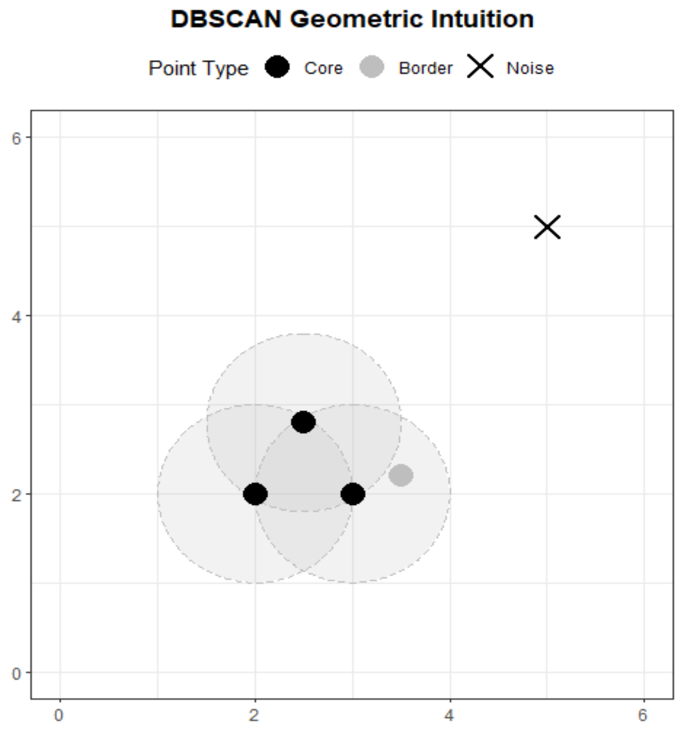
DBSCAN

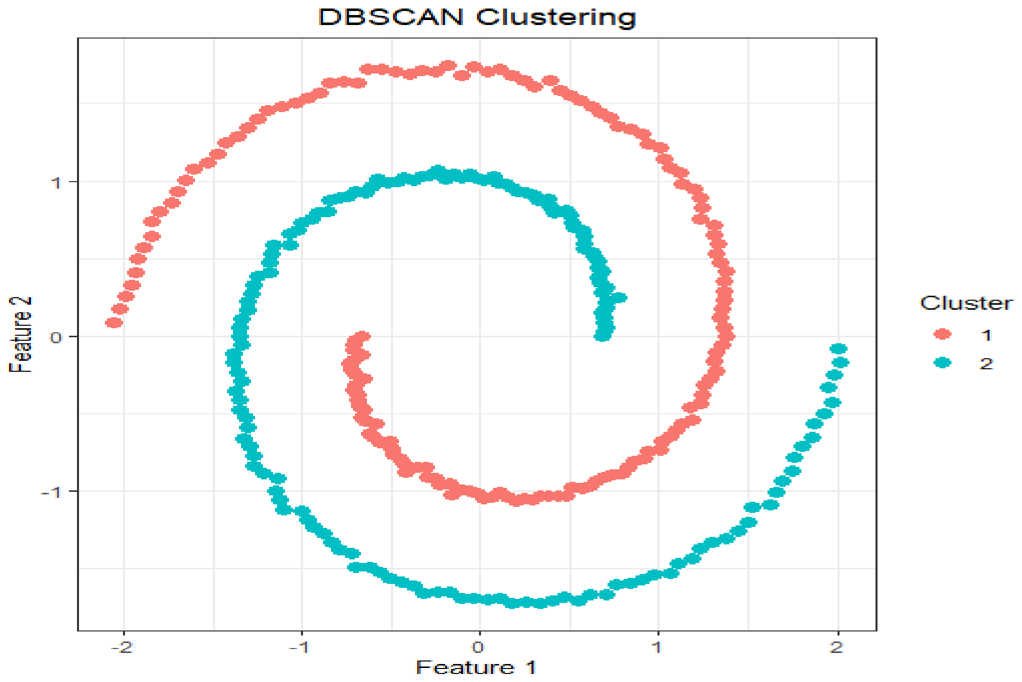
```
library(ggplot2)
library(ggforce)

# --- Step 2: Define the data points and parameters ---
# Combine all points into a single data frame with a 'type' column.
points_df <- data.frame(
  x = c(2, 3, 2.5, 3.5, 5),
  y = c(2, 2, 2.8, 2.2, 5),
  type = factor(c("Core", "Core", "Core", "Border", "Noise"),
                levels = c("Core", "Border", "Noise"))
)

# Define epsilon and create a data frame for the core point circles
epsilon <- 1.0
core_points_circles <- data.frame(
  x0 = c(2, 3, 2.5),
  y0 = c(2, 2, 2.8),
  r = epsilon
)

# --- Step 3: Create the plot using ggplot2 ---
ggplot() +
  # Draw the epsilon circles for core points
  geom_circle(
    data = core_points_circles,
    aes(x0 = x0, y0 = y0, r = r),
    color = "gray",
    fill = "gray",
    alpha = 0.2,
    linetype = "dashed"
  ) +

  # Draw the data points
  geom_point(
    data = points_df,
    aes(x = x, y = y, shape = type, color = type),
    size = 5,
    stroke = 1.5 # Makes shapes like 'x' thicker
  ) +

  # --- Step 4: Customize the plot's appearance ---
  # Set custom colors and shapes to match the Python plot
  scale_color_manual(values = c(Core = "black", Border = "gray", Noise = "black")) +
  scale_shape_manual(values = c(Core = 16, Border = 16, Noise = 4)) + # 16 is a solid circle,
4 is an 'x'
```

```
# Set axis limits and ensure aspect ratio is equal so circles are not distorted
coord_fixed(xlim = c(0, 6), ylim = c(0, 6)) +

# Add titles and labels
labs(
  title = "DBSCAN Geometric Intuition",
  x = NULL, y = NULL, color = "Point Type", shape = "Point Type"
) +

# Apply a clean theme and add a grid
theme_bw() +
theme(
  plot.title = element_text(hjust = 0.5, face = "bold"),
  legend.position = "top"
)
```



```
library(mlbench)
library(dbscan)
library(ggplot2)


set.seed(42)
moons_data <- mlbench.spirals(n = 300, cycles = 1, sd = 0.01)
```

```
X <- moons_data$x

# Standardize the Data ---

X_scaled <- scale(X)

#Apply DBSCAN Algorithm ---

# - eps = 0.3: Defines the radius of the neighborhood.
# - minPts = 5: The minimum number of points required for a core point.
dbscan_result <- dbscan(X_scaled, eps = 0.3, minPts = 5)


# First, create a data frame for plotting.
plot_data <- data.frame(
Feature1 = X_scaled[, 1],
Feature2 = X_scaled[, 2],
Cluster = as.factor(dbscan_result$cluster) # Convert cluster numbers to a factor for coloring
)

# Create the plot
ggplot(plot_data, aes(x = Feature1, y = Feature2, color = Cluster)) +
geom_point(size = 3) +
labs(
title = "DBSCAN Clustering",
x = "Feature 1",
y = "Feature 2",
color = "Cluster"
) +
theme_bw() + # A clean black and white theme

theme(plot.title = element_text(hjust = 0.5)) # Center the plot title
```


DBSCAN Clustering
Feature 2
Feature 1
Cluster
● 1
● 2