Final Exam: Take-Home (30 points)
Intersecting Circles

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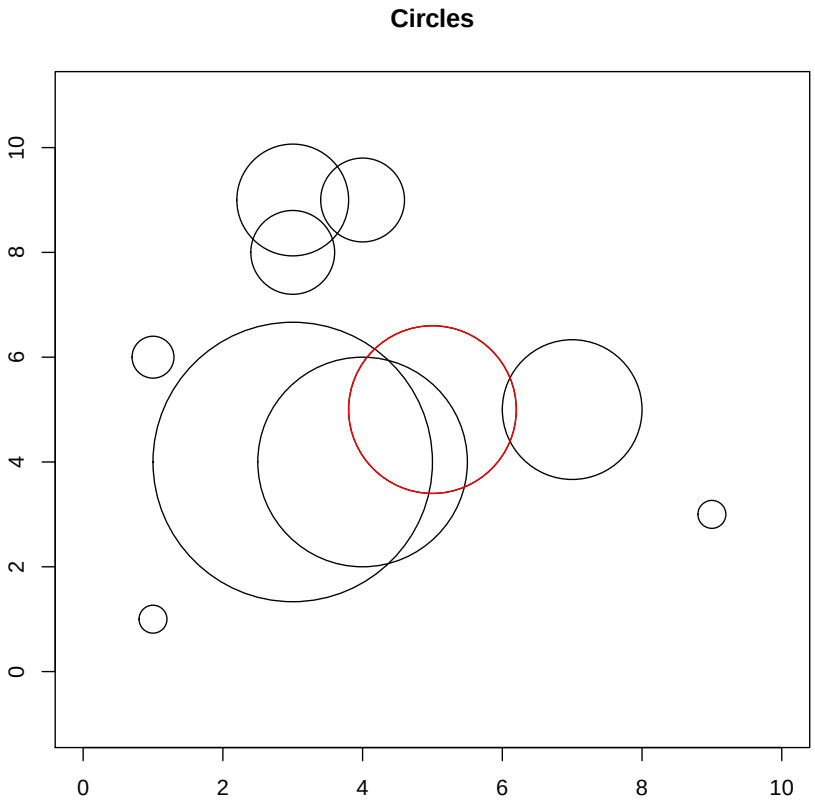
```
circles <- function(theXY, theR){
    maxIndex      <- 1
    intersections <- rep(0, nrow(theXY))
    circle        <- c(1:nrow(theXY))
    numIntersect  <- cbind(circle, intersections)

    # Draw plot and circles
    plot(0:10, 0:10, type = "n", asp = .75, xlab = "",
         ylab = "", main = "Circles")
    for (index in 1:nrow(theXY)) {
        symbols(theXY[index, 1], theXY[index, 2], theR[index],
                inches = F, add = T, fg = "black", xlab = "",
                ylab = "", xlim = c(0, 1.0), ylim = c(0, 1.0))
    }


    # Calculates number of intersections
    distance <- as.matrix(dist(theXY, "euclidean",
                               diag = NA, upper = T))
    for (row in 1:nrow(distance)) {
        for (column in 1:ncol(distance)) {
            if (distance[row, column] == 0) {
                next
            } else if (distance[row, column] <= theR[row] + theR[column]) {
                numIntersect[row, 2] <- numIntersect[row, 2] + 1
            }
        }
    }


    # Determines max number of intersections
    for (index in 1:nrow(numIntersect)) {
        if (numIntersect[index, 2] > numIntersect[maxIndex, 2]) {
            maxIndex <- index
        }
    }
```

```
    # Colors the circle with the most intersections
    symbols(theXY[maxIndex, 1], theXY[maxIndex, 2], theR[maxIndex],
            inches = F, add = T, fg = "red", xlab = "", ylab = "",
                xlim = c(0, 1.0), ylim = c(0, 1.0))


    # Prints results
    print(numIntersect)
    cat("Max number of intersections in circle", maxIndex)
}

myX  <- c(3, 1, 7, 3, 3, 4, 1, 5, 4, 9)
myY  <- c(4, 1, 5, 9, 8, 9, 6, 5, 4, 3)
myXY <- cbind(myX, myY)
myR  <- c(2.0, 0.2, 1.0, 0.8, 0.6, 0.6, 0.3, 1.2, 1.5, 0.2)
circles(myXY, myR)
```



```
##       circle intersections
##  [1,]      1             2
##  [2,]      2             0
##  [3,]      3             1
##  [4,]      4             2
##  [5,]      5             1
##  [6,]      6             1
##  [7,]      7             0
##  [8,]      8             3
##  [9,]      9             2
## [10,]     10             0
## Max number of intersections in circle 8
```