

Visualization Project

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Project#1

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Problem Statement

The project aims to find the clustering in decision space and objective space and to identify the mapping between the decision and objective space.

Used techniques:

1. Radviz
2. Dendogram
3. Clustermaps
4. Parallel Coordinates Plot
5. Pairwise Scatter plots

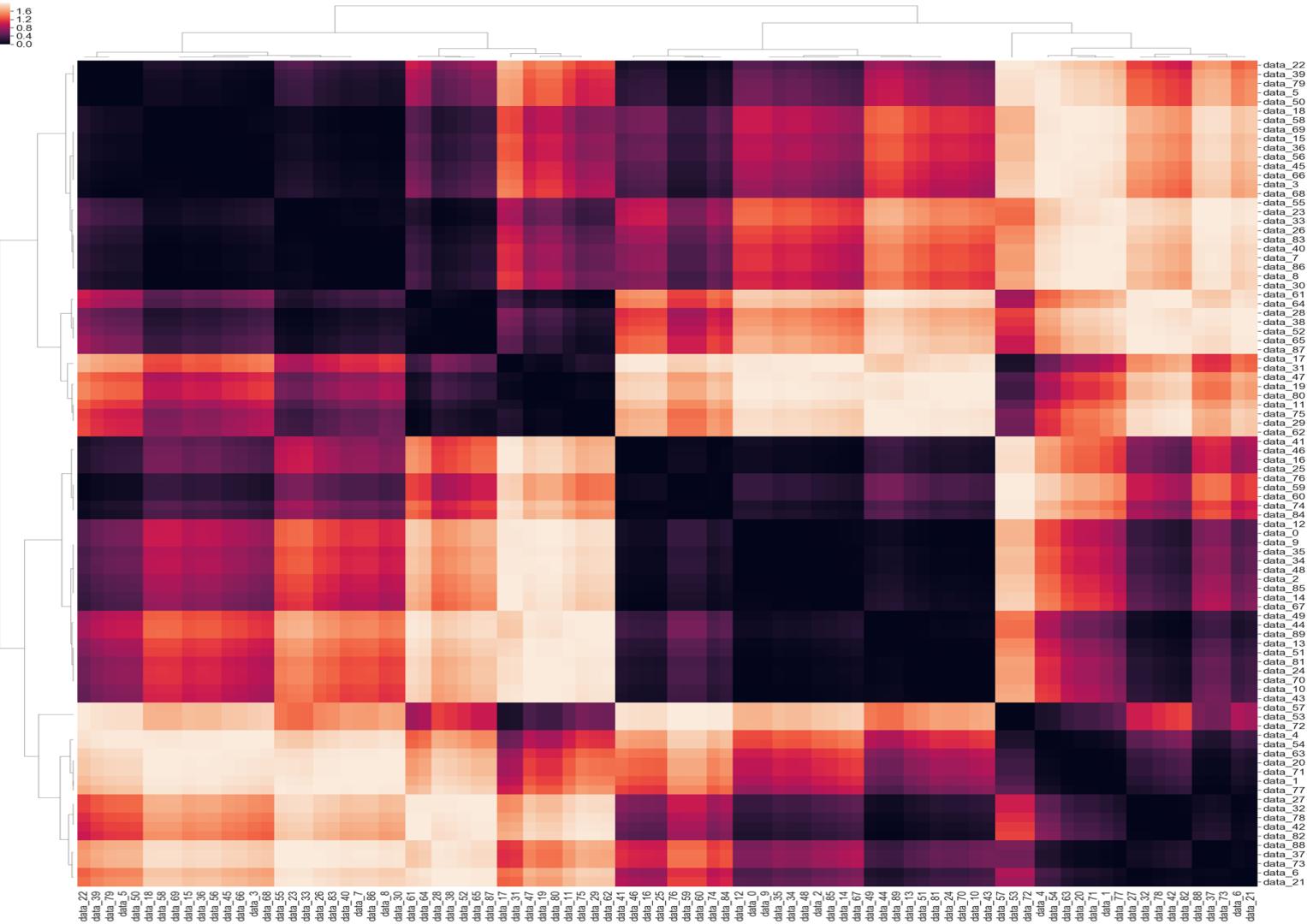


1.DTLZ2

No of Objective =3

Visualizing the
Decision space

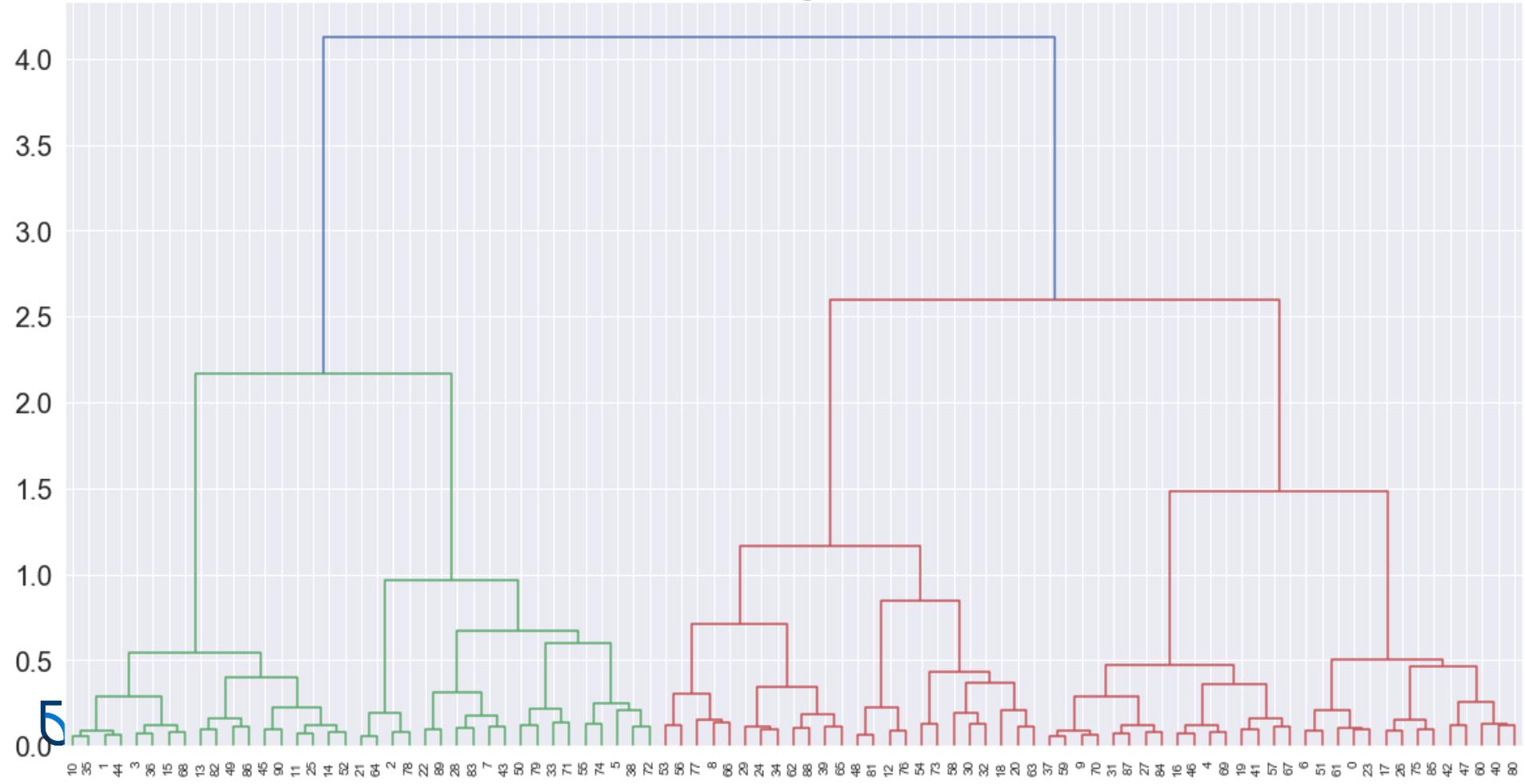
Figure 1a: Clustermap



Visualizing the Decision space

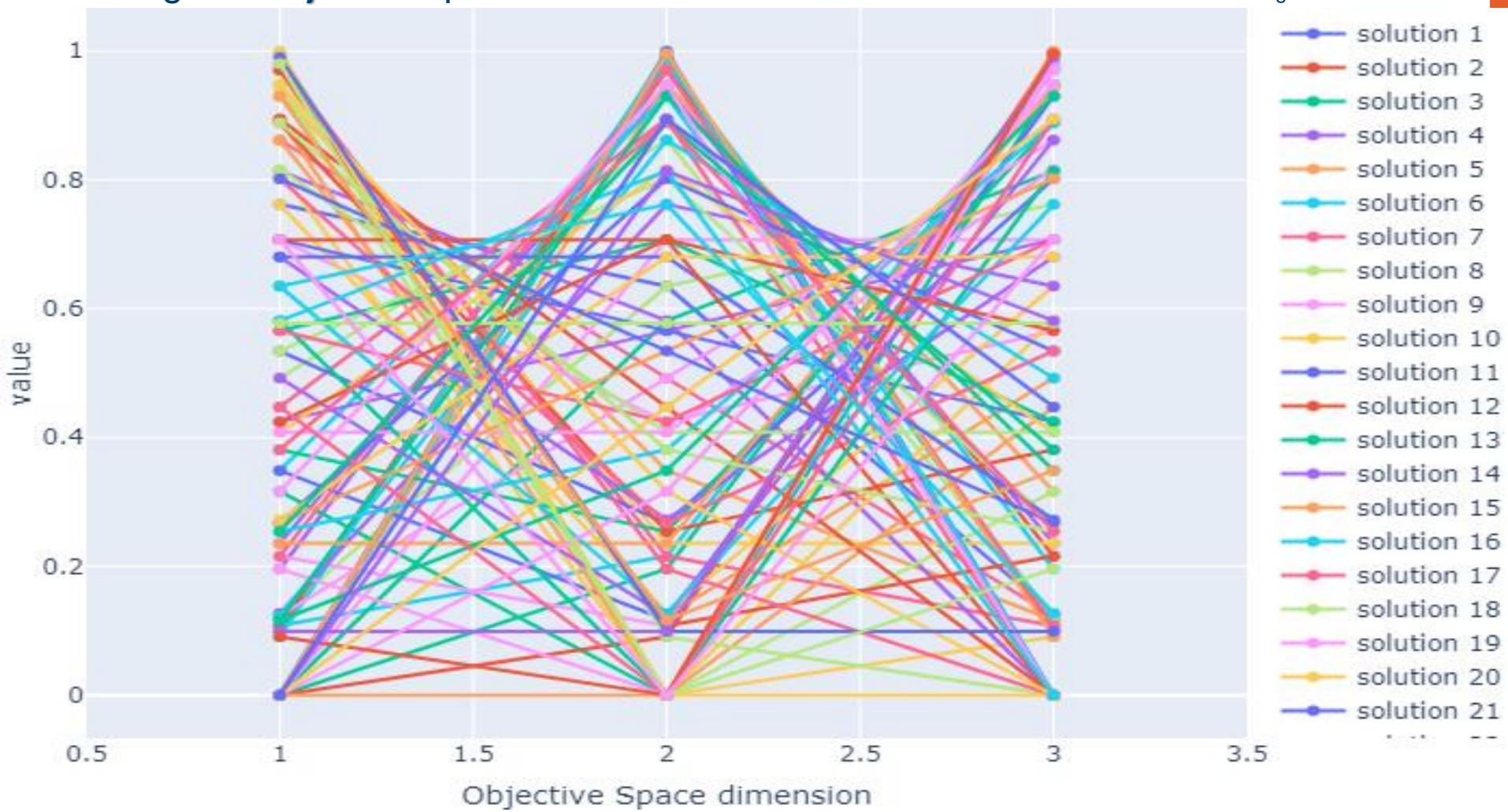
Dendograms

Figure 1b: Dendogram



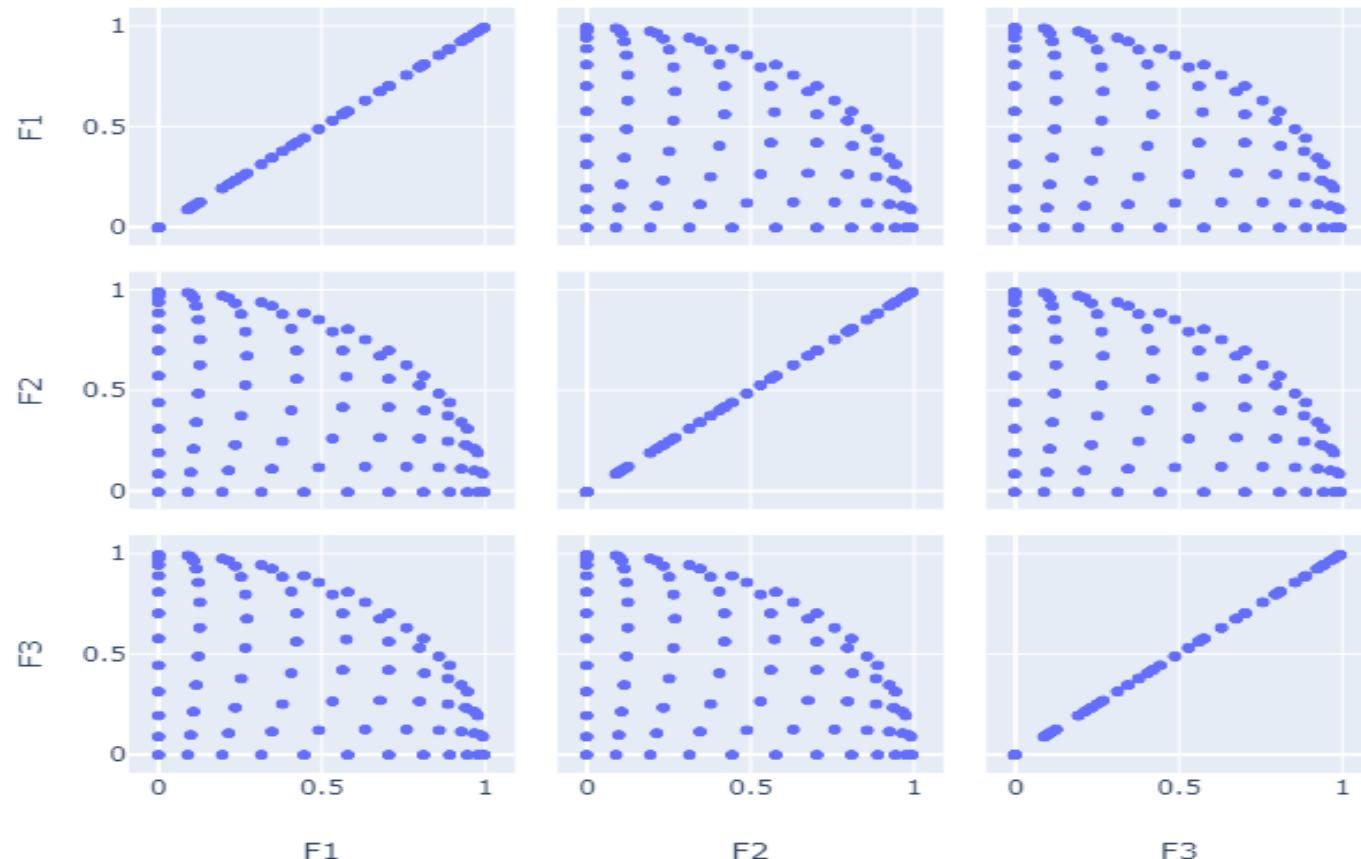
Visualizing the Objective space

Figure 1c: PCP



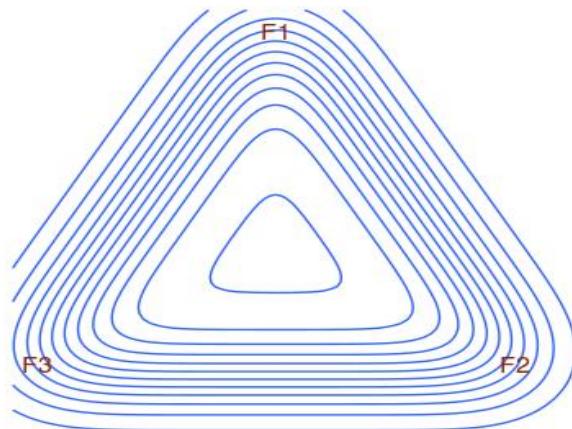
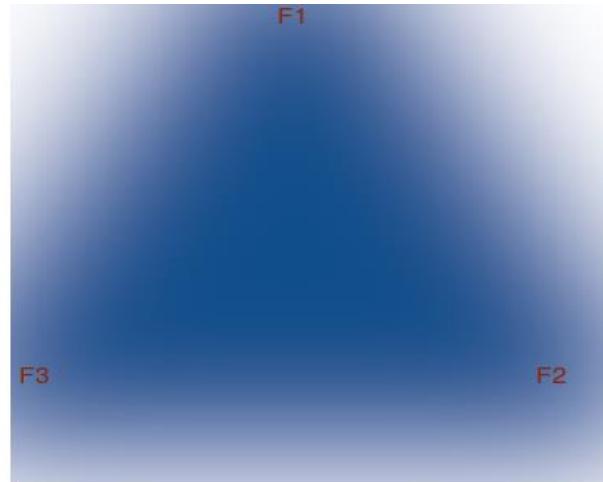
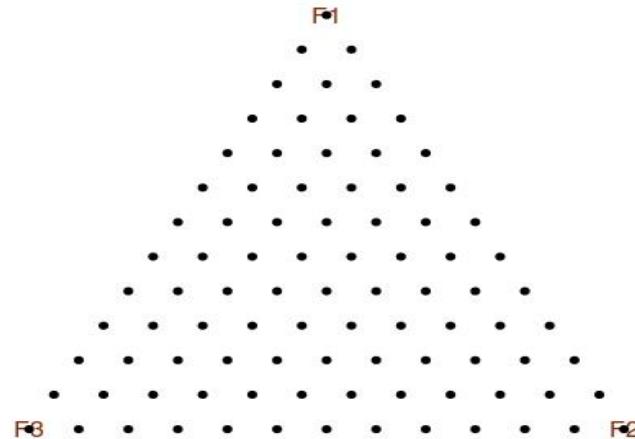
Visualizing the Objective space

