DIANA(Divisive analysis)

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Import Data

```
data <- read_excel("~/ANALISIS MULTIVARIAT/data uas anmul.xlsx")
head(data)
```

```
## # A tibble: 6 x 6
##   Provinsi           IPM `Umur Harapan Hidup` `Harapan Lama Sekolah`
##   <chr>            <dbl>                <dbl>                  <dbl>
## 1 ACEH              74.0                 70.4                   14.4
## 2 SUMATERA UTARA    74.0                 70.3                   13.5
## 3 SUMATERA BARAT    74.5                 70.3                   14.3
## 4 RIAU              74.8                 72.5                   13.4
## 5 JAMBI             73.4                 72.0                   13.1
## 6 SUMATERA SELATAN  72.3                 70.9                   12.6
## # i 2 more variables: `Rata-rata Lama Sekolah` <dbl>,
## #   `Pengeluaran per Kapita` <dbl>
```

Cek Data Kosong (Missing Values)

```
print(colSums(is.na(data)))
```

```
##               Provinsi                    IPM     Umur Harapan Hidup
##                      0                      0                      0
##   Harapan Lama Sekolah Rata-rata Lama Sekolah Pengeluaran per Kapita
##                      0                      0                      0
```

Cek Data Duplikat

```
cat("\nJumlah baris duplikat:", sum(duplicated(data)))
```

```
##
## Jumlah baris duplikat: 0
```

Pilih Variabel Numerik

```
data_num <- data[, c("IPM","Umur Harapan Hidup","Harapan Lama Sekolah","Rata-rata Lama Sekolah","Pengelu
```

Standardisasi Data

```
data_scaled <- scale(data_num)
head(data_scaled)
```

```
##              IPM Umur Harapan Hidup Harapan Lama Sekolah Rata-rata Lama Sekolah
## [1,]  0.31873916        -0.02829145           1.15520328               0.6504944
## [2,]  0.31679750        -0.08950570           0.27431248               0.8866871
## [3,]  0.40805562        -0.07037624           1.06711420               0.4876029
## [4,]  0.46630548         0.76749372           0.20579876               0.4794583
## [5,]  0.20223944         0.58385099          -0.06825616               0.0477958
## [6,] -0.01716838         0.15917717          -0.55763993              -0.2209752
##      Pengeluaran per Kapita
## [1,]             -0.31702435
## [2,]             -0.05357270
## [3,]              0.05115846
## [4,]              0.10758339
## [5,]              0.01178279
## [6,]              0.17172108
```

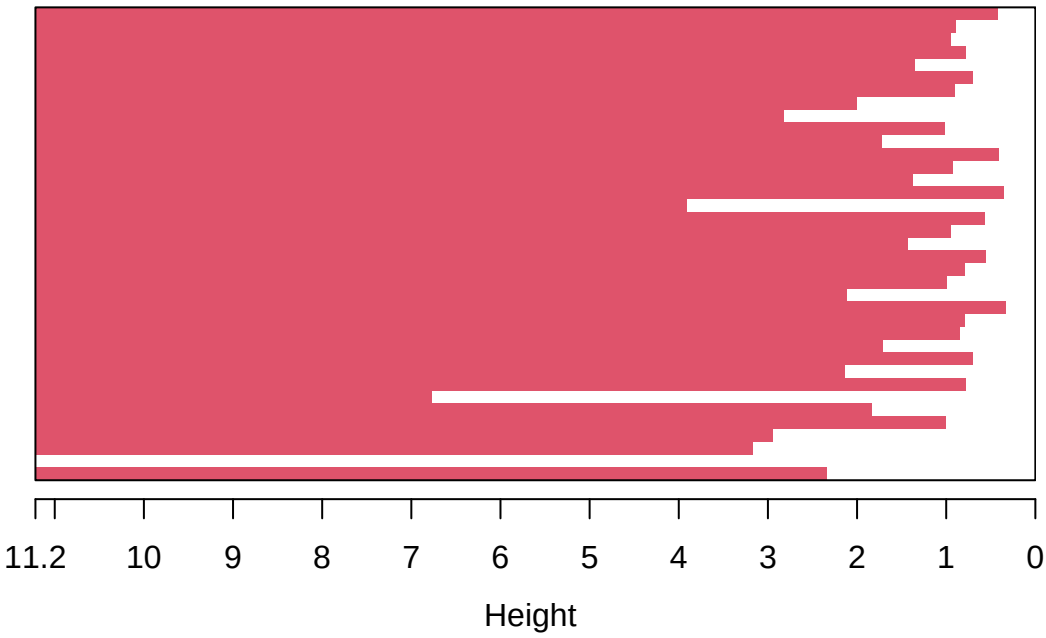
DIANA (Divisive analysis)

```
diana_result <- diana(data_scaled)
```

