JULY, 2018	● Title: “Synthetic to Photo-realistic Image Generation” [GitHub]		
		● Advisor: Dr. Amit Arvind Kale , Principal Senior Expert		
		● Description: I worked on various domain adaptation techniques to improve the performance of state-of-the-art semantic segmentation methods by leveraging large synthetic datasets.		
	MAY, 2017	● Advisor: Prof. Partha Pratim Roy , Ph.D.		
	TO	Dept. of Computer science, IIT Roorkee, India.		
	PRESENT	● Research Directions: Machine learning, computer vision, pattern recognition, document analysis, visual Scene understanding etc		
		● Collaborated with: Prof. Umapada Pal , CVPR Unit, ISI-Kolkata, Dr. Alireza Alaei , Research Fellow, Griffith University, Australia.		
RELEVANT COURSEWORK	* Statistics & Probability	* Linear Algebra	* Signal Processing	
	* ML & DL Algorithms	* Computer Vision	* Reinforcement learning	
FAMILIARITY WITH DL	* CNN/RNN/LSTM	* Auto-encoder	* Transfer Learning	
	* Semantic Segmentation	* Object Detection	* Attention Mechanism	
	* Siamese Network	* Triplet Network	* Generative Models	
	* Domain Adaptation	* Style Transfer	* Image Trans. Models	
TECHNICAL SKILLS	● Programming Languages: Python , C, MATLAB.			
	● Deep Learning Framework: Tensorflow , Keras, PyTorch.			
	● Mathematics: Linear-algebra, Probability, Statistics.			
	● Miscellaneous: OpenCV, OpenAI gym, Numpy, Matplotlib, Pandas, Scikit-Learn.			
REFERENCES	Dr. Partha Pratim Roy			
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