

RESEARCH PROJECTS

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| 09/19 - CURRENT | <p>Mitral Valve Regurgitation Classification
<i>Deep Learning and Computer Vision research on Cardiac MRI data</i></p> <p>Developing a fully automated pipeline consisting of a CNN-LSTM classification model, a U-Net segmentation model and a Random Forest ensemble model for classifying mitral valve regurgitation with long-axis view cardiac MRI datasets from UK Biobank.</p> <p>In order to improve model performance and utilizing large unlabeled datasets, we are developing multi-view CNN-LSTM classification model and weakly supervised image segmentation model as well.</p> <p>Ultimately, we are looking for a weakly supervised or an unsupervised solution for extracting, ensembling and utilizing the information from available cardiac MRI datasets.</p> |
| 07/17 - 08/19 | <p>Bicuspid/Tricuspid aortic valve classification project
<i>Machine Learning and Computer Vision application on Cardiac MRI data</i></p> <p>Developed a Convolutional Neural Network (CNN) model using pre-trained CNN with customized Fully-connected Neural Network (FNN) top model. Developed a fully automated pipeline for experiments and hyper-parameter tuning.</p> <p>Applied image pre-processing and augmentations to further boost model performance. Developed multiple other Neural Network model structures for experiments, such as building a un-trained CNN encoder parallel to the pre-trained CNN model then concatenate the outputs together before feeding into the final FNN top model for classification.</p> <p>Introduced Recurrent Neural Network (RNN) component into the Neural Network model to incorporate temporal information in the MRI sequence for improving the model.</p> |
| 01/16 - 12/16 | <p>Geobot Project
<i>Four-wheeled ground vehicle operating on ROS</i></p> <p>Built a self-driving robot. Used LiDAR and ROS to collect environment data and 3D reconstruct the map of a mine. Also, used the LiDAR point cloud data to avoid obstacle.</p> <p>Designed a path-planning algorithm and built a communication module between the robot and the Ground Penetrating Radar(GPR) through a Network Interface Controller(NIC).</p> <p>Given the GPS coordinates of the corners of a selected area, the prototype robot can scan the underground area using attached GPRs and collects the related data. The robot is fully autonomous on its own.</p> |
| 12/13 - 06/14 | <p>Undergraduate Research Project
<i>Research on compliant mobile robots in rough terrain</i></p> <p>Designed several compliant joints for 6-wheeled robots that are flexible and suitable for rough terrain. Used Mathematica and ANSYS to build the pseudo-rigid model and a finite element analysis model. Used Solidworks to build a prototype.</p> |