Deep Learning

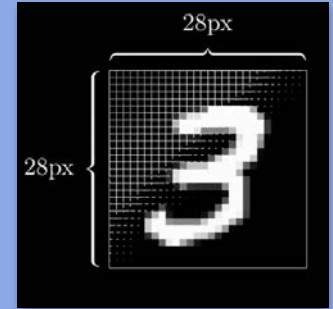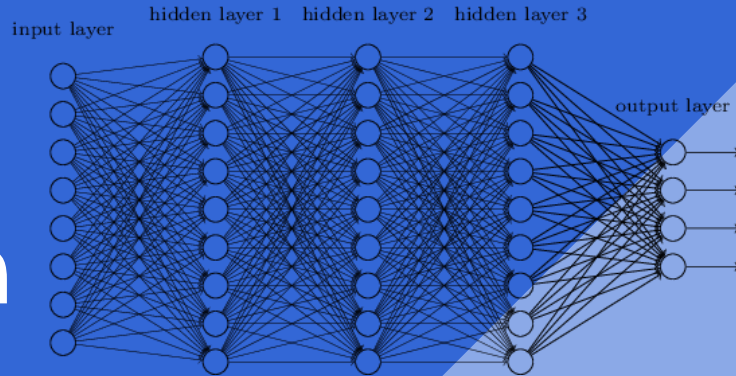for Image Classification and Segmentation

The study plan

- Unit 1: What is Tensorflow and how to solve linear regression problem in Python and Tensorflow?
- Unit 2: What is image classification and how to implement a solution?
- Unit 3: What is Neural Networks and how to apply on image classification?
- Unit 4: What is Convolutional Neural Networks and Deep Neural Networks?
- Unit 5: What is image segmentation and how to implement a solution?
  Unit 6: How to improve Deep Neural Networks?
  Short-Term Project Report Presentation

The study plan
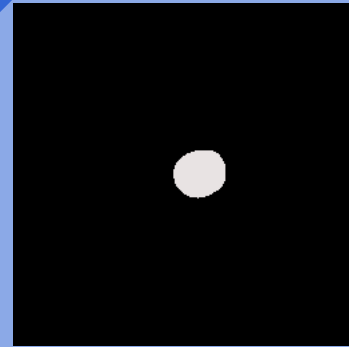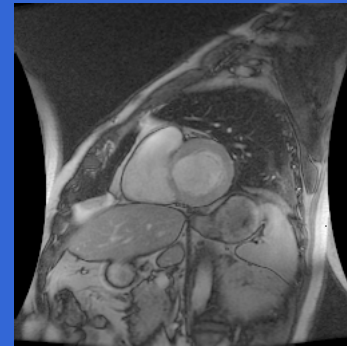
- Unit 3: What is Neural Networks and how to apply it on image classification ?

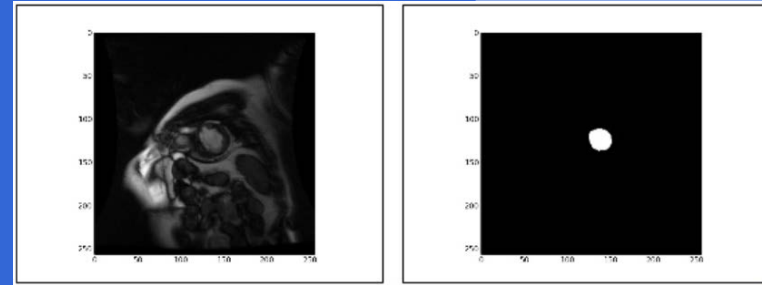# **Individual Assignment Activity of Unit 5: (option)**

➢ Segment MRI images to measure parts of the heart by setting up a computer vision workflow using using NVIDIA DIGITS™.
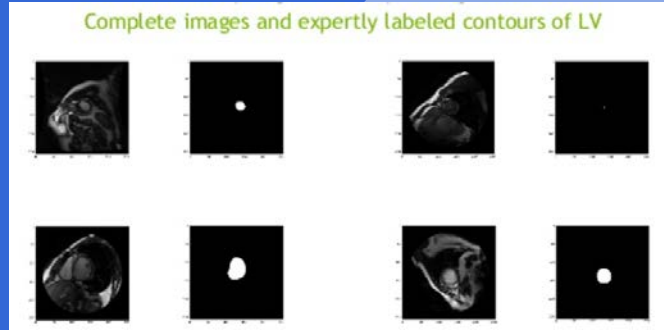
Web site

Short-Term Project in teams

Using MRI to measure cardiac volumes and derive ejection fraction
Ref: Kaggle challenge in the 2016 Data Science Bowl Competition.

