

Lesson Title	Adapt MNIST
Sequence	5 of 6
Duration	<ul style="list-style-type: none"> ● 1 - 45 minute class to create, scan, and resize data set ● 2 - 45 minute classes to organize data and run code
Materials	<ul style="list-style-type: none"> ● Tensorflow environment ● Marker ● Plain Paper ● Scanner (or Scanner App)
Objectives	Students will create an MNIST data set, organize their data samples, and train a neural network with their own handwriting using provided code. Students will adapt the template code to meet a different need of their choice.
Standards	<p>Indiana</p> <ul style="list-style-type: none"> ● CSII-1.5 Modify an existing program, such as a template, to add additional functionality and discuss intended and unintended implications. ● CSII-2.4 Analyze the work of peers and provide feedback <p>ITEEA</p> <ul style="list-style-type: none"> ● 10 Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. ● 11 Students will develop the abilities to apply the design process <p>CSTA</p> <ul style="list-style-type: none"> ● 3A-AP-13 Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests. (P5.2) ● 3A-AP-18 Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs. (P5.2) ● 3A-AP-23 Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs. (P7.2)

Lesson Notes:

This lesson is accomplished through two different parts. In the first part, students generate their own data set from their handwriting samples. Initially, this will feature three digits. After the students write their digits and scan them, they will need to resize the images and organize them in a file structure. This can be quite challenging for students to keep straight. It is important that they double check to ensure all of their data is labeled correctly. Then, they will train the network using their own handwriting samples and the provided code. In part two, students will adapt their model to serve a new purpose. Some expected student choices might included adding a class of digits to the data set and modifying the code appropriately or changing the digits being classified to shapes. The goal is that they critically examine the provided code, modify it to engage their changes, and troubleshoot the new errors they have introduced.

Assessment: This task will be assessed for documentation of the design process, clear communication, network performance, and timeliness.

Part I: Create your own MNIST

Follow the [lab instructions](#) to create your own MNIST data set. Be very careful with how you set up your file system. When you have successfully run this script with your own data, demonstrate your output.

Part II: Adapt MNIST

Using the understanding you developed through the video tutorials and while creating your own MNIST, adapt your model to meet a different purpose. This might include adding classes or changing the data inputs. *I recommend copying your files from Part I, stripping the test and validate data files that were created by the build_python script and making changes here. Otherwise, you lose your working copy of the script and troubleshooting will be more cumbersome.*