Figure 1d: PSP



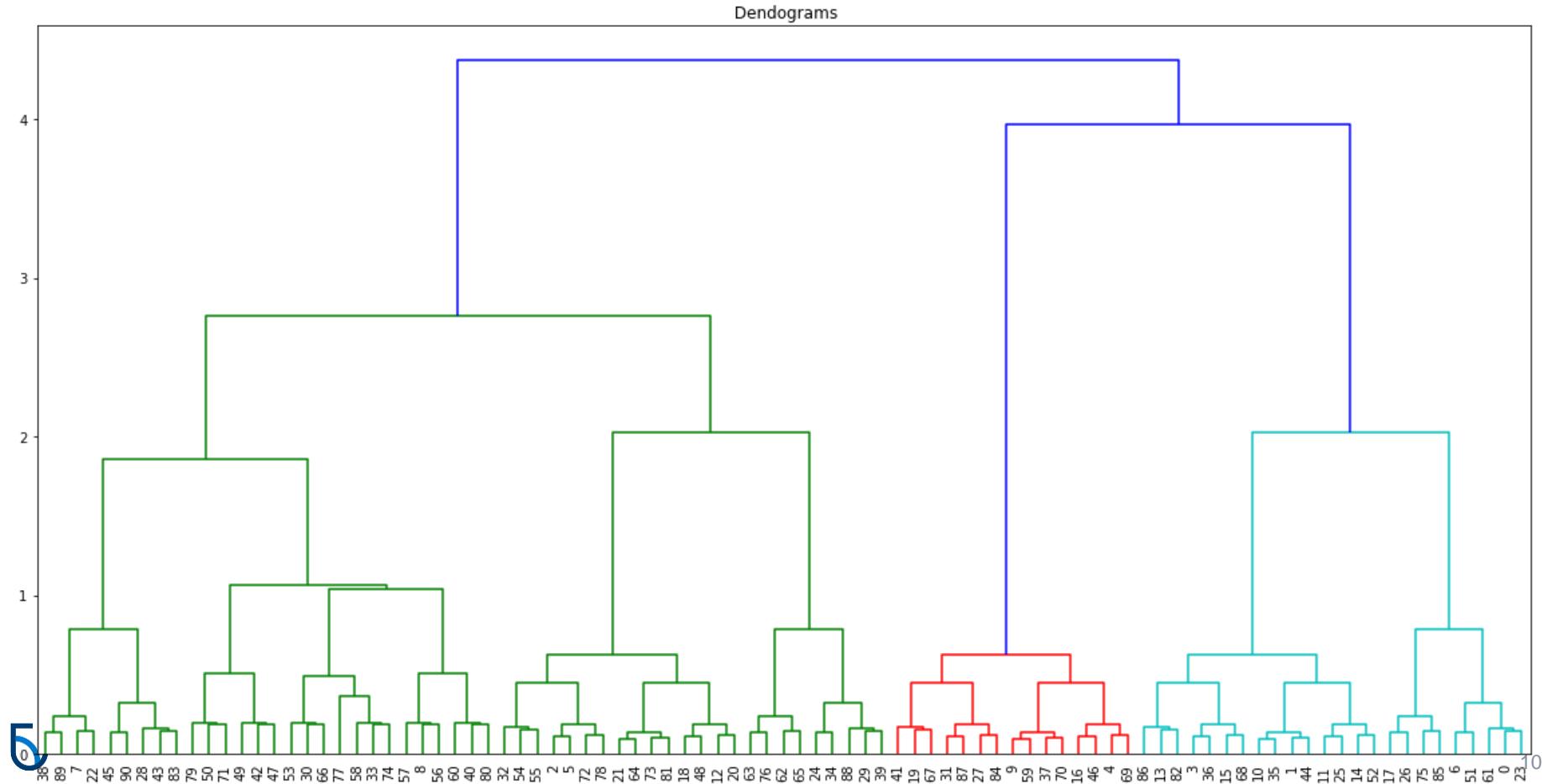
Visualizing the Objective space

Figure 1e: Radvis and contour plot



Visualizing the Objective space

Figure 1f: Dendogram

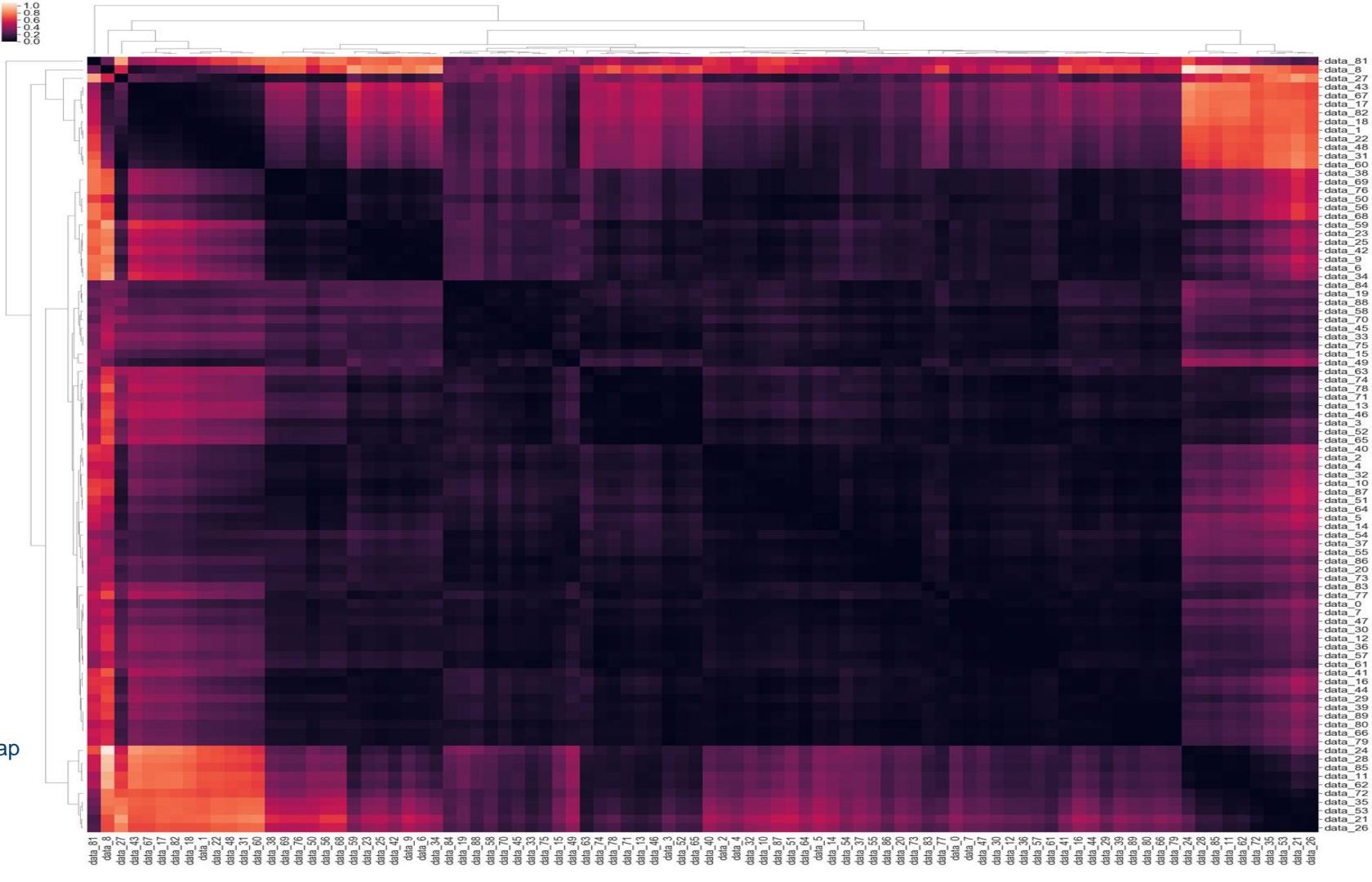


2.MaF3

• No of
Objective =3

Visualizing
the
Decision
space

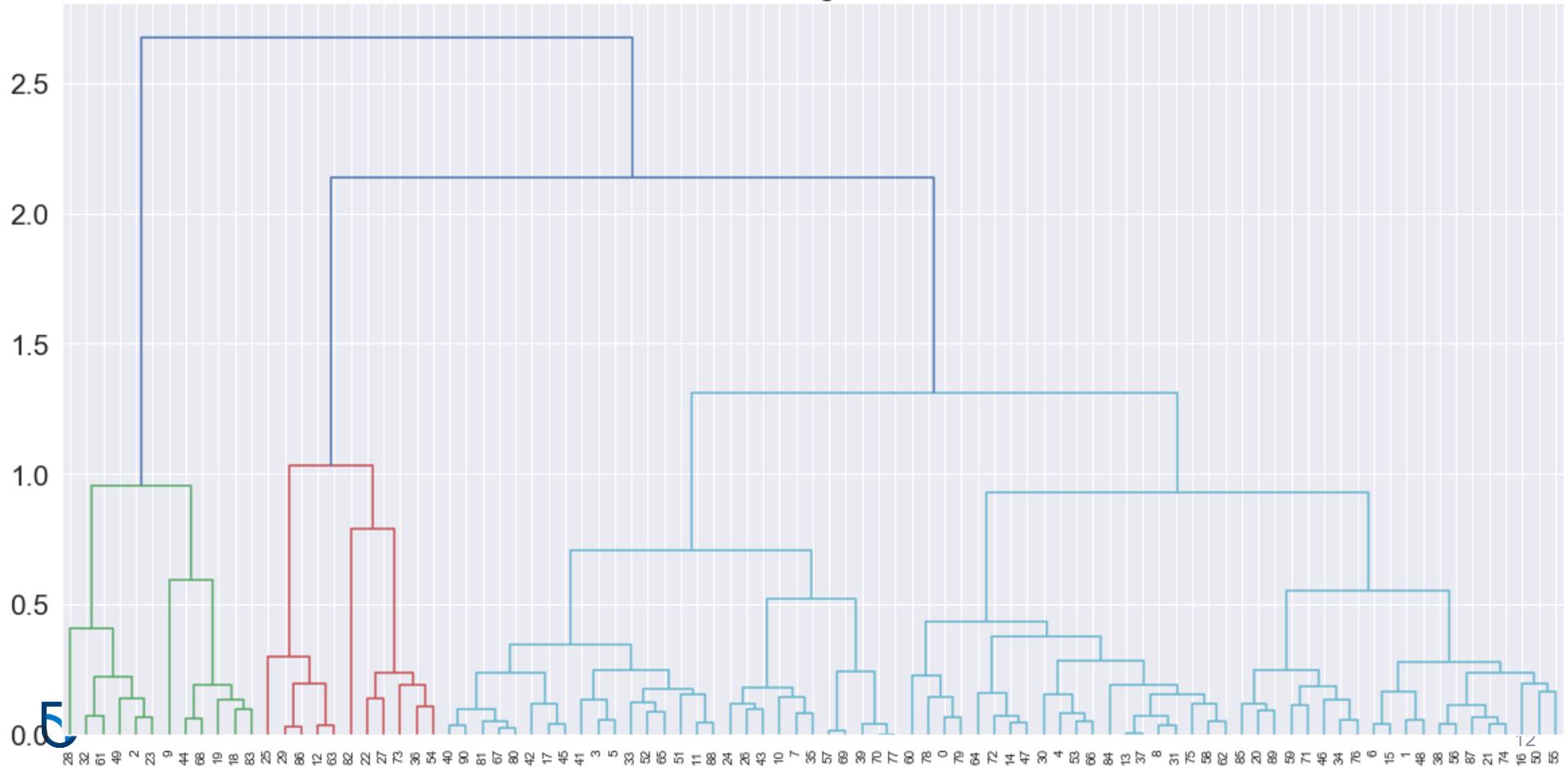
Figure 2a: Clustermap