Short-Term Project in teams

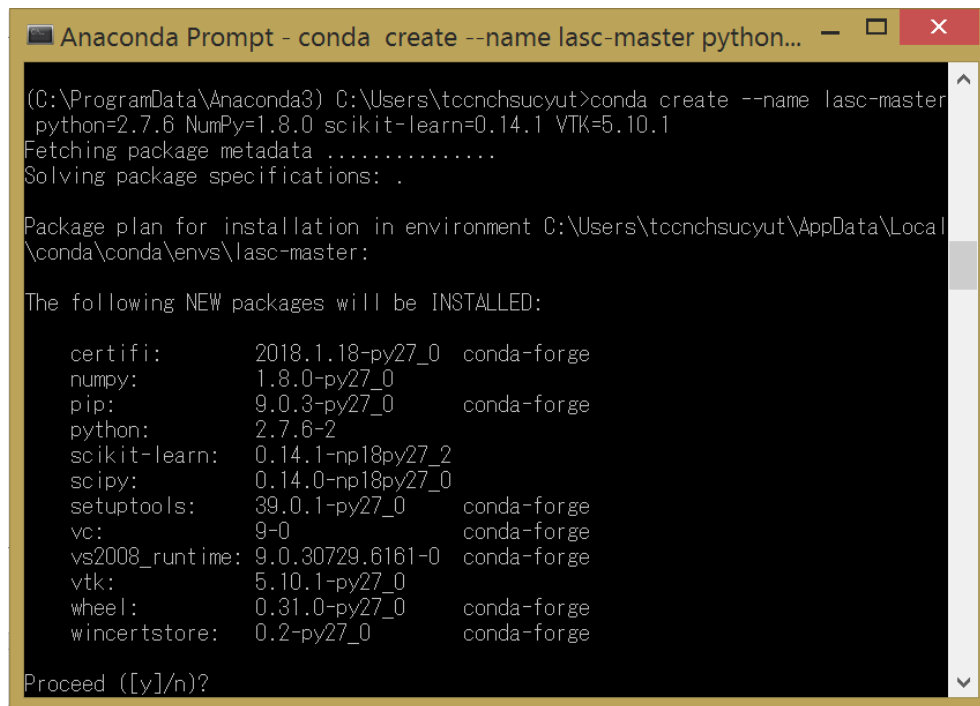Complete images and expertly labeled contours of LV

- Segment MRI images to measure parts of the heart by setting up a computer vision workflow using deep learning.

