AI for Healthcare Syllabus

Contact Info

While going through the program, if you have questions about anything, you can reach us at support@udacity.com. For help from Udacity Mentors and your peers visit the Udacity Classroom.

Nanodegree Program Info

Learn to build, evaluate, and integrate predictive models that have the power to transform patient outcomes. Begin by classifying and segmenting 2D and 3D medical images to augment diagnosis and then move on to modeling patient outcomes with electronic health records to optimize clinical trial testing decisions. Finally, build an algorithm that uses data collected from wearable devices to estimate the wearer's pulse rate in the presence of motion.

Prerequisite Skills

A well-prepared learner is able to:

- Read, understand, and write code in Python, including language constructs such as functions and classes.
- Read code using vectorized operations with the NumPy library.
- Build a machine learning model for a supervised learning problem and understand basic methods to represent categorical and numerical features as inputs for this model.
- Perform simple machine learning tasks, such as classification and regression, from a set of features.
- Apply basic knowledge of Python data and machine learning frameworks (Pandas, NumPy, TensorFlow, PyTorch) to manipulate and clean data for consumption by different estimators/algorithms (e.g. CNNs, RNNs, tree-based models).

Version: 1.0.0

Length of Program: 85 Days*

** This is a self-paced program and the length is an estimation of total hours the average student may take to complete all required coursework, including lecture and project time. Actual hours may vary.*

Part 1: Welcome to the AI for Healthcare Nanodegree Program

Part 2: Applying AI to 2D Medical Imaging Data

Project: Pneumonia Detection From Chest X-Rays

Supporting Lessons

Lesson	Summary
Introduction to AI for 2D Medical Imaging	In this lesson, you will be given an introduction to this course about AI for 2D medical imaging, why AI is important and where AI fits in the space.
Clinical Foundations of 2D Medical Imaging	In this lesson, we will cover clinical foundations such as clinical workflows, applications of 2D imaging in clinical settings and how machine learning impacts clinics.
2D Medical Imaging Exploratory Data Analysis	In this lesson, we will learn the DICOM standard in medical imaging, and how to explore medical imaging data and prepare it for machine learning applications.
Classification Models of 2D Medical Images	In this lesson, we'll dive deep into classification tasks for 2D medical imaging using different machine learning models. and we will talk about pre-process data, train, test, and validate models.
Translating AI Algorithms for Clinical Settings with the FDA	In this lesson, you will learn about how your work fits into the bigger picture, and how it's regulated by the FDA, which is an often-overlooked, but incredibly important.

Part 3: Applying AI to 3D Medical Imaging Data

Project: Hippocampal Volume Quantification in Alzheimer's Progression

In this project, you will curate a dataset of brain MRIs, train a segmentation on a CNN, and integrate this into a clinical network to quantify hippocampal volume for Alzheimer's progression.

Supporting Lessons

Lesson	Summary
Introduction to AI for 3D Medical Imaging	In this lesson, we will introduce the course and instructors. We will give you an overview of the context for AI in 3D medical imaging space, and cover the objectives of the course.
3D Medical Imaging - Clinical Fundamentals	In this lesson, we cover the basic terminology and concepts related to 3D medical imaging. We will look at the problem space from a clinical standpoint and learn how CT and MR scanners produce images.
3D Imaging Exploratory Data Analysis	In this lesson, we will dive deeper into medical imaging formats NIFTI and DICOM, how scanner data is represented, and how to read medical volumes stored in these files and analyze them.
3D Medical Imaging - End-to-End Deep Learning Applications	In this lesson, we cover the basics of building deep neural networks for 3D medical imaging (mostly segmentation & classification) and performance evaluation from a software and clinical perspective.
Deploying AI Algorithms in Real World Scenarios	In this lesson, we'll talk about clinical networks, architecture, and AI deployment, tools and their use by data scientists and clinicians, as well as medical device regulation and data privacy.

Part 4: Applying AI to EHR Data

Project: Patient Selection for Diabetes Drug Testing

In this project students will use what they learn in the classroom to apply AI in healthcare for patient data.

Supporting Lessons

Lesson	Summary
Applying AI to EHR Data Introduction	Introduction to the EHR Data course and the instructor.
EHR Data Security and Analysis	Learn about the importance of data security and the different standards that apply to EHR. Also, learn about analyzing EHR data.
EHR Code Sets	In this lesson you will learn how to work with different EHR codes and how to map them properly to records.
EHR Transformations & Feature Engineering	In this lesson, you'll gain skills in feature engineering and transformation of EHR.
Building, Evaluating and Interpreting Models	In this final lesson, you'll be putting all of your skills together to build, evaluate and interpret ML models for Bias and Uncertainty.

Part 5: Applying AI to Wearable Device Data

Project: Motion Compensated Pulse Rate Estimation

In this project, you will create a pulse rate algorithm that takes into account activity and apply this algorithm to a new data set to determine clinically significant features.

Supporting Lessons

Lesson	Summary
Introduction to Wearable Data	We'll cover what wearables are and the scope of the class. Learn who your instructor is and his thoughts on the promise and caveats of wearables in medical research and decision making.
Intro to Digital Sampling & Signal Processing	A brief tour through sampling theory, signal processing, the Fourier transform, and other related topics. We'll briefly cover some plotting and visualization techniques here as well.
Introduction to Sensors	We cover the basics of the accelerometer, the PPG sensor, and the ECG sensor, as well as what these signals look like in typical environments and the types of noise that we will encounter.
Activity Classification	Build an activity classifier using a wrist-worn accelerometer!
ECG Signal Processing	We deep dive into a fundamental algorithm for ECG processing and use that as the basis for an arrhythmia detection algorithm.

Project: Improve Your LinkedIn Profile

Find your next job or connect with industry peers on LinkedIn. Ensure your profile attracts relevant leads that will grow your professional network.

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