Visualizing the Decision space

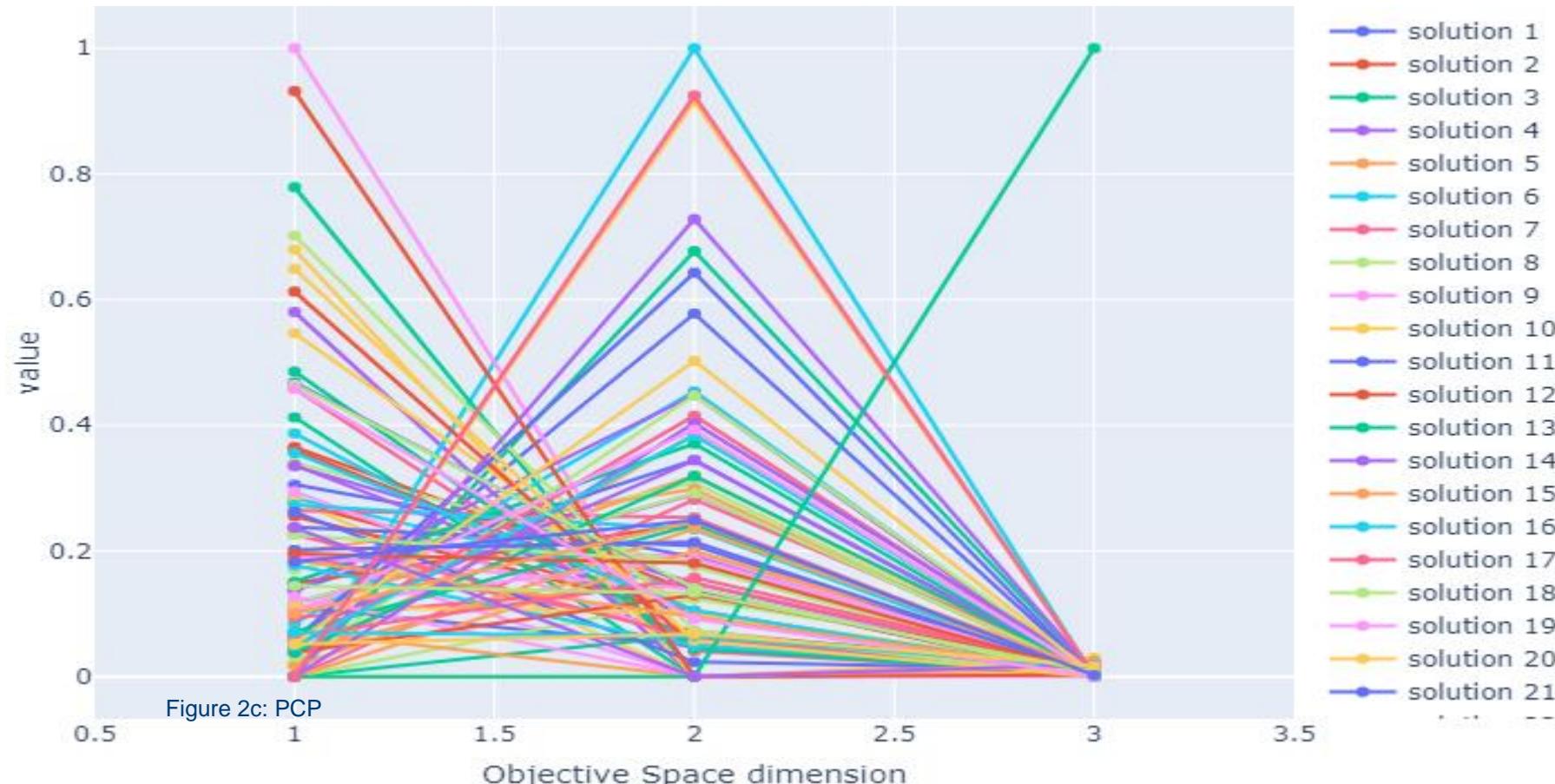
Dendograms

Figure 2b: Dendogram

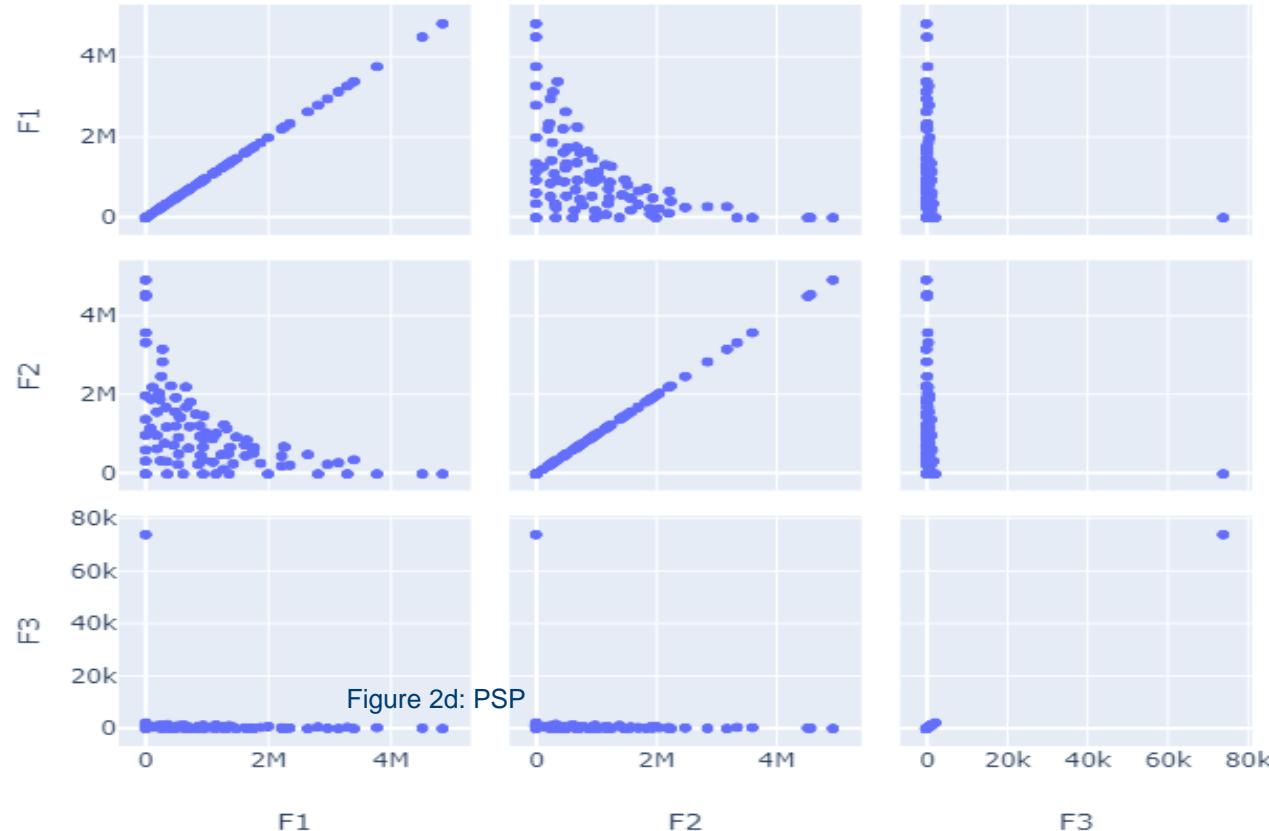


Visualizing the Objective space

Figure 2c: PCP



Visualizing the Objective space



Visualizing the Objective space

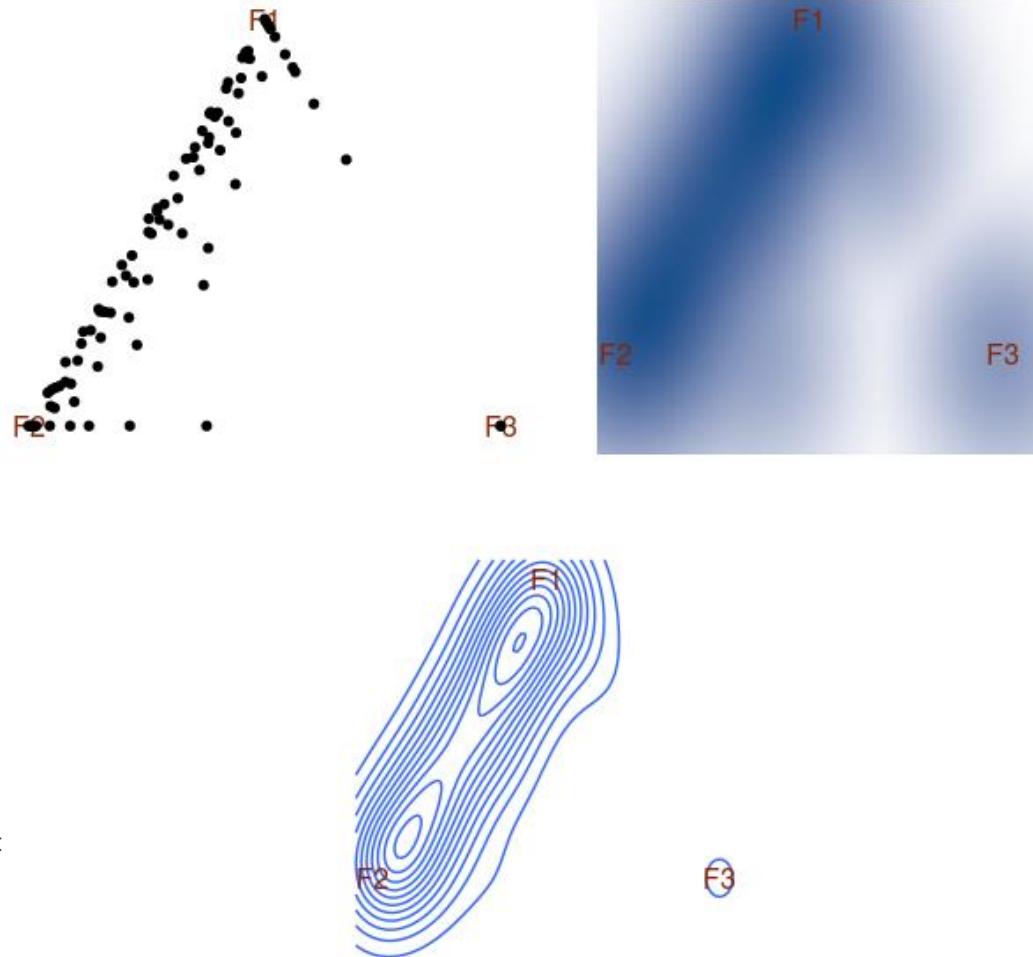
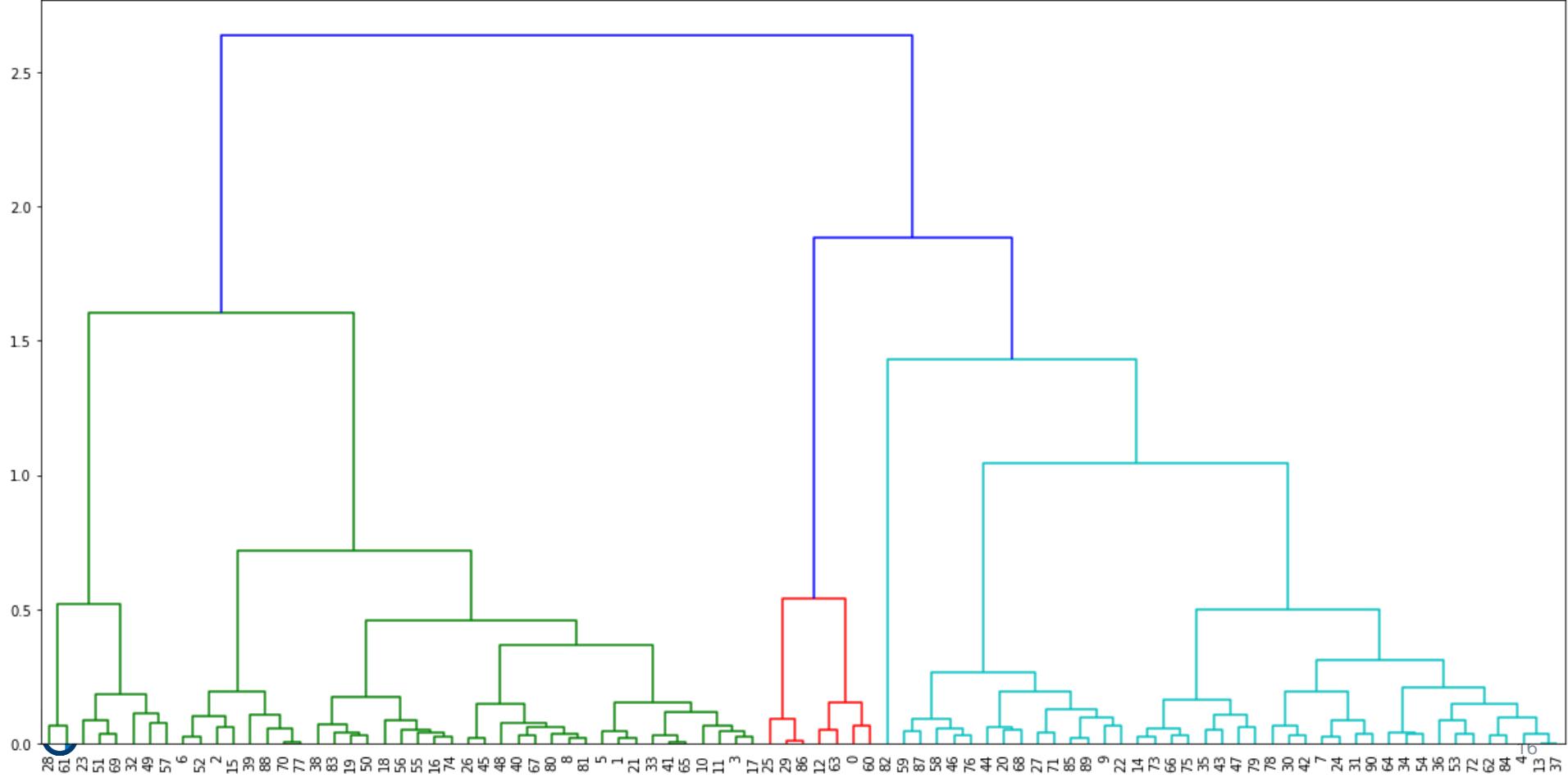