Anaconda Prompt Environment

- The scripts in this repository were successfully run with:
- Python 2.7.6
- NumPy 1.8.0
- scikit-learn 0.14.1
- VTK 5.10.1
- conda create --name lasc-master python=2.7.6 NumPy=1.8.0 scikit-learn=0.14.1 VTK=5.10.1
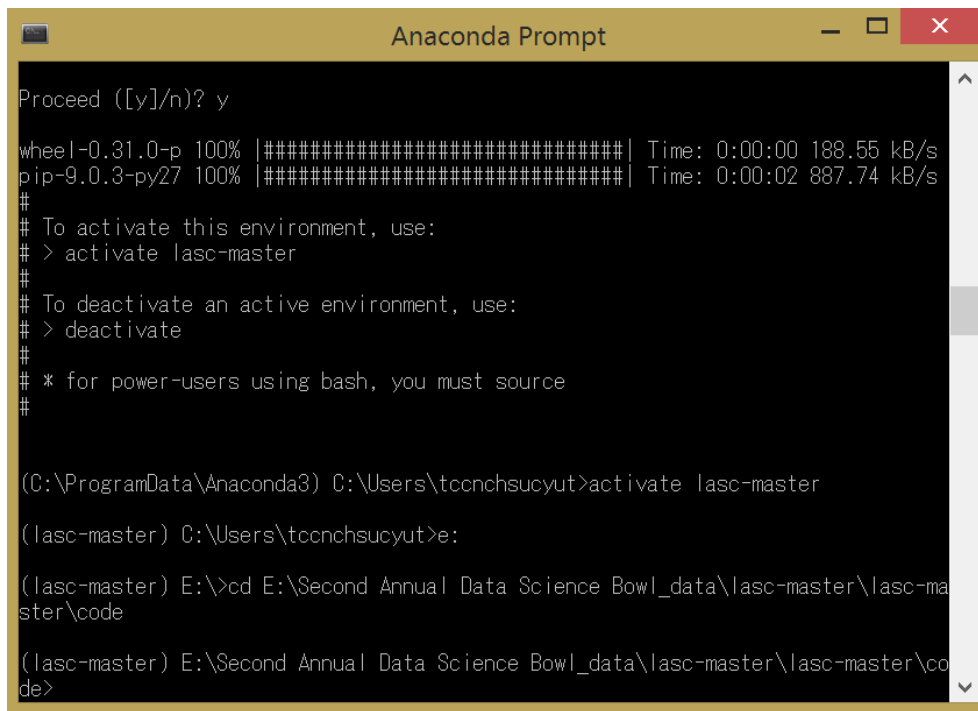
Anaconda Prompt Environment

- conda create --name lasc-master python=2.7.6 NumPy=1.8.0 scikit-learn=0.14.1 VTK=5.10.1

Anaconda Prompt Environment

- conda create --name lasc-master python=2.7.6 NumPy=1.8.0 scikit-learn=0.14.1 VTK=5.10.1

Anaconda Prompt Environment
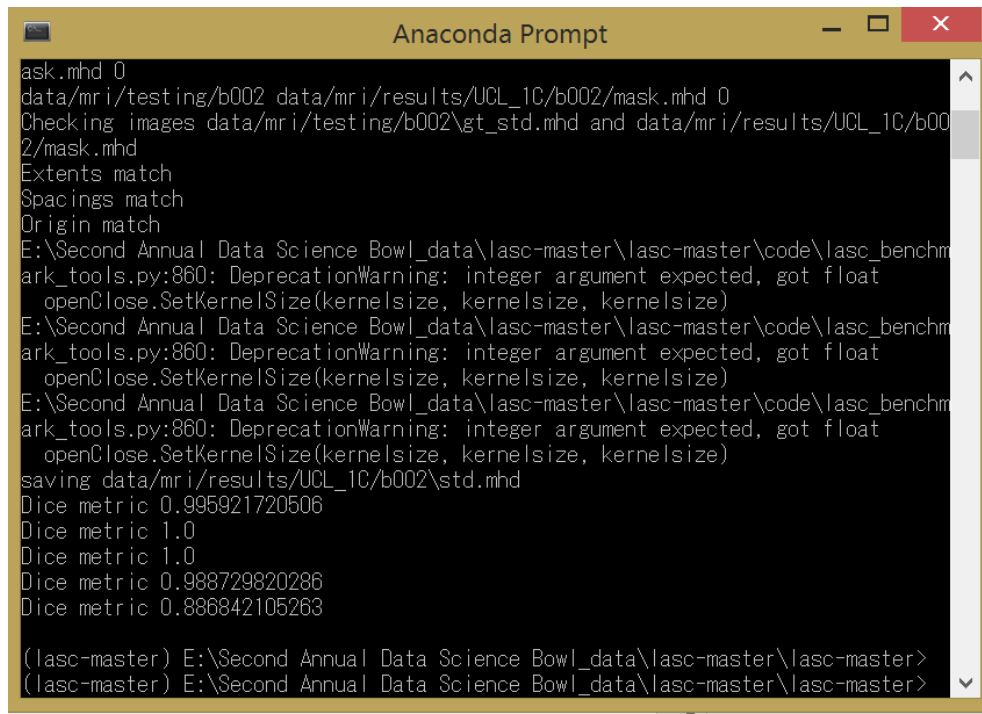
- Activate lasc-master
- E:
- cd \Second Annual Data Science Bowl_data\lasc-master\lasc-master