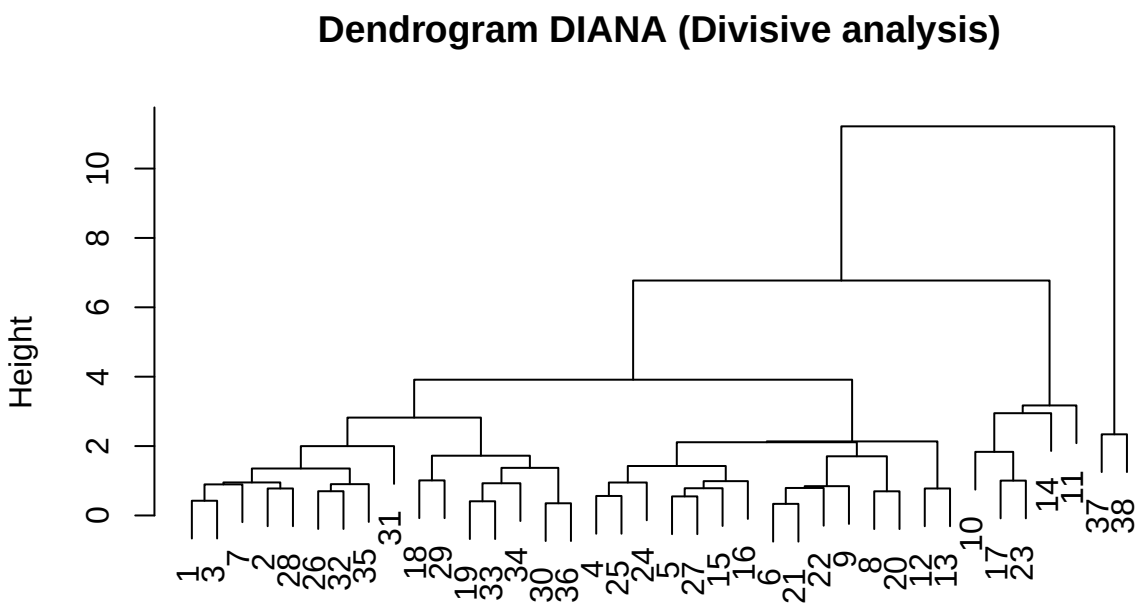
Plot Dendrogram

```
plot(diana_result, main="Dendrogram DIANA (Divisive analysis)")
```

Dendrogram DIANA (Divisive analysis)



Divisive Coefficient = 0.91



Pemotongan Cluster

```
clusters <- cutree(as.hclust(diana_result), k=3)
data$Cluster <- clusters
head(data)
```

```
##           Provinsi   IPM Umur Harapan Hidup Harapan Lama Sekolah
## 1             ACEH 74.03              70.44                14.39
## 2   SUMATERA UTARA 74.02              70.28                13.49
## 3   SUMATERA BARAT 74.49              70.33                14.30
## 4             RIAU 74.79              72.52                13.42
## 5            JAMBI 73.43              72.04                13.14
## 6 SUMATERA SELATAN 72.30              70.93                12.64
##   Rata-rata Lama Sekolah Pengeluaran per Kapita Cluster
## 1                   9.64                   10811       1
## 2                   9.93                   11460       1
## 3                   9.44                   11718       1
## 4                   9.43                   11857       1
## 5                   8.90                   11621       1
## 6                   8.57                   12015       1
```

```r
cat("\n=== PROFIL CLUSTER (Mean Tiap Variabel per Cluster) ===\n")
```

```
##
## === PROFIL CLUSTER (Mean Tiap Variabel per Cluster) ===
```

```r
cluster_profile <- aggregate(data_num, by = list(Cluster = clusters), FUN = mean)
print(cluster_profile)
```

```
##   Cluster      IPM Umur Harapan Hidup Harapan Lama Sekolah
## 1       1 72.20645           70.29323             13.29806
## 2       2 79.83800           73.73000             14.02600
## 3       3 56.58500           65.89500              9.80000
##   Rata-rata Lama Sekolah Pengeluaran per Kapita
## 1               8.844194               11205.77
## 2              10.294000               15920.00
## 3               5.165000                6758.00
```

CLUSTER VALIDATION (Silhouette Score)

```r
cat("\n=== CLUSTER VALIDATION (Silhouette Score, k = 3) ===\n")
```

```
##
## === CLUSTER VALIDATION (Silhouette Score, k = 3) ===
```

```r
dist_eu <- dist(data_scaled, method = "euclidean")
sil_eu <- silhouette(clusters, dist_eu)
cat("\nSilhouete(Euclidean):", mean(sil_eu[, 3]), "\n")
```

```
##
## Silhouete(Euclidean): 0.4640621
```

```r
dist_ma <- dist(data_scaled, method = "manhattan")
sil_ma <- silhouette(clusters, dist_ma)
cat("Silhouette(Manhattan):", mean(sil_ma[, 3]), "\n")
```

```
## Silhouette(Manhattan): 0.4862954
```

```r
dist_ca <- dist(data_scaled, method = "canberra")
sil_ca <- silhouette(clusters, dist_ca)
cat("Silhouette(Canberra):", mean(sil_ca[, 3]), "\n")
```

```
## Silhouette(Canberra): 0.06328778
```

SIMPAN HASIL FINAL DALAM CSV

```r
write.csv(data, "hasil_cluster_diana.csv", row.names = FALSE)
cat("\nFile 'hasil_cluster_diana.csv' berhasil disimpan.\n")
```

```
##
## File 'hasil_cluster_diana.csv' berhasil disimpan.
```