Figure 2f: Radvis and contour plot

Visualizing the Objective space

Figure 2e: Dendogram

Dendograms



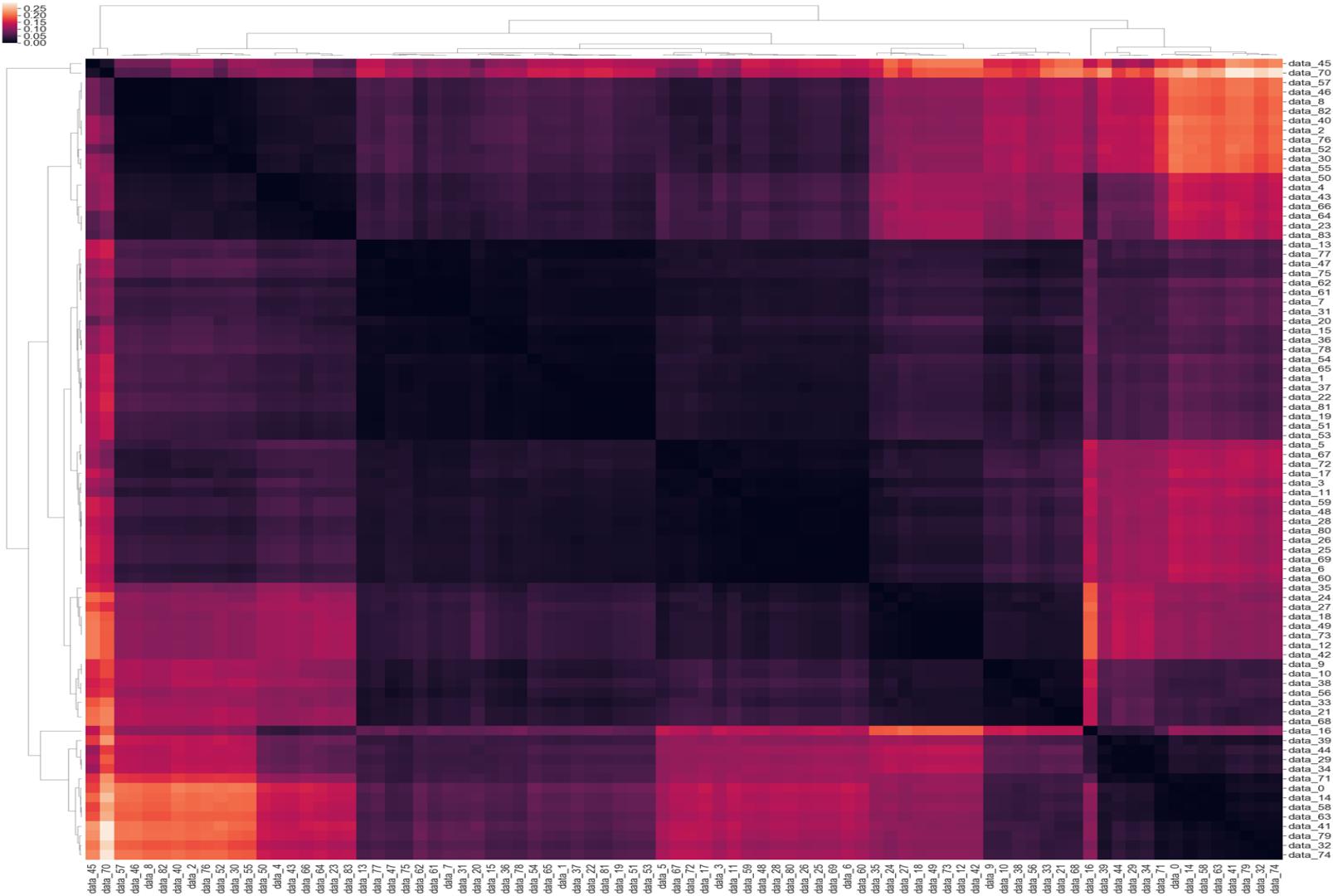
3.MaF3

No of
Objective = 5

Visualizing the
Decision space



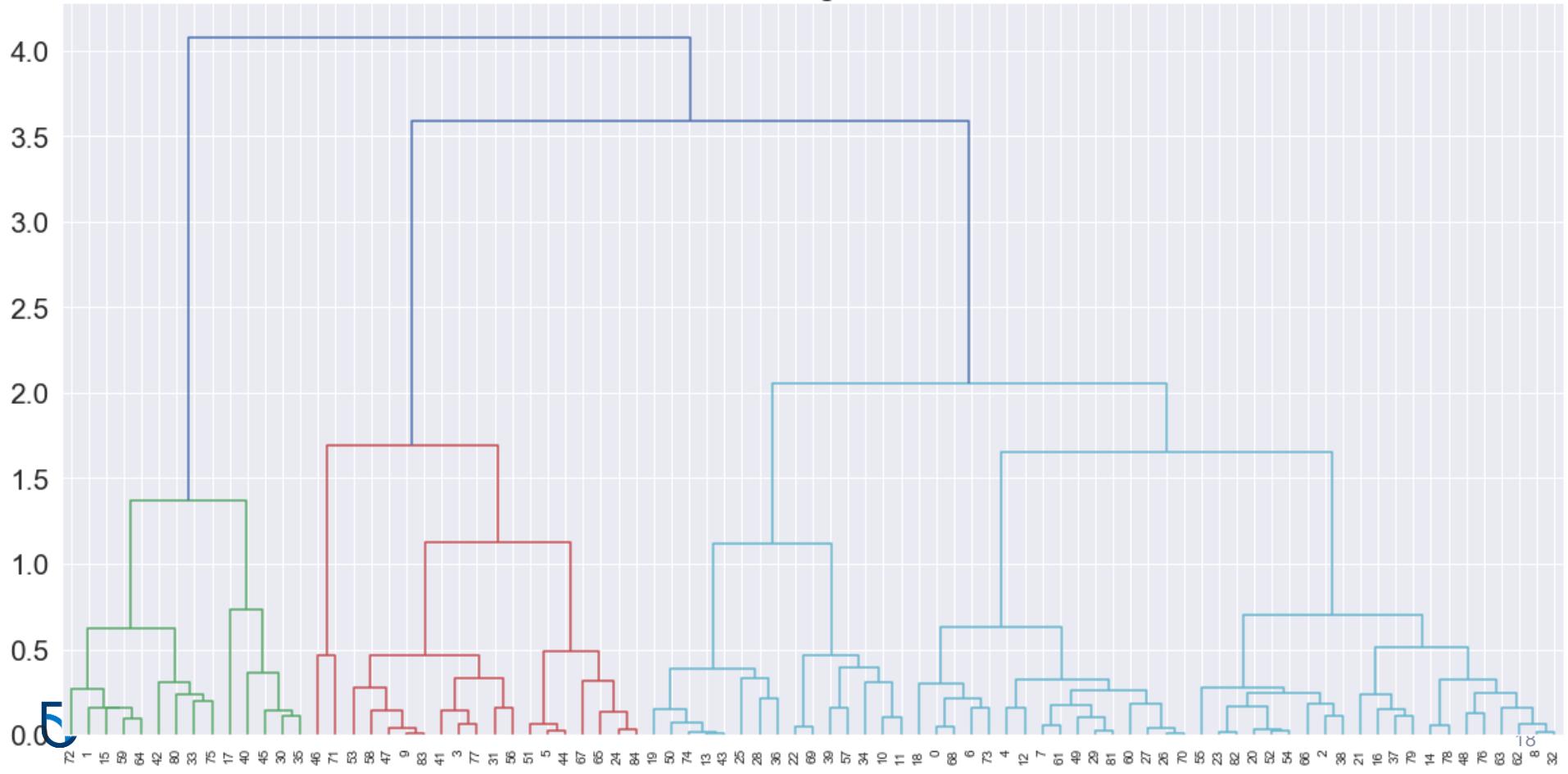
Figure 3a: Clustermap



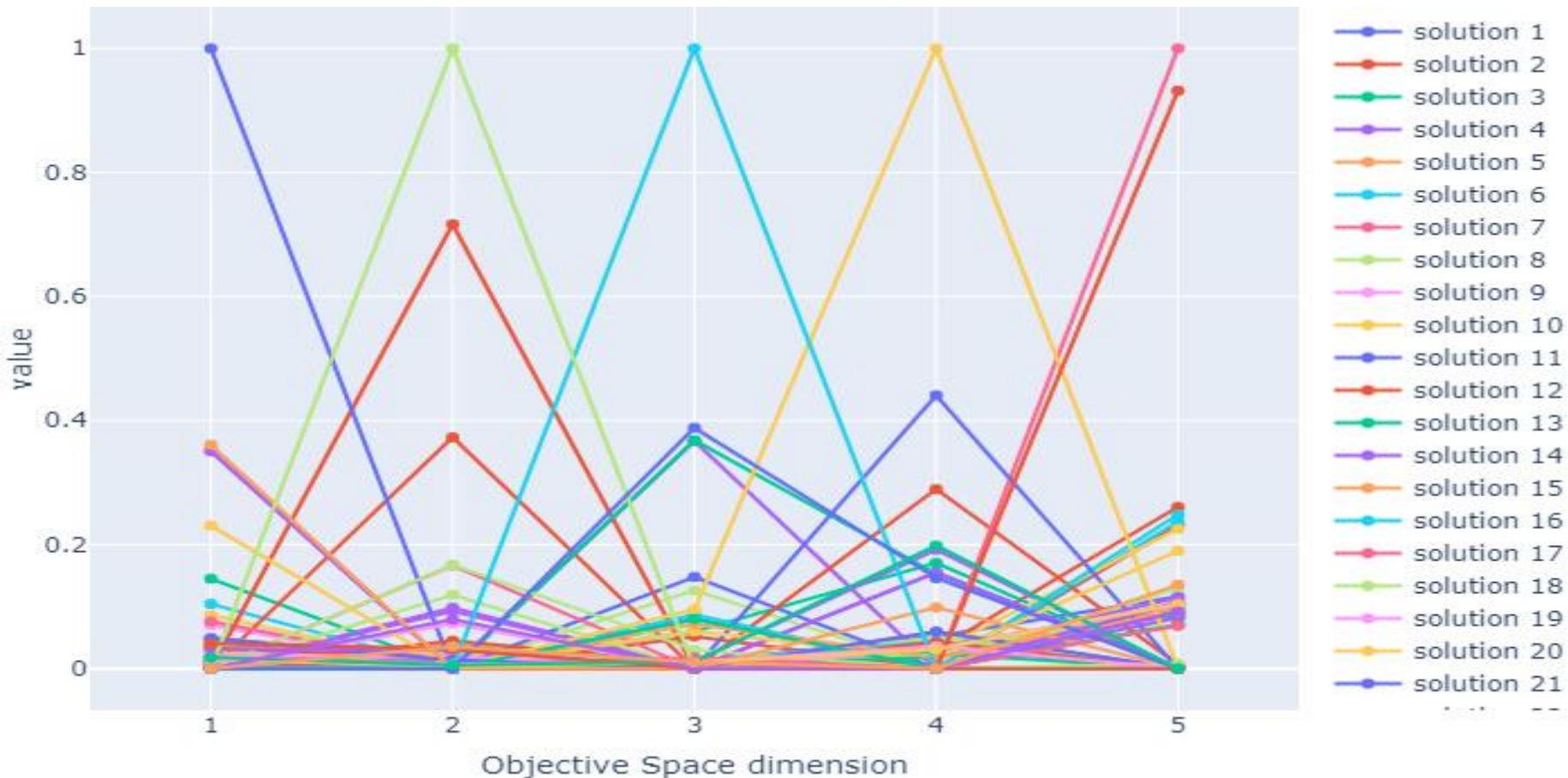
Visualizing the Decision space

Dendograms

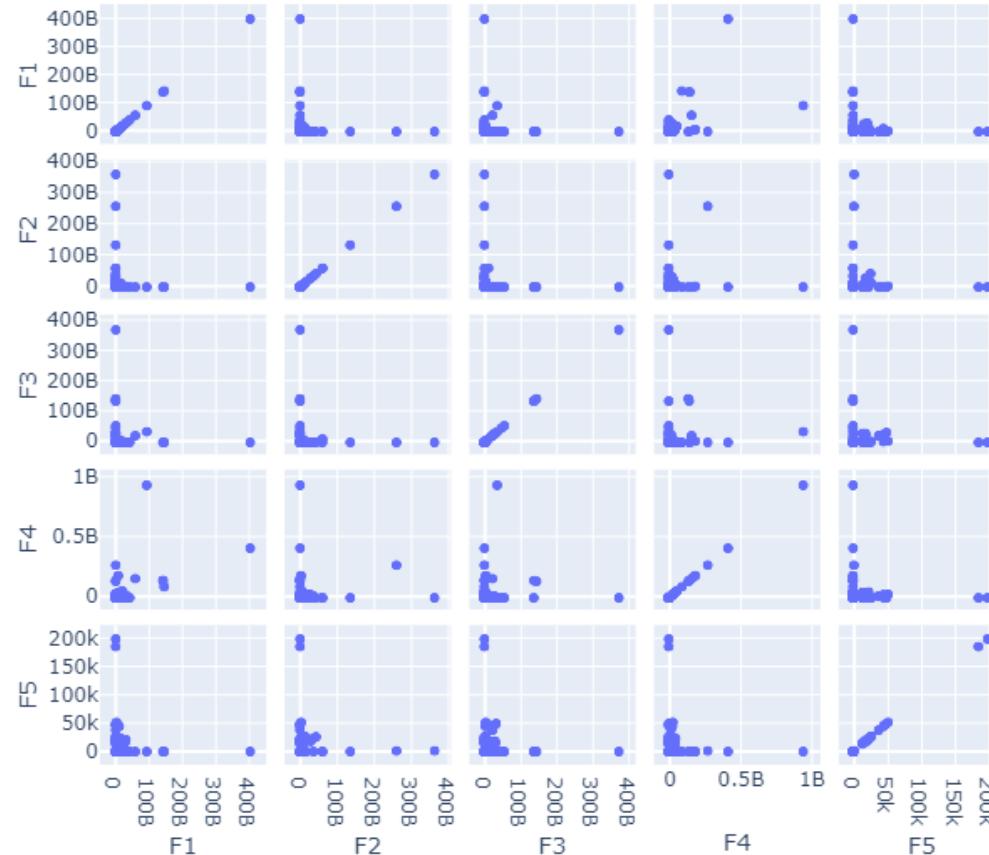
Figure 3b: Dendrogram



Visualizing the Objective space