Anaconda Prompt Environment

- python code/lasc_benchmark.py data/mri/testing/b002 data/mri/results/UCL_1C/b002/mask.mhd 0

DIGITS medical image segmentation

- **Using DIGITS to train a medical image segmentation network**
- **https://github.com/NVIDIA/DIGITS/tree/master/examples/medical-imaging**

Short-Term Project Dataset
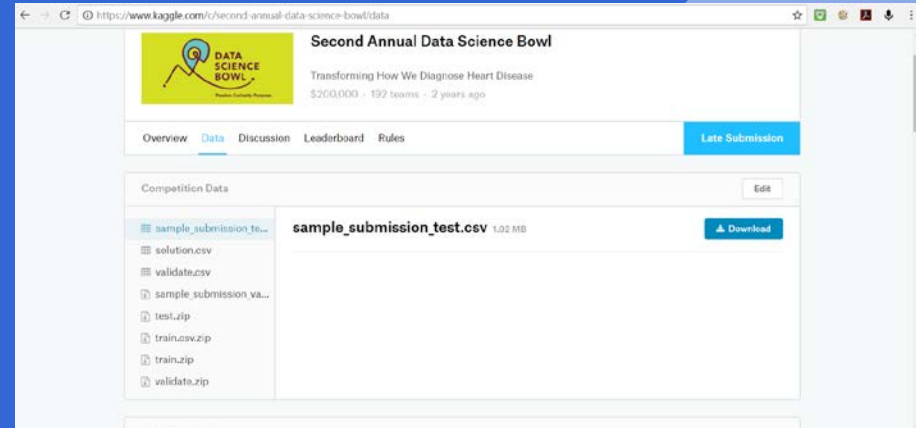
- Data Science Bowl Competition
  Second Annual Data Science Bowl
- Transforming How We Diagnose Heart Disease
- https://www.kaggle.com/c/second-annual-data-science-bowl

Short-Term Project in teams

After completing this project, you will:
- Know how Convolutional Neural Networks (CNNs) work.
- Know how to prepare data for CNNs.
- Know how to design architecture of CNNs.
- Know how to tune CNNs to a problem.
- Know how to save an CNN model and use it to make predictions.

Short-Term Project Report

Report Contents involved as follows:

Section 1: Overview of concepts of Deep Neural Networks

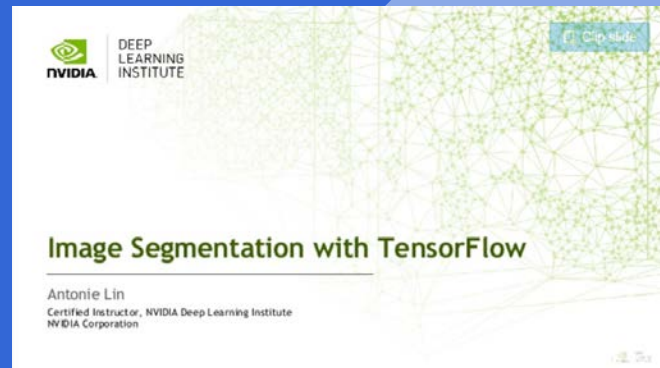Section 2: Design a CNNs architecture for medical image segmentation.

Section 3: Impemetation of the CNNs architecture in Tensorflow and Python.

