Image and Video Analytics

Project (Review – 1)

Kidney Stone Detection using Image Processing

Team Members:

Guruarunachalam G

Prabhath Sai G B

S. No	Title	Author	Year	Algorithm	Applications	Tools	Advantages	Disadvantages	Dataset used and Directory	Future Scope
1.	Interpretable Deep Learning Classifier by Detection of Prototypical Parts on Kidney Stones Images	Daniel Flores-Araiza, Francisco Lopez-Tiro, Elias Villalvazo-Avila	2022	Prototypical Part Network (CNN: ResNet)	This model can be used for ESR by an urologist.	Python	VGG19 with batch normalization on CNN makes better accuracy rate for each of the 6 classes.	Model collapse of the learned ProtoPnet plus is a limitation on the current PPs.	ex-vivo dataset of kidney stone images. Kaggle.	Better Initialization Procedures for PP and loss function adjustments in CNN will be explored.
2.	A deep learning system for automated kidney stone detection and volumetric segmentation on non-contrast CT scans	Daniel C. Elton, Evrim B. Turkbey, Perry J. Pickhardt, Ronald M. Summers	2021	Gradient Anisotropic diffusion denoising, CNN	Can be used in robotic vision to detect kidney stone on AI vision.	Python	Use of anisotropic Diffusion up-to 200 connected components removes noise without blurring the image.	Usage of scan thickness 1mm won't make so accurate result and should be at 0.75 mm.	NNMC-CTC dataset	Future work will study how systems such as this can automatically track kidney stone volume changes over time
3.	Analysis and implementation of kidney stones detection by applying segmentation techniques on computerized tomography scans	Mua'ad M Abu-Faraj, Mohammad Zubi	2020	Edge Based, Watershed, Threshold Based Segmentation.	In finding comprise stone disease, kidney cysts, hydronephrosis, congenital anomalies and tumours.	Matlab	Watershed algorithms relics better segmentation method for detecting kidney stones.		Kidney Stones images from Michigan University.	Applying other segmentation techniques and improving the quality and efficiency of a reasonable analysis algorithm.

No.	Title	Authors	Year	Technique	Objective	Platform	Findings	Limitation	Dataset	Future Scope
4.	Stone Detection In Kidney With Image Processing Technique: CT Images	Felix Alberto, Caycho Valencia, Juan José Augusto Moyano Muñoz, Flor María Jaramillo Montaño	2022	Median Filter (Preprocessing), K- Means (Segmentation), Classification (Binary).	Detecting the stone by only using CT scan.	Python	An improved version for detecting stone in kidneys with image processing with only CT scanned images with accuracy 92.5%.		40 patients CT scan from Hospital.	Applying different image segmentation techniques to explore specific pixel values to reduce the time complexity of the process.
5.	Deep Segmentation Networks for Segmenting Kidneys and Detecting Kidney Stones in Unenhanced Abdominal CT Images	Dan Li, Chuda Xiao, Yang Liu, Zhuo Chen, Haseeb Hassan, Liyilei Su, Jun Liu, Haoyu Li, Weiguo Xie, Wen Zhong, Bingding Huang.	2022	Min-Max Normalisation, 3D U-Net, Res U-Net, SegNet, DeepLabV 3+, and UNETR.	This work focused on performing kidney and kidney stone detection tasks and presented a replaceable training procedure for 3D semantic segmentation algorithms.	Python	Deep semantic segmentation models are feasible and capable of accurately segmenting kidneys and detecting kidney stones on unenhanced abdominal CT scans.		260 CT scans from Hospital of Guangzhou Medical University	To annotate and segment the inner kidney's structure using enhanced CT images
6.	DoubleU-Net: A Deep Convolutional Neural Network for Medical Image Segmentation	Debesh Jha, Michael A. Riegler, Dag Johansen, Pal Halvorsen, Havard D. Johansen	2020	CNN DoubleU-Net	Used for Medical Image Segmentation to differentiate the foreign body from the Human organ	Tensor flow, Volta 100 GPU, Nvidia DGX-2 AI system	DoubleU-Net is capable of producing better segmentation mask even for the challenging images	It uses more parameters as compared to U-Net.	CVC-ClinicDB, https://www.kaggle.com/datasets/balraj98/cvcclinicdb	Designing simplified architectures with fewer parameters while maintaining its ability

7.	Detection of kidney stone using digital image processing: a holistic approach	Angshuman Khan, Rupayan Das, M C Parameshwara	2022	Principle Component Analysis (PCA), K-means, Fuzzy C means clustering	Pre-processing, Fragmentation, and the Feature extraction on the input image	Matlab	Higher accuracy rate of the proposed Model.	Not able to achieve the Highest accuracy	Geertsma T 2021 Ultrasound Images & Clips, https://www.ultrasoundcases.info/fornix-rupture-745	Extend the work by proposing artificial neural network-based methodology to achieve more accuracy
8.	Kidney stones detection using Image processing technique	Jyothirmai Joshi, Sai Nikitha, Viswa Chandrika, Sindhu, Jahnvi	2021	KNN Classification, Gabor Filter, Median blur, Laplacian Filter, Gaussian blur	To detect the kidney stone from a digital ultrasound image of the kidney by performing various image processing techniques	Python	Improves the Image quality to examine easily	Major identification of the stone cannot be observed	Ultrasound Images from the Ultrasound Machine	Should work on Gaussian in frequency domain, because the real and imaginary plane were not separated and hence the inverse transformation did not take place properly.

9.	Kidney Stone Analysis Using Digital Image Processing	T. Vineela, R. V. G. L. Akhila, T. Anusha, Y. Nandini, S. Bindu	2020	ROI Model, K-Means Clustering	Doctors can look forward for appropriate treatment method which can result in the removal of stone from kidneys in an efficient manner	Matlab	The accuracy of proposed algorithm is 92.57% which is competent enough as compared to previous algorithms.	In the proposed algorithm there were some variations in the exact position of the stone	Ultrasound images from the Ultrasound machine.	Implementing the proposed algorithm there were some variations in the exact position of the stone which could be rectified by varying the intensity adjustment of each ultrasound image of the stone.
10.	Detection of Kidney Stones Using Image Processing	M. Kavitha, Kiruba. N	2022	Fuzzy C-Means Algorithm, Histogram Equalization, ROI Model	The resulting image helped in detecting the exact location of stone and further the edge detection method was used to identify the shape and structure of the stones formed	Matlab	Proved to be an accurate method that can be used in the process of detection of kidney stone	Using seperate process for clearing the noises from the ultrasound which is time consuming	Ultrasound Images from Ultrasound Machine	Increasing the accuracy of the algorithm by working with new technologies