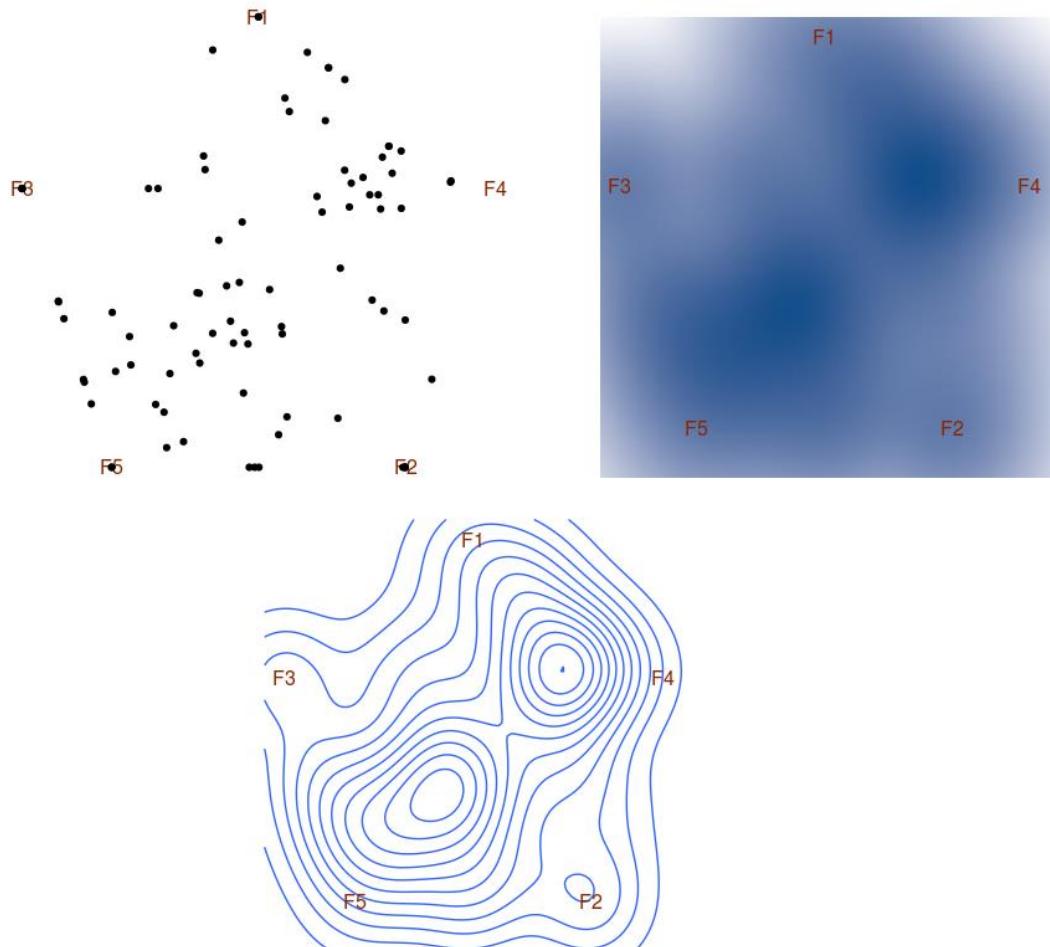


Visualizing the Objective space



Visualizing the Objective space

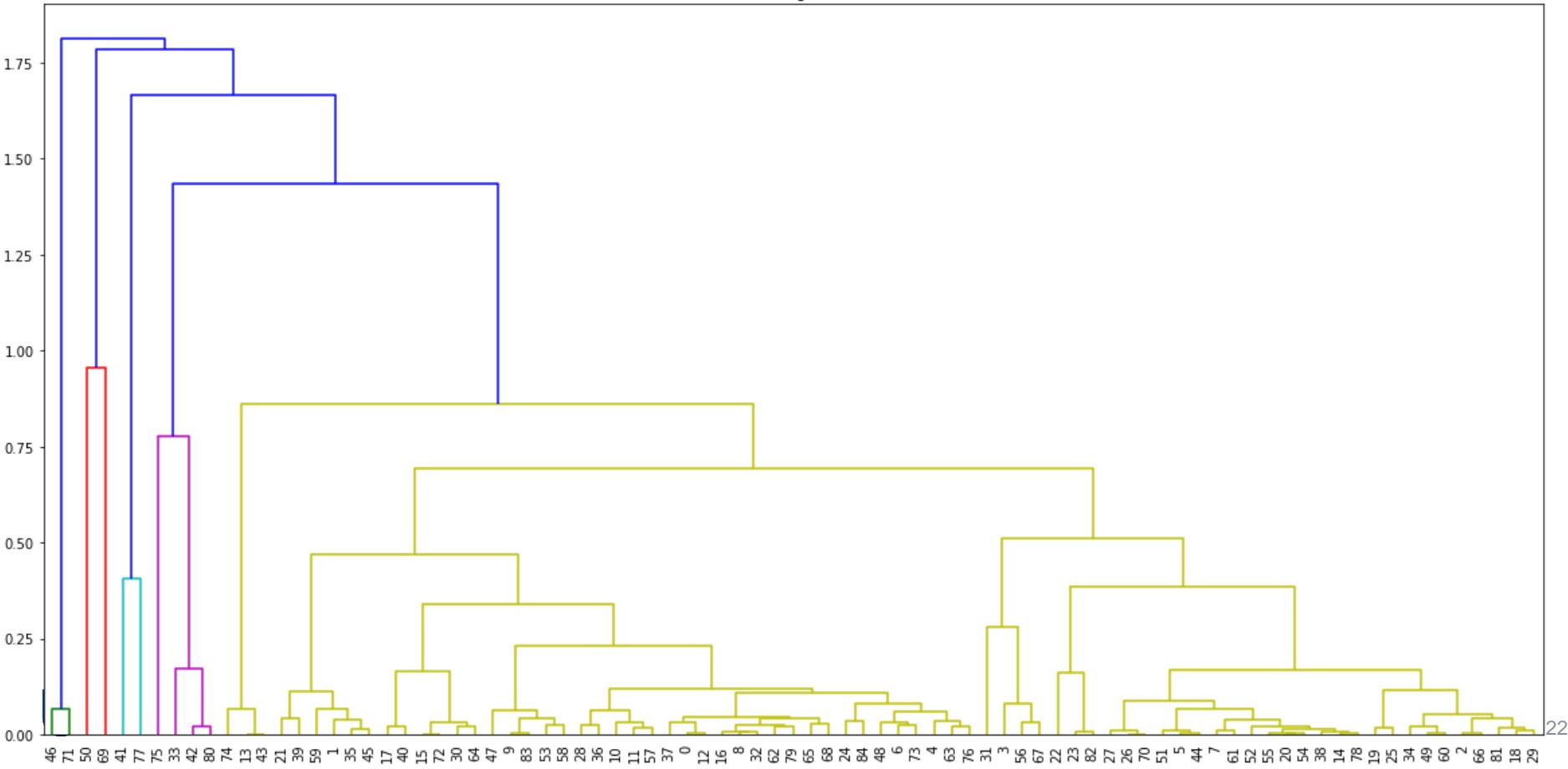
Figure 3f: Radvis and contour plot



Visualizing the Objective space

Figure 3e: Dendogram

Dendograms



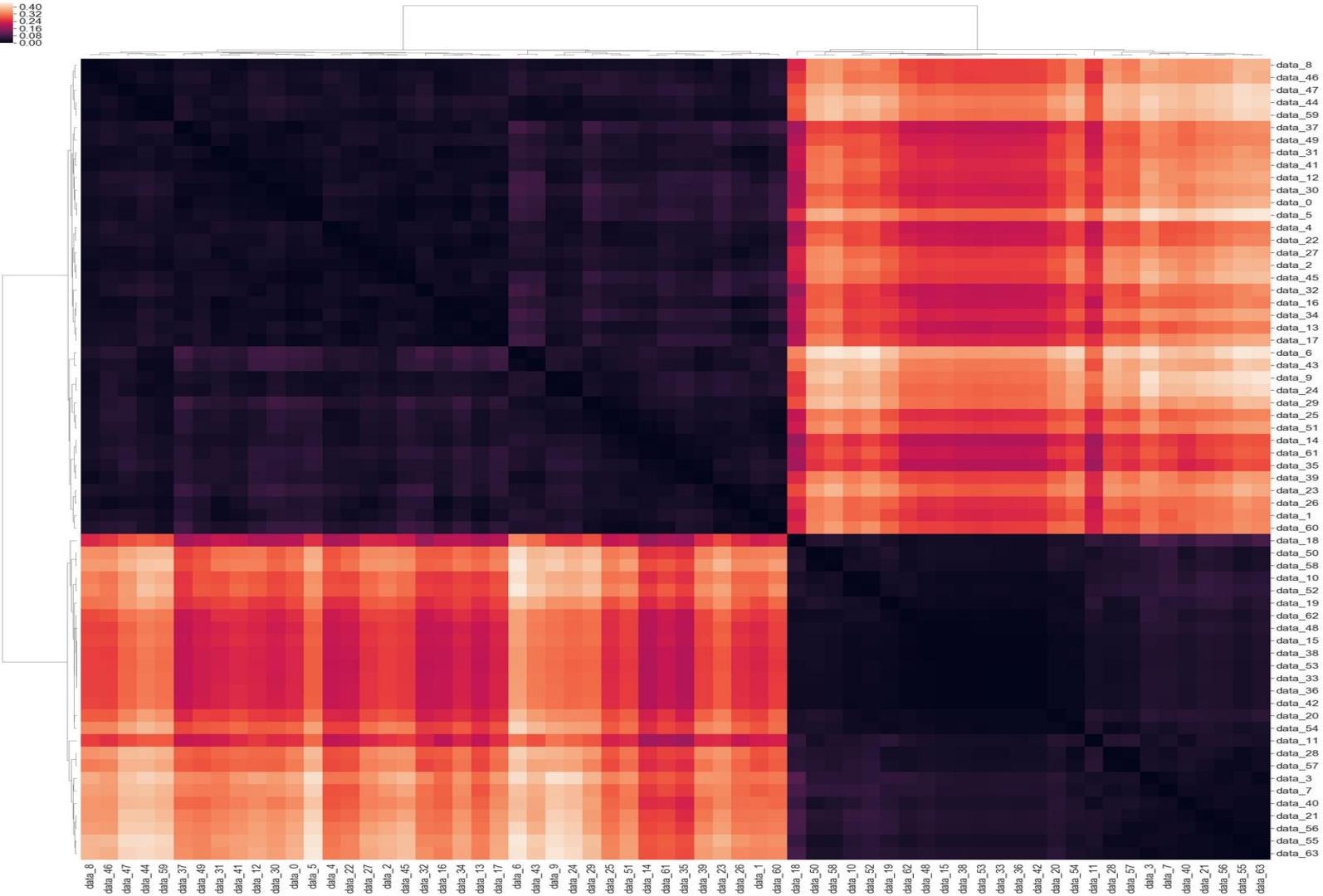
4.MaF5

No of
Objective =10

Visualizing the
Decision
space

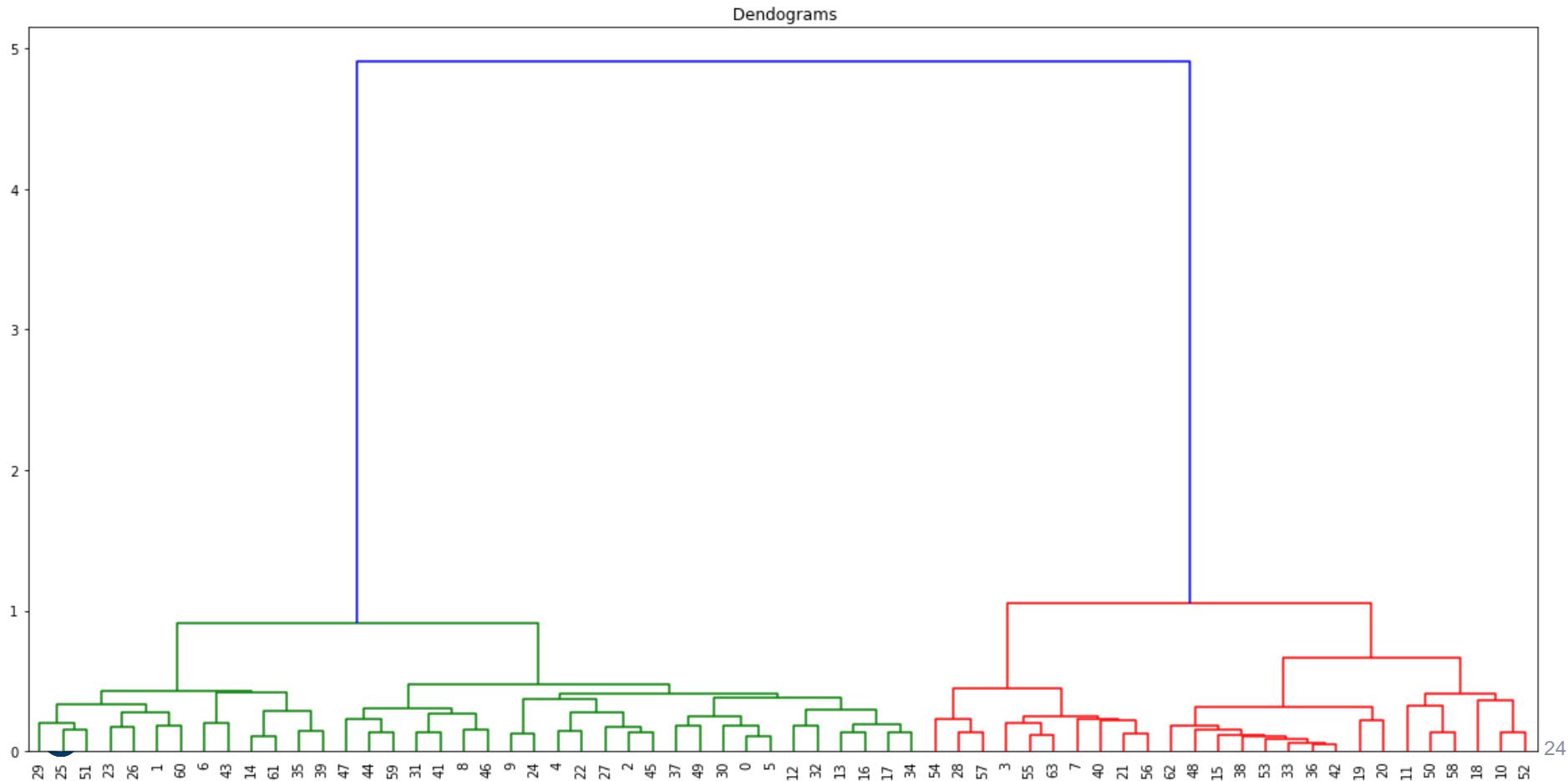


Figure 4a: Clustermap



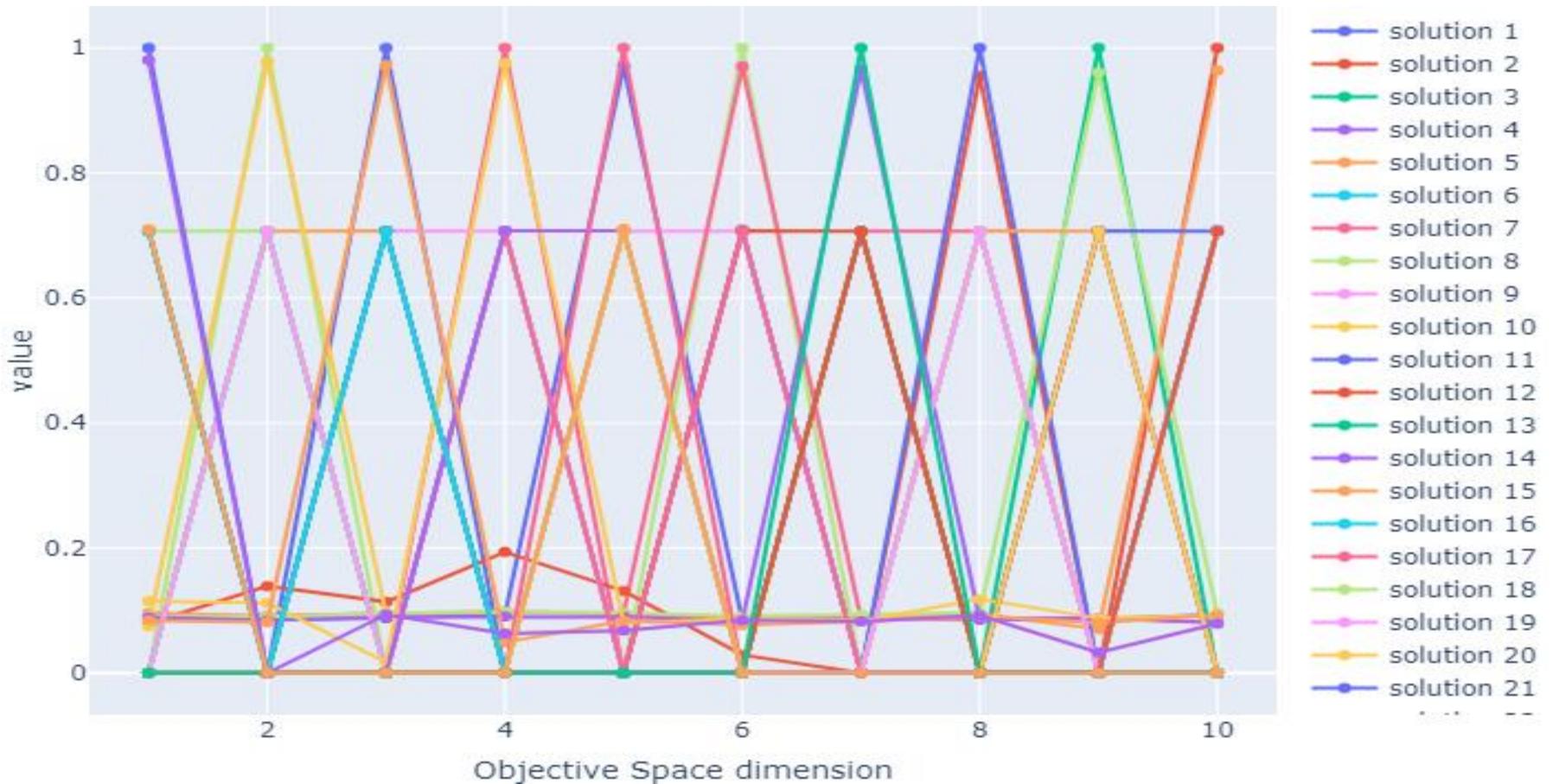
