

## Deep Learning for Healthcare Image Analysis

This workshop teaches you how to apply deep learning to radiology and medical imaging. You'll learn image segmentation, how to train convolutional neural networks (CNNs), and techniques for using radiomics to identify the genomics of a disease.

<b>Duration:</b>	8 hours
<b>Price:</b>	\$10,000 for groups of up to 20 (price increase for larger groups). During the workshop, each participant will have dedicated access to a fully configured, GPU-accelerated workstation in the cloud.
<b>Assessment type:</b>	Code-based
<b>Certificate:</b>	Upon successful completion of the assessment, participants will receive an NVIDIA DLI certificate to recognize their subject matter competency and support professional career growth.
<b>Prerequisites:</b>	Basic familiarity with deep neural networks; basic coding experience in Python or a similar language
<b>Languages:</b>	English, Japanese
<b>Tools, libraries, and frameworks:</b>	Caffe, NVIDIA DIGITS, R, MXNet, TensorFlow
<b>Collaborators:</b>	Mayo Clinic

### Learning Objectives

At the conclusion of the workshop, you'll understand how to use deep learning in healthcare image analysis and be able to:

- > Train CNNs to infer the volume of the left ventricle of the human heart from time-series MRI data
- > Perform image segmentation on MRI images to determine the location of the left ventricle
- > Use CNNs to detect heart disease and calculate ejection fractions by measuring the differences between diastole and systole
- > Apply CNNs to MRI scans of low-grade gliomas (LGGs) to determine 1p/19q chromosome co-deletion status

### Why Deep Learning Institute Hands-On Training?

- > Learn to build deep learning and accelerated computing applications for industries such as autonomous vehicles, finance, game development, healthcare, robotics, and more.
- > Obtain hands-on experience with the most widely used, industry-standard software, tools, and frameworks.
- > Gain real-world expertise through content designed in collaboration with industry leaders such as the Children's Hospital of Los Angeles, Mayo Clinic, and PwC.
- > Earn an NVIDIA DLI certificate to demonstrate your subject matter competency and support career growth.
- > Access content anywhere, anytime with a fully configured GPU-accelerated workstation in the cloud.

## Workshop Outline

TOPIC	DESCRIPTION
<b>Introduction</b> (15 mins)	<ul style="list-style-type: none"> <li>&gt; Meet the instructor.</li> <li>&gt; Create an account at <a href="https://courses.nvidia.com/join">courses.nvidia.com/join</a></li> </ul>
<b>Image Segmentation</b> (120 mins)	<p><b>Learn techniques for placing each pixel of an image into a specific class:</b></p> <ul style="list-style-type: none"> <li>&gt; Extend Caffe with custom Python layers.</li> <li>&gt; Implement the process of transfer learning.</li> <li>&gt; Create fully convolutional neural networks from popular image classification networks.</li> </ul>
<b>Break</b> (60 mins)	
<b>Image Analysis</b> (120 mins)	<p><b>Leverage CNNs for medical image analysis to infer patient status from non-visible images:</b></p> <ul style="list-style-type: none"> <li>&gt; Extend a canonical 2D CNN to more complex data.</li> <li>&gt; Use the framework MXNet through the standard Python API and R.</li> <li>&gt; Process high-dimensional imagery that may be volumetric and temporal.</li> </ul>
<b>Break</b> (15 mins)	
<b>Image Classification with TensorFlow</b> (120 mins)	<p><b>Learn about deep learning techniques for detecting imaging genomics (radiomics) from MRIs:</b></p> <ul style="list-style-type: none"> <li>&gt; Design and train CNNs.</li> <li>&gt; Use radiomics to create biomarkers that identify the genomics of a disease without the use of an invasive biopsy.</li> <li>&gt; Explore the radiogenomics work being done at the Mayo Clinic, which has led to more effective treatments and better health outcomes for patients with brain tumors.</li> </ul>
<b>Final Review</b> (15 mins)	<ul style="list-style-type: none"> <li>&gt; Review key learnings and wrap up questions.</li> <li>&gt; Complete the assessment to earn a certificate.</li> <li>&gt; Take the workshop survey.</li> </ul>