Integrating Computer Vision in AP Computer Science Principles at Apopka High School

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UCF Center for Research in Computer Vision

Apopka High School Blue Darters

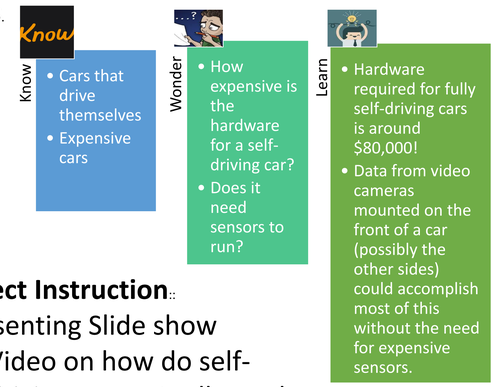


Autonomous Car Lesson Plan

Day 1

Overview: Students should be able to start to identify where computer vision and artificial intelligence meet by researching self-driving cars, and being able to describe the attributes found.

Bell work: Students will fill in the first two sections on an online interactive KWL chart. Students will share one fact about what they know on self-driving cars and one question on what they will like to know on self-driving cars.



Direct Instruction::
Presenting Slide show

- Video on how do self-driving cars actually work.
- Group Discussion on Self-driving cars



Guided Practice
Worksheet with questions on video

Closure: Students will reflect on one thing that they learned from the lesson and explain how they can speak about it to a friend.

Mission

The primary mission of the project is to enhance the knowledge of computer vision among AP Computer Science Principles students.

Goal

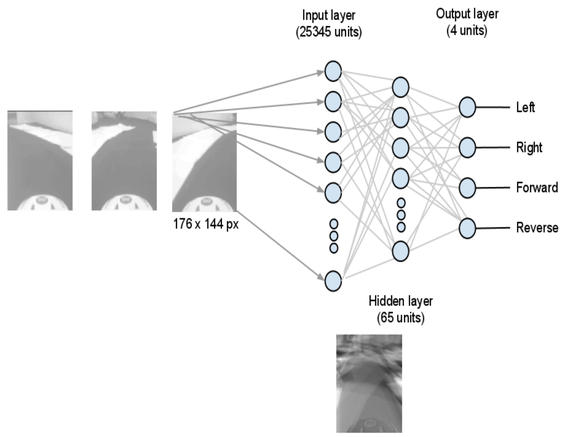
Teach the concept of computer vision in which students:

- Start to identify where computer vision and artificial intelligence meet.
- Identify and define what are neural networks.

Florida State Standards for Computer Science

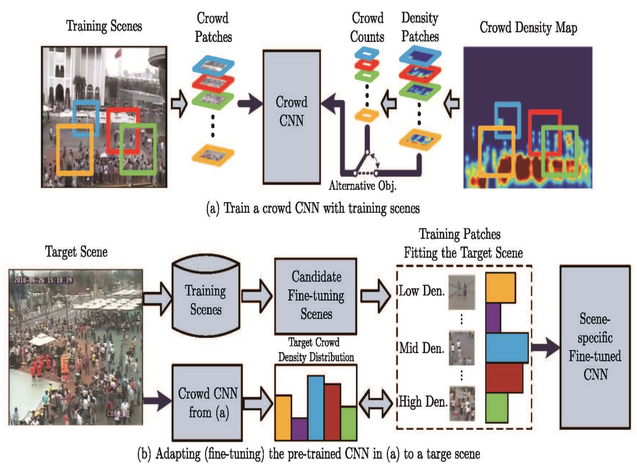
SC.912.CS-CS.6.5: Describe common measurements of machine intelligence.
SC.912.CS-CS.6.6 :Describe a few of the major branches of artificial intelligence.
SC.912.CS-CS.6.7: Describe major applications of artificial intelligence.
SC.912.CS-CS.2.11 :Evaluate algorithms by their efficiency, correctness, and clarity.

How Neural Networks are implemented in an Autonomous Car



The self-driving car has cameras that will be taking pictures and sending those to the on-board neural network. Then based on previous trainings of known objects the neural network will then try to identify and react to relevant data so it can alert the rest of the AI system. Causing the self-driving car to act appropriately.

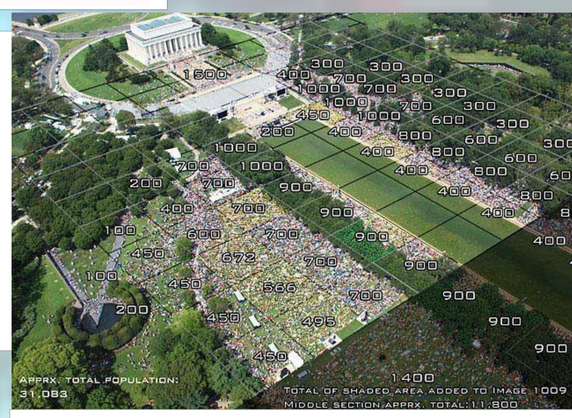
How Neural Networks are implemented in Crowd Counting



The Convolutional Neural Network (CNN) model is trained for crowd scenes by a switchable learning process with two learning objectives to be able to produce crowd density maps and crowd counts.

Acknowledgements

1. Davies, C. (2018). [Photograph]. Retrieved from https://www.slashgear.com/nvidia-halts-autonomous-car-testing-after-fatal-uber-crash-27524737/
2. Singleton, D. (2017). *The Neural Network* [Photograph]. Retrieved from http://blog.davidsingleton.org/nnrccar/
3. Zhang, C., Li, H., Wang, X., & Yang, X. (2015). *CNN in a crowd counting* [Photograph]. Retrieved from http://www.ee.cuhk.edu.hk/~xgwang/expo.html



Crowd Counting Lesson Plan

Day 1

Overview: Students will be able to analyze the concepts of crowd counting and see how it relates to the concept of deep learning within the field of computer vision.

Bell work: Students will be given a picture of a crowd, then they will come up with an algorithm to determine how to count the amount of people in the crowd.



Direct Instruction:
Presenting Slide Show:

- Lecture on the Jacobs method

Independent Practice:

- Take a picture of a crowd (50+).
- Make an infographic design on your findings with picture & steps on how you determined the number of students in the crowd.

Day 2

Bell work:

- Open up your info graphs
- With your partner share the steps that you came up with to get your results.

Direct Instruction:
Direction given to what UCF is accomplishing in the field of computer vision and crowd counting.

Guided Practice:

- Write a pseudo code based on your steps.
- Share with your partner to see if it is accurate.

Closure:
Take the picture you collected and upload it to UCF CS website link