Visualizing the Decision space

Figure 4b: Dendogram



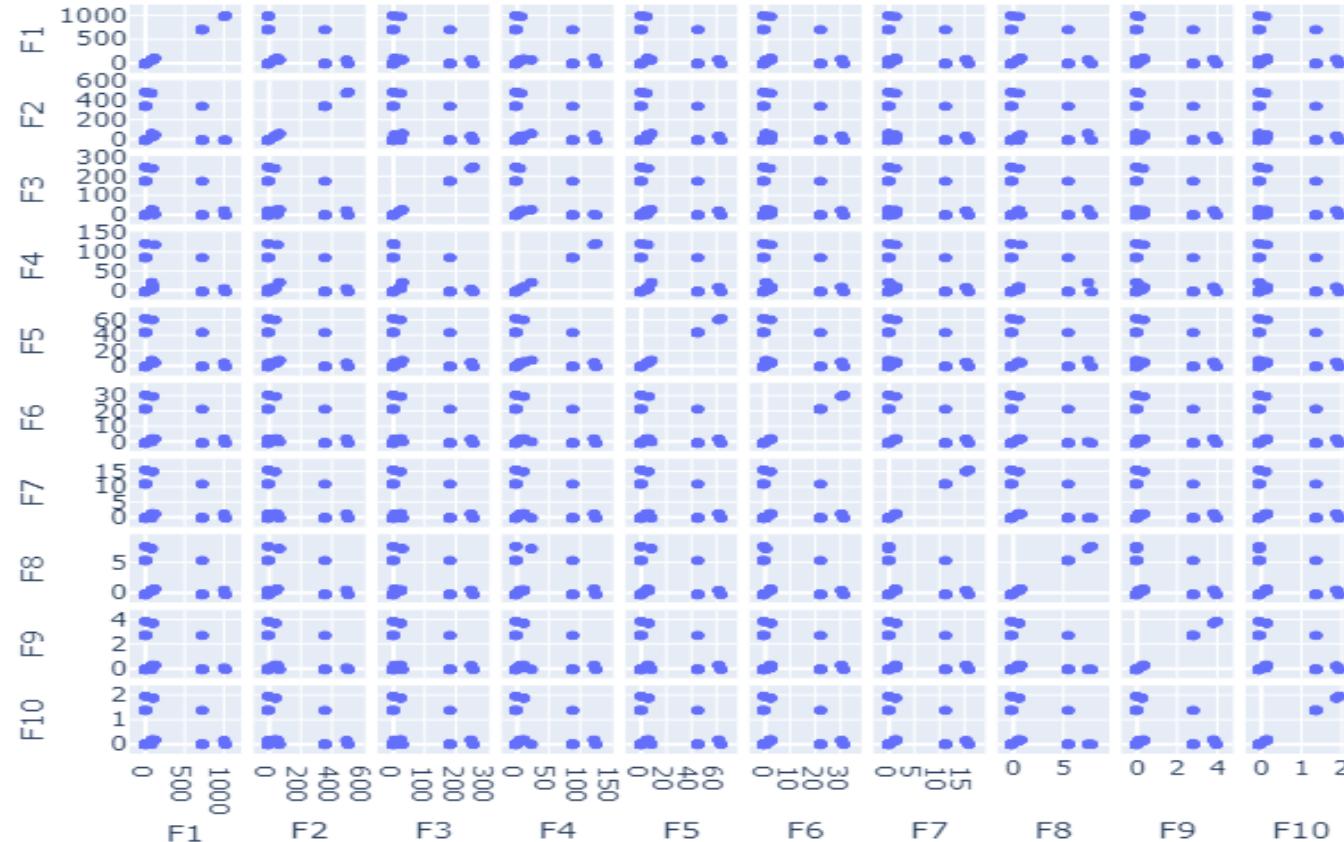
Visualizing the Objective space

Figure 4c: PCP



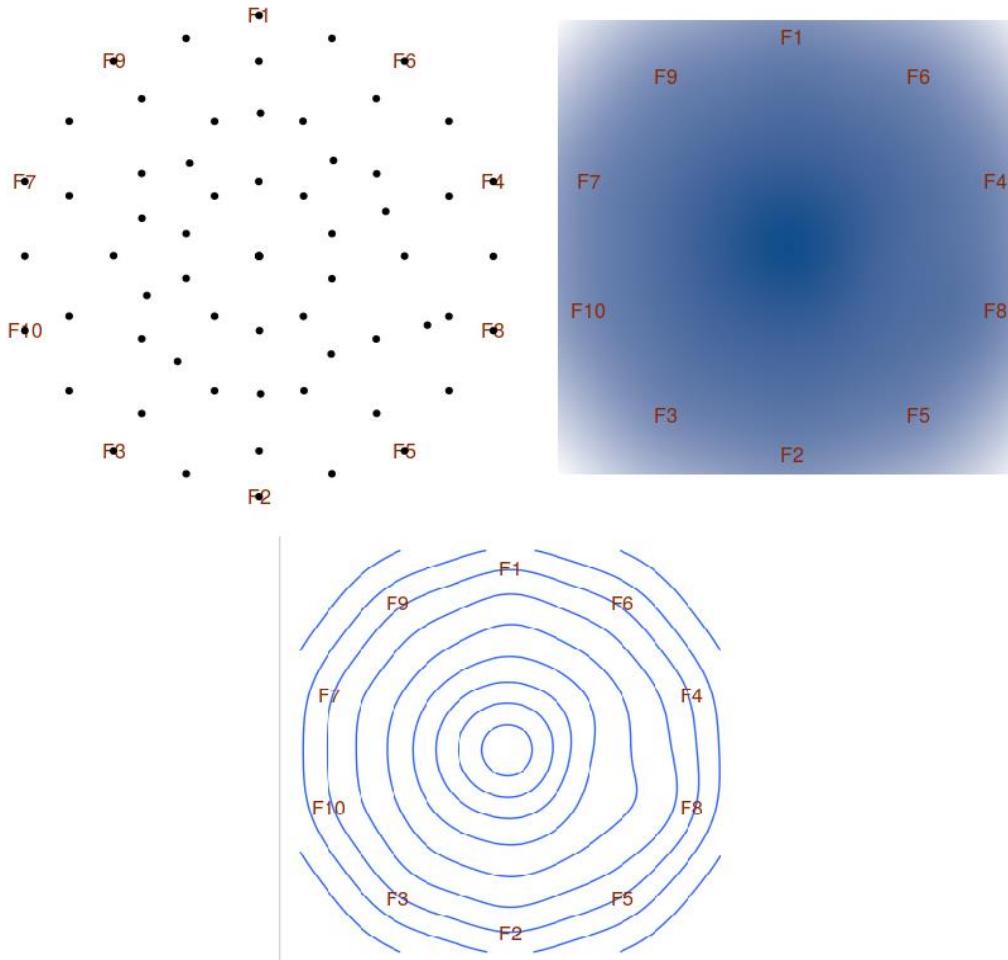
Visualizing the Objective space

Figure 4d: PSP



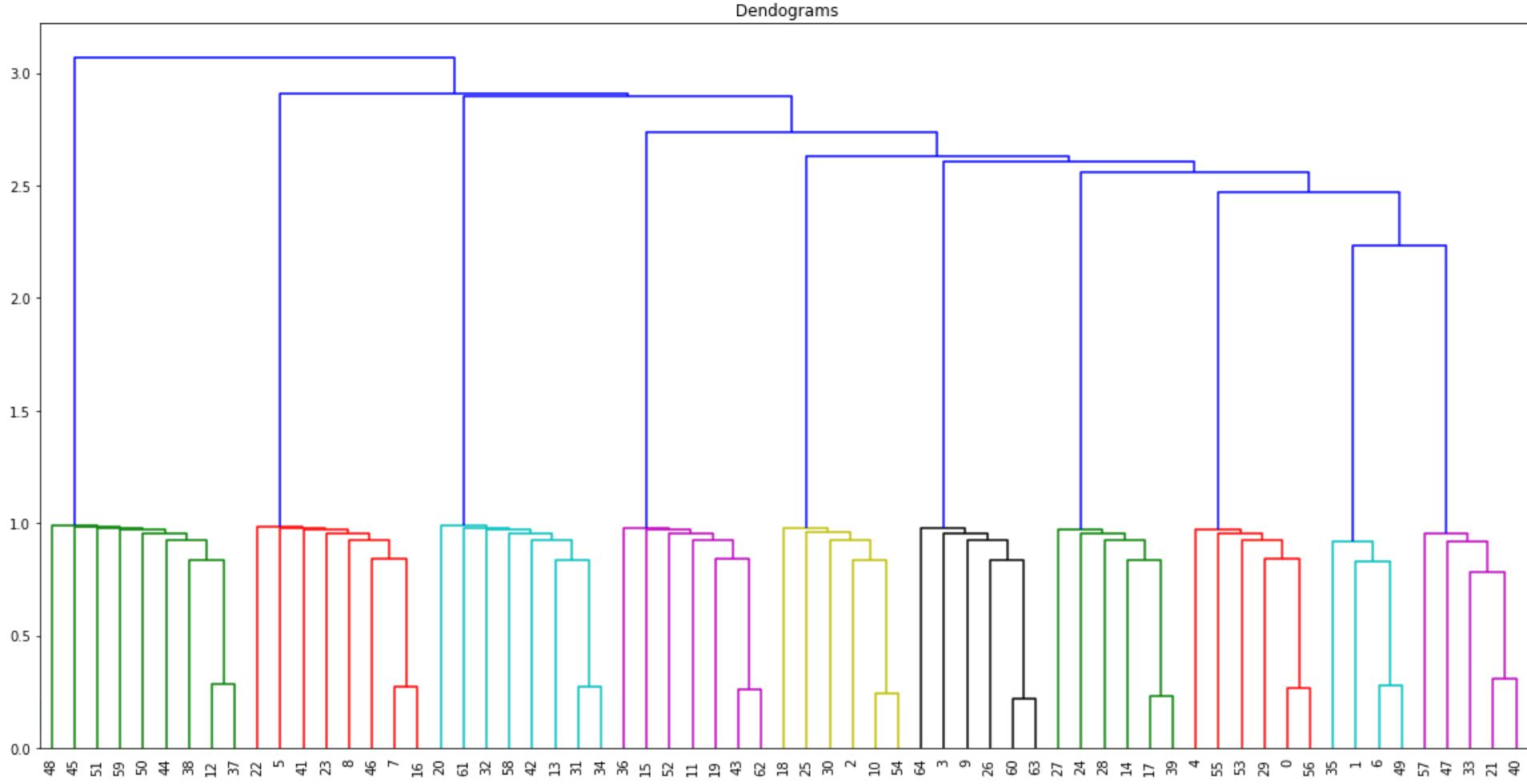
Visualizing the Objective space

Figure 4f: Radvis and contour plot



Visualizing the Objective space

Figure 4e: Dendogram



5.DTLZ6

No of Objective =10

Visualizing the Decision space

