Quadtree

The node of a quadtree store points. (The 3d analog of the quadtree is called the octree.) See my notes on trees. You can also use google to find out more about quadtrees. It's essentially a 4-ary tree. Each node contains points in rectangular region of a 2d space. When the number of points reach a maximum limit, the rectangular region that the node keeps track on is equally divided into 4 smaller rectangles. The points in the original rectangle is now placed into the smaller rectangles. The purpose of doing this is a minimize the number of computations of collisions between objects in a game. If you have 1000 objects moving around in a computer window, then you need to look at roughly (1000^2)/2 = 500000 pairs of objects and see if they collide. If the 1000 are equally distributed into 4 smaller regions, then the collision is between the pairs of objects in each room, which means roughly that there are (250^2)/2 * 4 = 12500 pairs of objects fo analyze.

Although you can use any online material to study the quadtree, you must write your own code, otherwise it will be considered plagiarism.

VERSION 2: Simplified Project

Demo:
https://photos.app.goo.gl/Z5dLy99RLMyg4wET9 (Zach)
https://drive.google.com/file/d/1qjDhGvNlNONMwcqvjkVBgKh0Mq3bsT5s/view?usp=sharing
(Sushil)
https://photos.app.goo.gl/HPZUqzi3hoBubsETA (Karissa)

Write a simulation of 1000 circles in a window. The circles moves and collides with each other. In your simulation, draw the boundary of the region for each node in the quadtree. When a circle collides with another, change it's color. You just need two colors for each circle – toggle the color on collision. You must have a key that changes between collision by pairwise check for all pairs of circles and collision using a quadtree. Choosing collision without quadtree should significantly slow down your simulation. If the number of circles is too small, increase it so that a slow-down is observable.