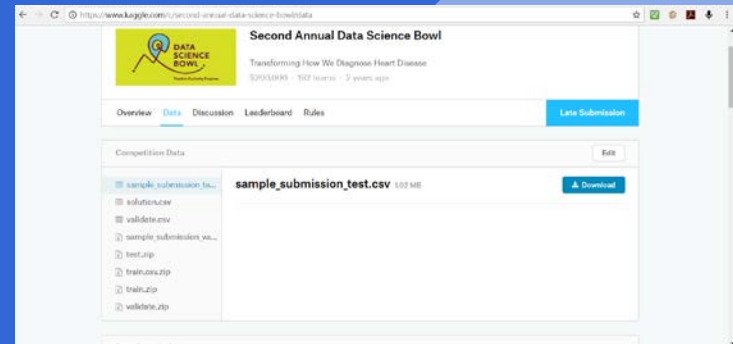Section 4: Evaluation of the Design of a CNNs architecture.

Short-Term Project Resources

- Introduction to Image Segmentation with TensorFlow
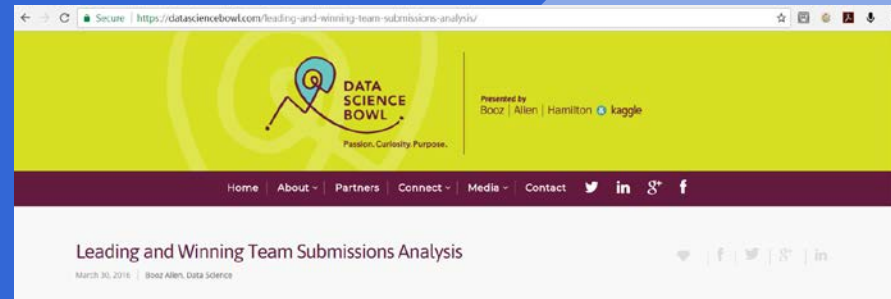- https://www.slideshare.net/NVIDIATaiwan/nvidia-dli-image-segmentation-with-tensorflow

Short-Term Project Resources

- Diagnosing Heart Diseases in the Data Science Bowl: 2nd place, Team kunsthart
- http://blog.kaggle.com/2016/04/13/diagnosing-heart-diseases-with-deep-neural-networks-2nd-place-ira-korshunova/

Short-Term Project Resources
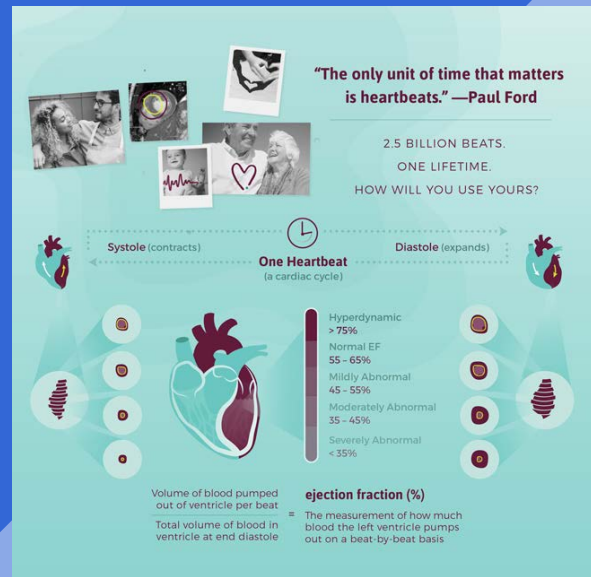
- Leading and Winning Team Submissions Analysis
- https://datasciencebowl.com/leading-and-winning-team-submissions-analysis/

Short-Term Project Resources

- **Left Atrial Segmentation Challenge 2013**
- https://github.com/catactg/lasc

Short-Term Project Resources

- Using DIGITS to train a medical image segmentation network
- https://github.com/NVIDIA/DIGITS/tree/master/examples/medical-imaging

Let the course make you feel like eating Grapes!

GRAPE Retention
- **G**rowth
- **R**ecognition
- **A**chievement
- **P**articipation
- **E**njoyment
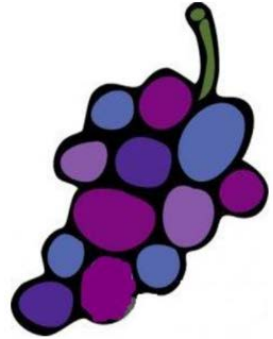
Make you Growth. Make you Recognition.

Make you Achievement. Make you Participation.

Make you Enjoyment.