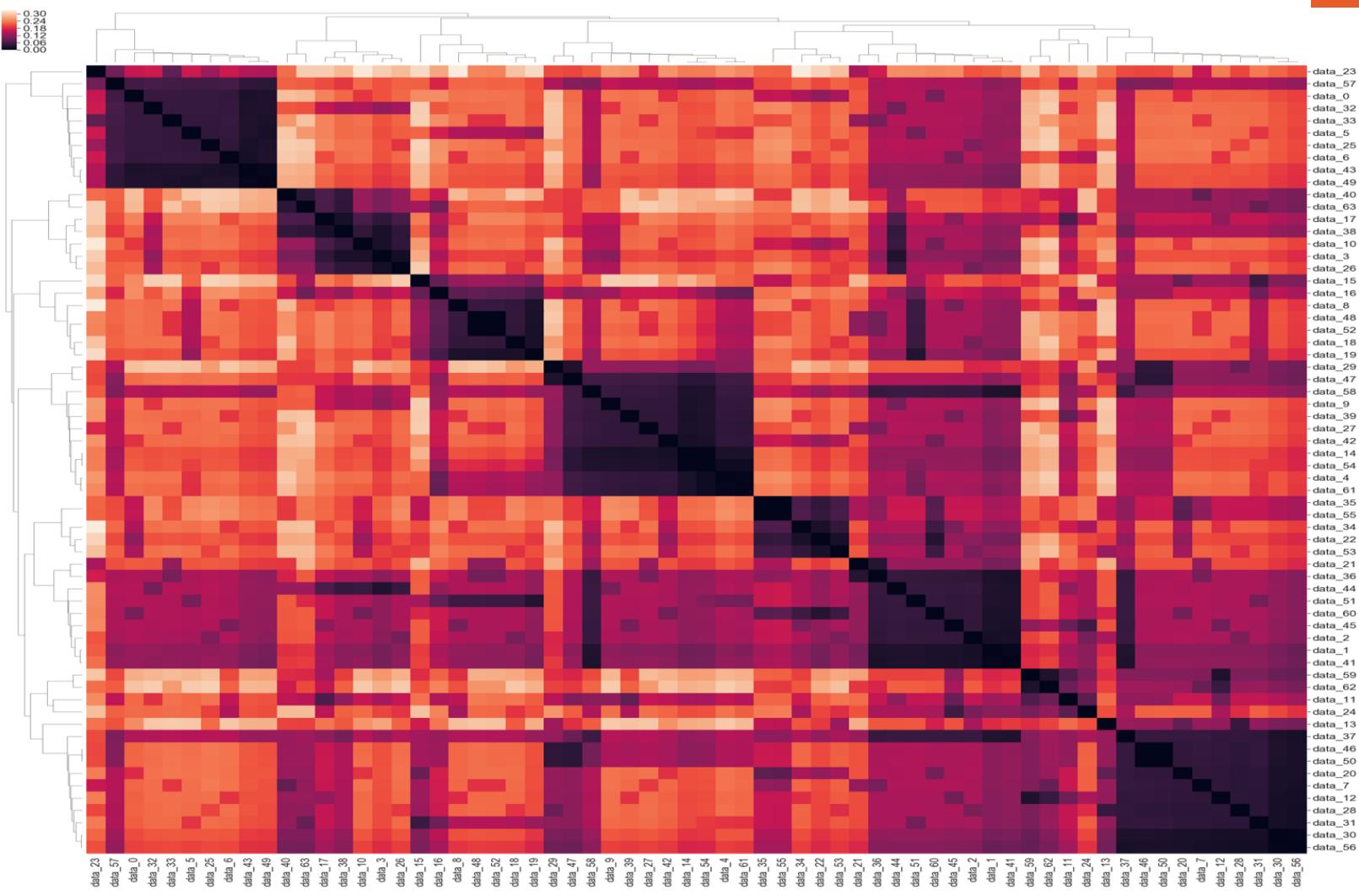


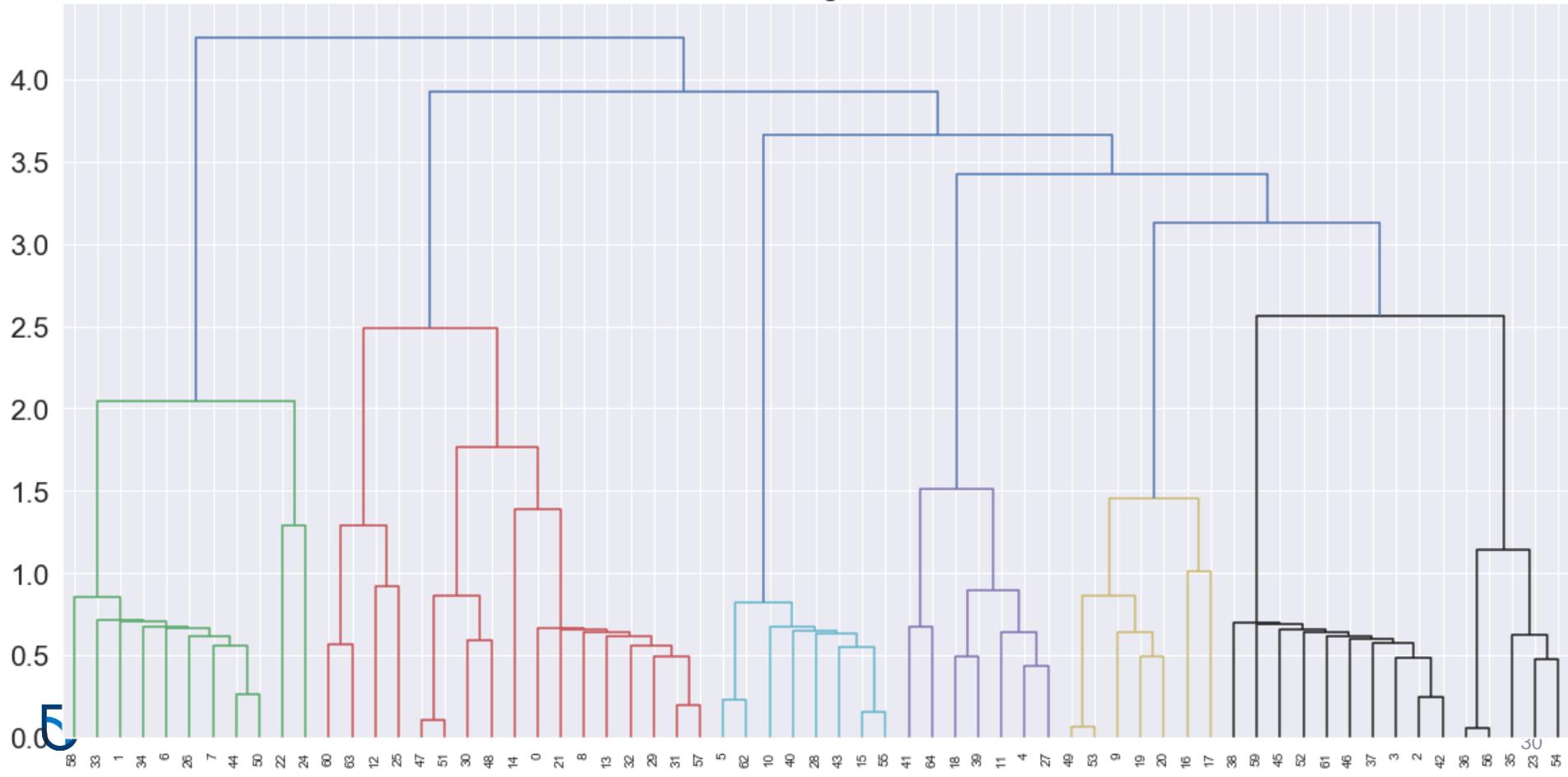
Figure 5a: Clustermap



Visualizing the Decision space

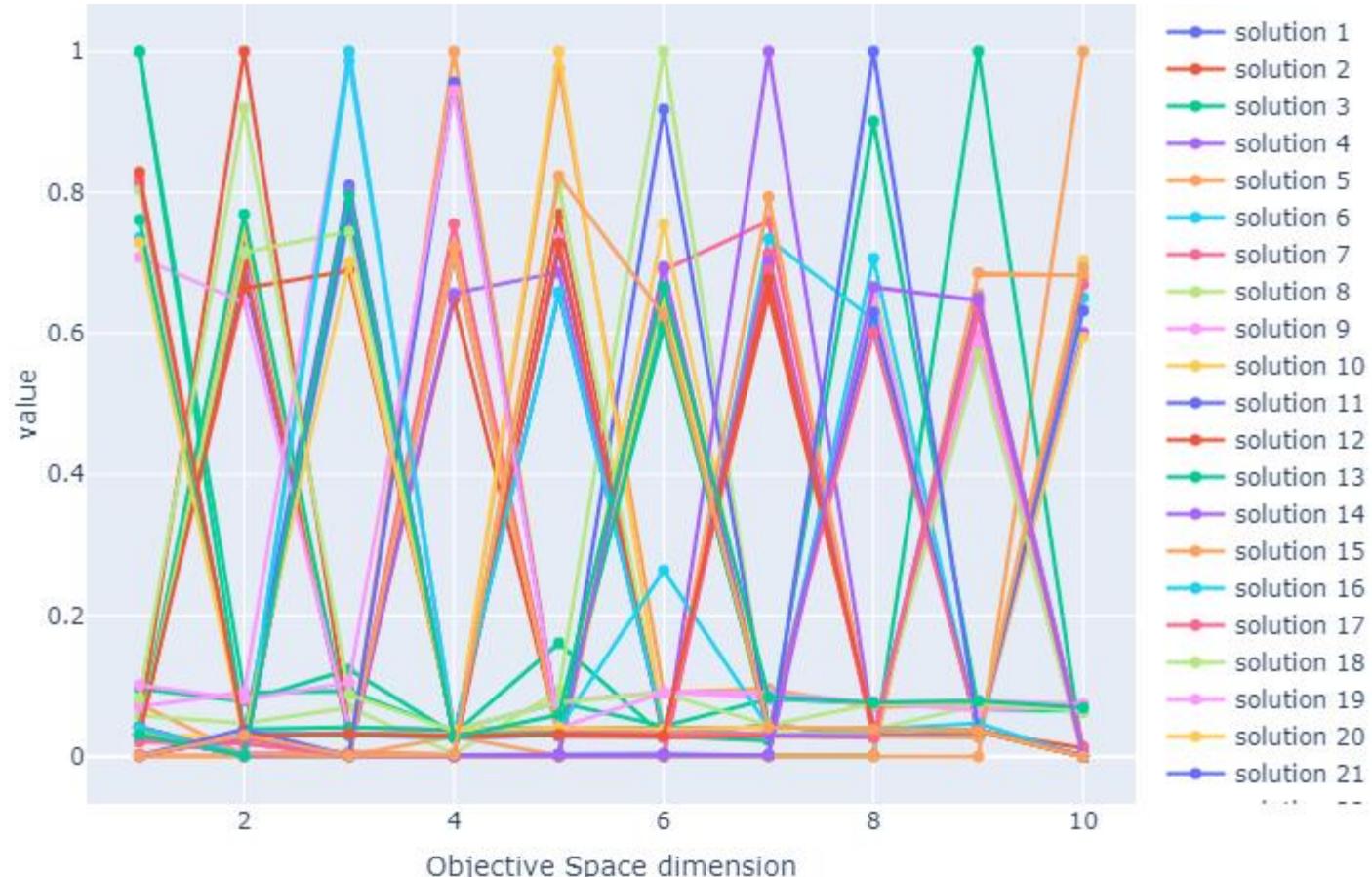
Figure 5b: Dendogram

Dendograms

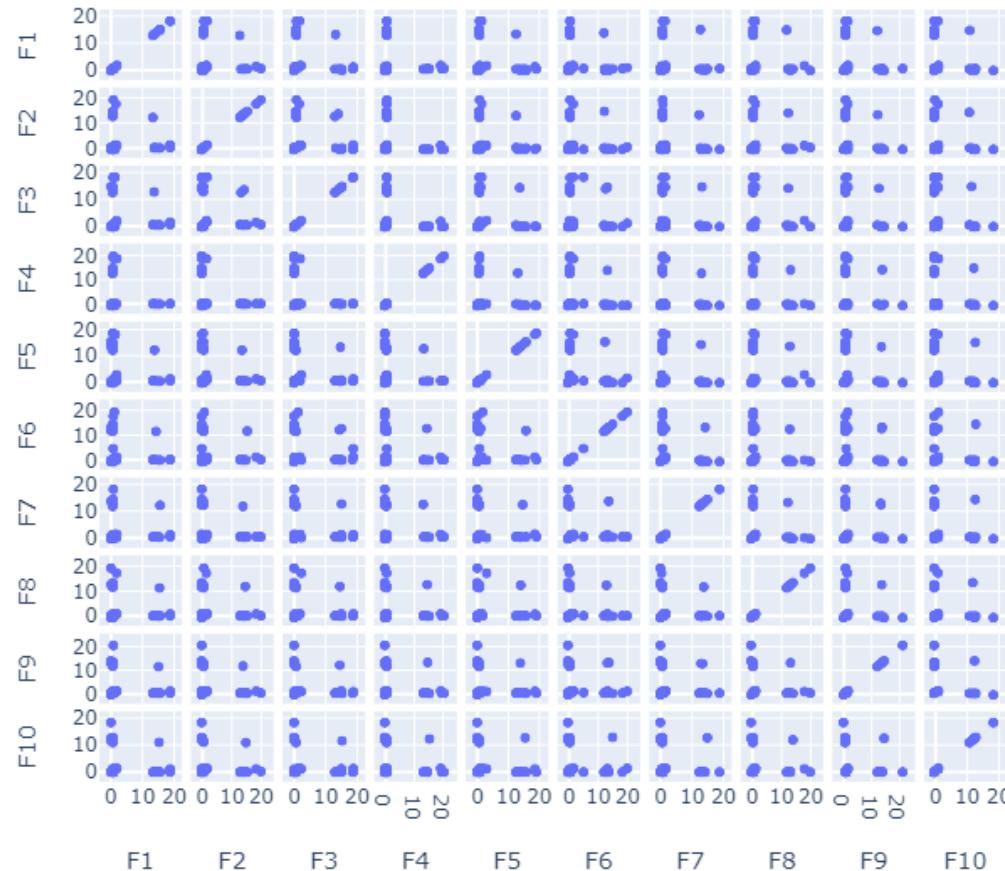


Visualizing the Objective space

Figure 5c: PCP

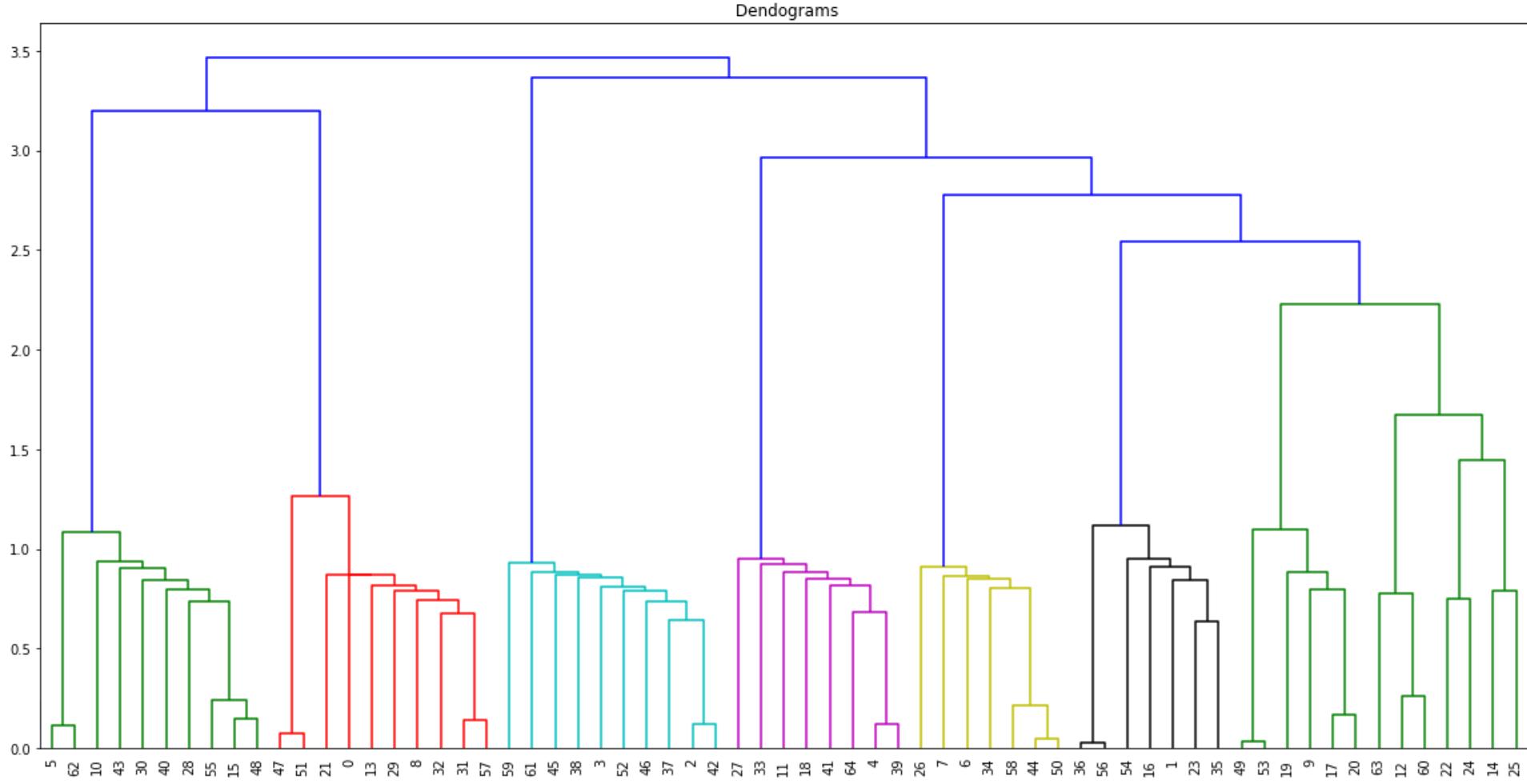


Visualizing the Objective space



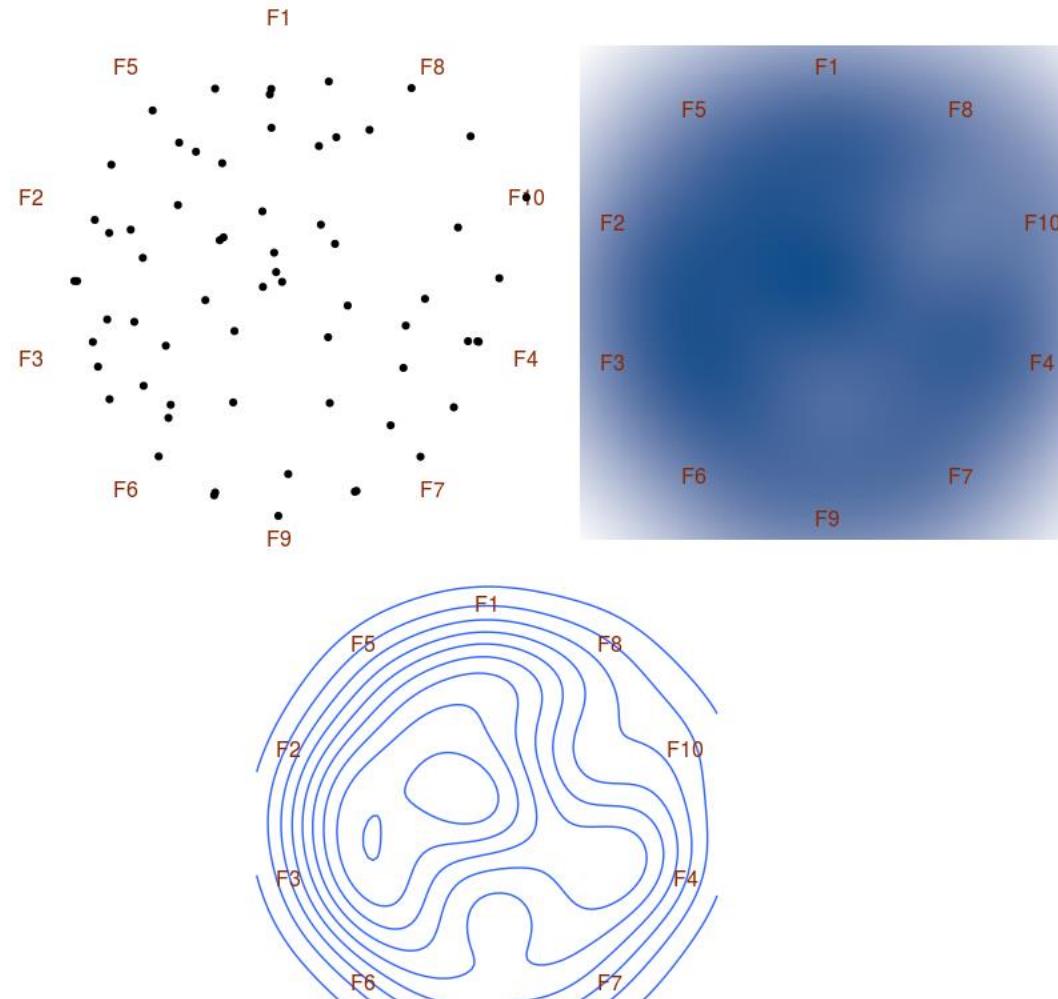
Visualizing the Objective space

Figure 5e: Dendogram



