Course Description:

We live in a world of digital photos. In this course students, will work with digital images, understand their components and transform them using MATLAB to make their own digital story.

Students will learn the basics of programming while they edit images, build GIFs and create filters used in popular apps like Instagram and SnapChat! No prior knowledge of programming is required.

Learning Goals:

At the end of each day students will be able to:

Day 1
- Identify that an image is stored in a computer as a collection of pixels. - Create any color using combinations of Red, Green and Blue. - Explain that programming is using keywords and syntax to communicate with a computer. - Open MATLAB and navigate the interface. - Create variables and perform basic operations. - Create and index vectors and matrices. - Identify the relationship between and image (real world) and a matrix (digital world).
Day 2
- Import and visualize images in MATLAB - Identify the different formats of images – jpg, png, tif, etc - Use MATLAB functions on images - Create MATLAB scripts - Add matrices to apply color filters to images (Instagram)   Create bigger images by concatenating matrices
Day 3
- Create complex color filters by combining matrix addition and concatenation - Read text from and write text to images - Complete Treasure Hunt by applying concepts learned in the course so far
Day 4
- Apply masks to faces on images - Create custom masks from images - Create collages using several images
Day 5
- Use for-loops to create motion pictures from image frames - Apply all the concepts learnt so far to create their personal artwork

Course Overview:

The course is designed to have approximately 4 hours of programming each day, for a total of 20 hours.

Day 1	Day 2	Day 3	Day 4	Day 5
Ice Breaker	Review concepts from Day 1	Review concepts from Day 2	Review concepts from Day 3	Review concepts from Day 4
Great Demo	Create character arrays	Creating complex color filters in MATLAB	Set up for the day	Creating video montage and flipbooks
Many pixels make an image	Import and visualize image	Recognizing text in images	Applying masks to faces in images	Showcase Preparation
Pixels have RGB Colors	Performing basic operations on images	Writing text on images	Apply custom masks on images	Showcase
RGB Color Range	Applying Special Effects to Images	Enciphering and deciphering text in MATLAB *(optional)*	Applying Masks using Face Detection *(optional)*	
Exploring Color Illusion	Applying Color Filters to Images	Treasure Hunt	Creating custom collages	
What is Programming	Using Concatenation to solve block puzzles			
Using MATLAB as a Calculator				
Creating Numeric Variables and Variable Assignments				
Creating and Indexing Vectors and Matrices				
Playing Word Search				
Combining Images and Matrices				

Educational Standards:

NGSS:

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

ISTE:

1. Creativity and Innovation:

a. Apply existing knowledge to generate new ideas, products, or processes.
b. Create original works as a means of personal or group expression.
4. Critical thinking, problem solving, and decision making:
a. Identify and define authentic problems and significant questions for investigation.
b. Plan and manage activities to develop a solution or complete a project.
c. Collect and analyze data to identify solutions and/or make informed decisions.
d. Use multiple processes and diverse perspectives to explore alternative solutions.

CSTA:

Computational Thinking

1. Use the basic steps in algorithmic problem-solving to design solutions (e.g., problem statement and exploration, examination of sample instances, design, implementing a solution, testing, evaluation).

Computing Practice & Programming

5. Implement problem solutions using a programming language, including: looping, behavior, conditional statements, logic, expressions, variables, and functions.

8. Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).

Course materials updated - December 2017