Visualizing the Objective space

Figure 5f: Radvis and contour plot

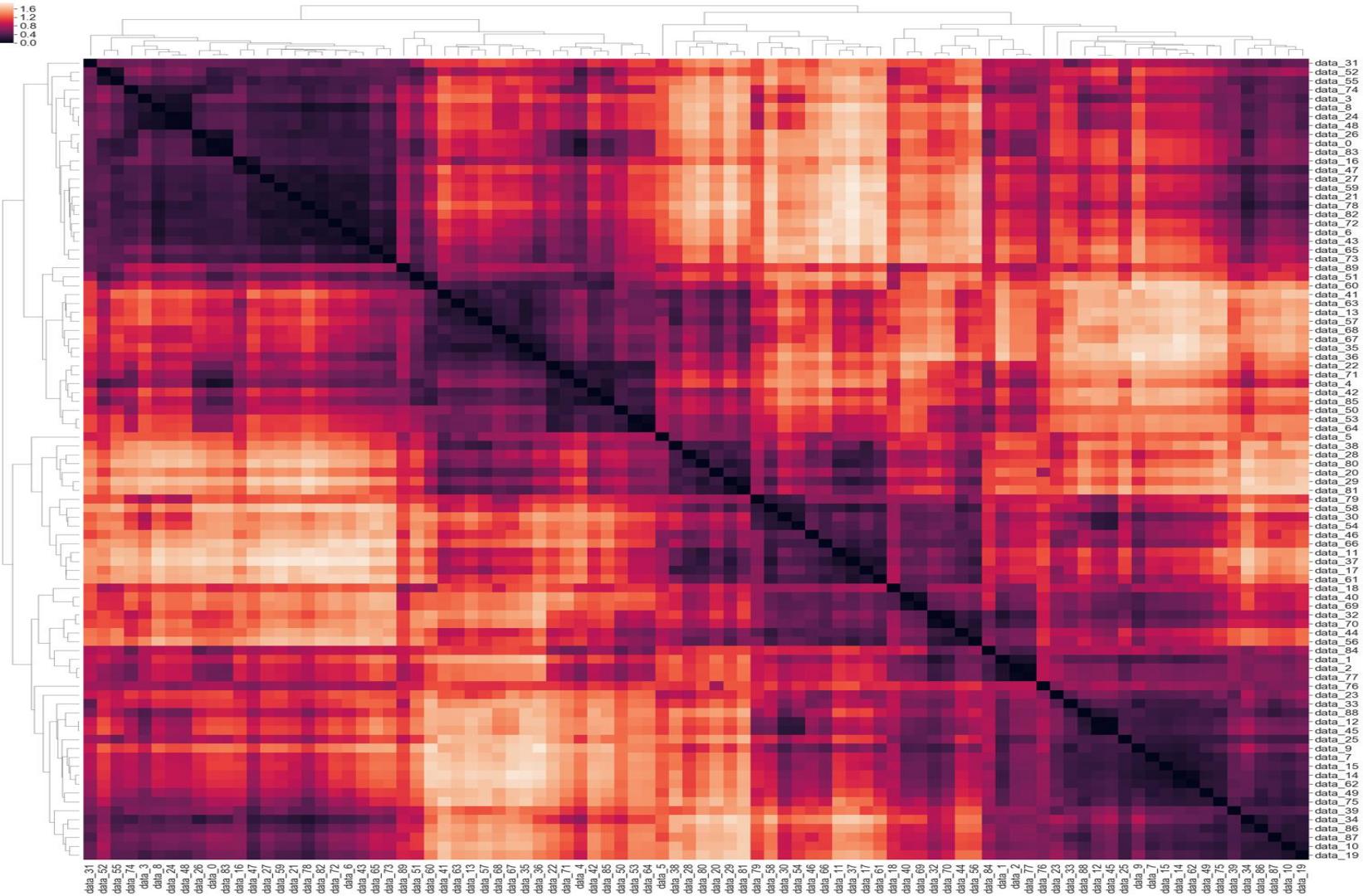


6.MaF2

No of Objective =3

Visualizing the Decision space

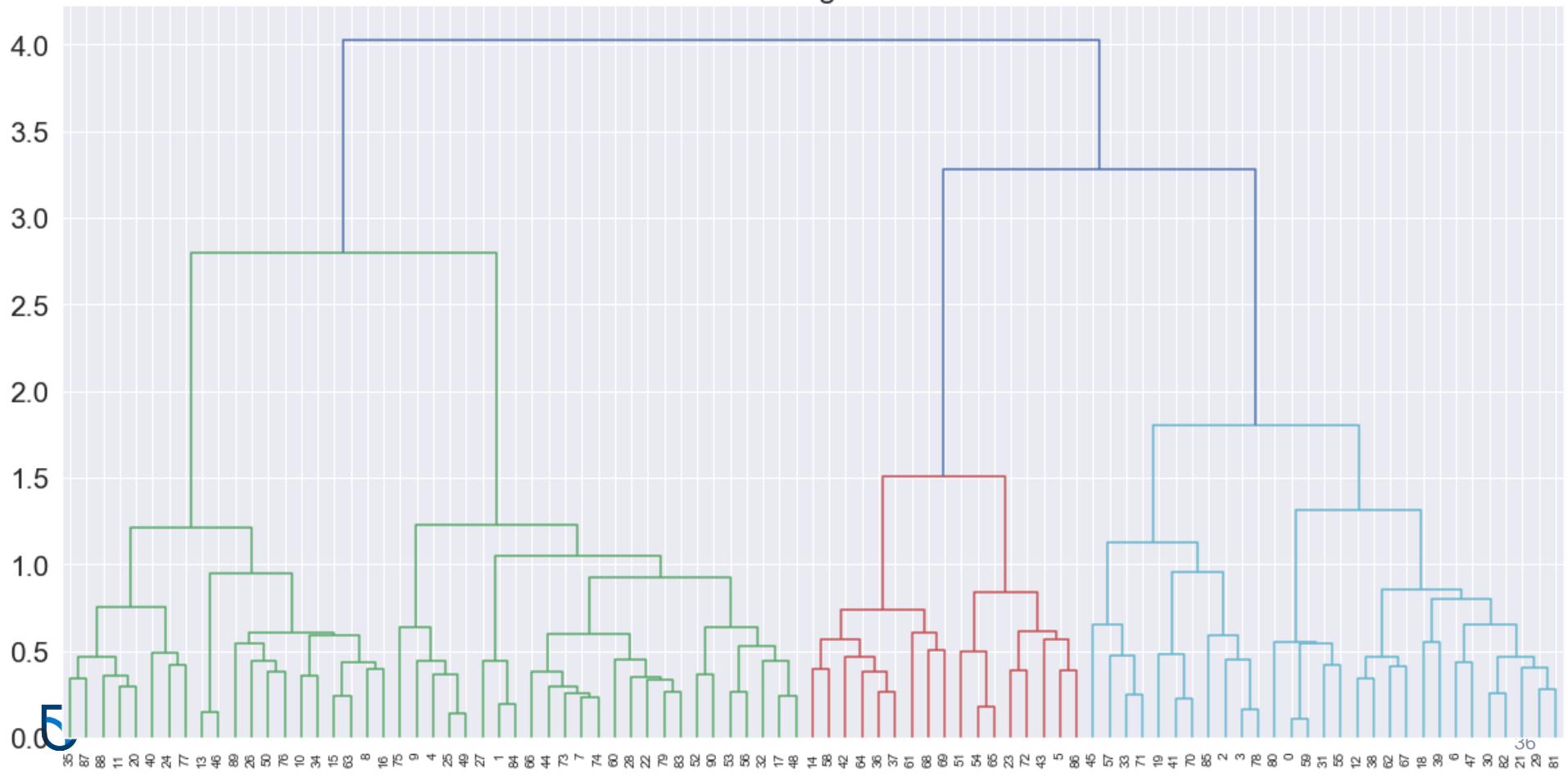
Figure 6a: Clustermap



Visualizing the Decision space

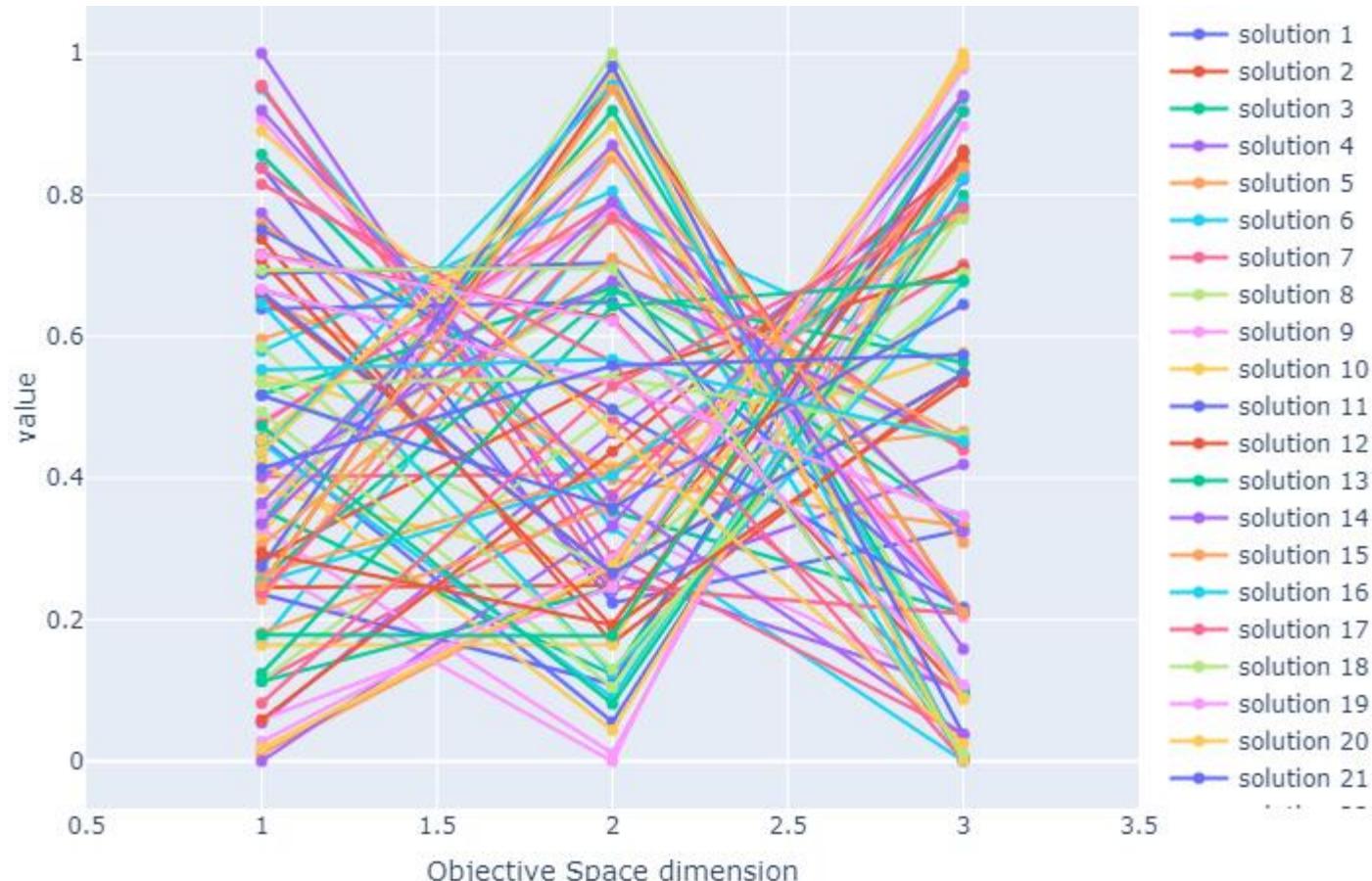
Figure 6b: Dendogram

Dendograms



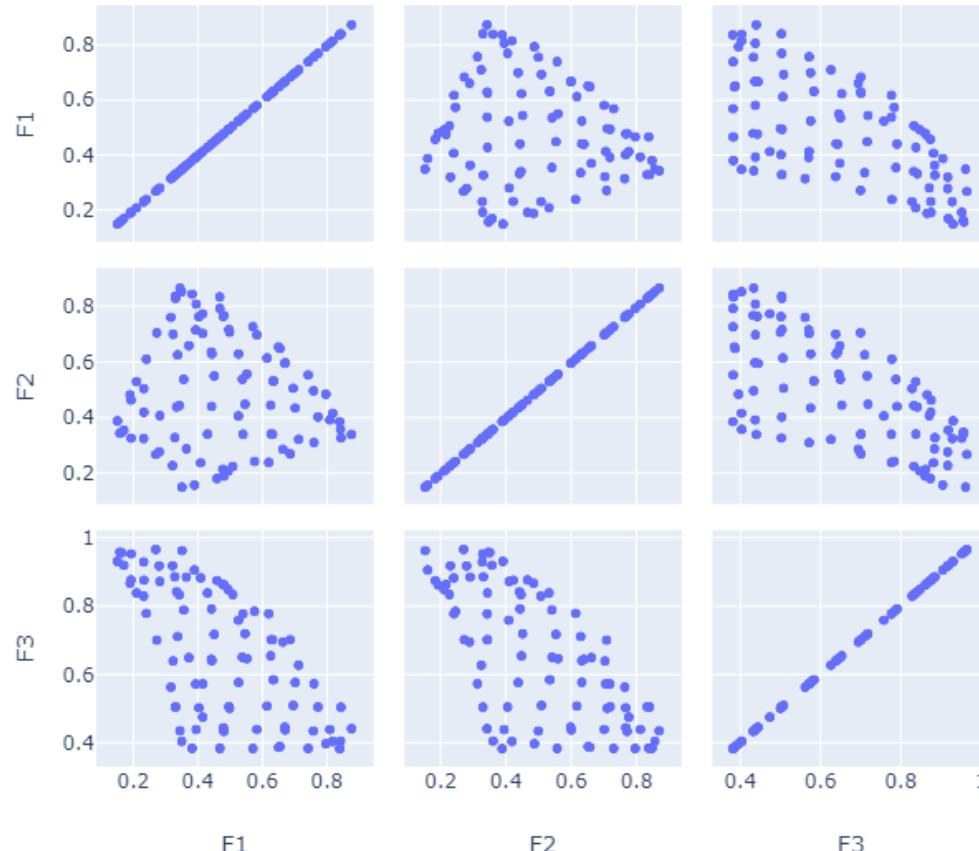
Visualizing the Objective space

Figure 6c: PCP



Visualizing the Objective space

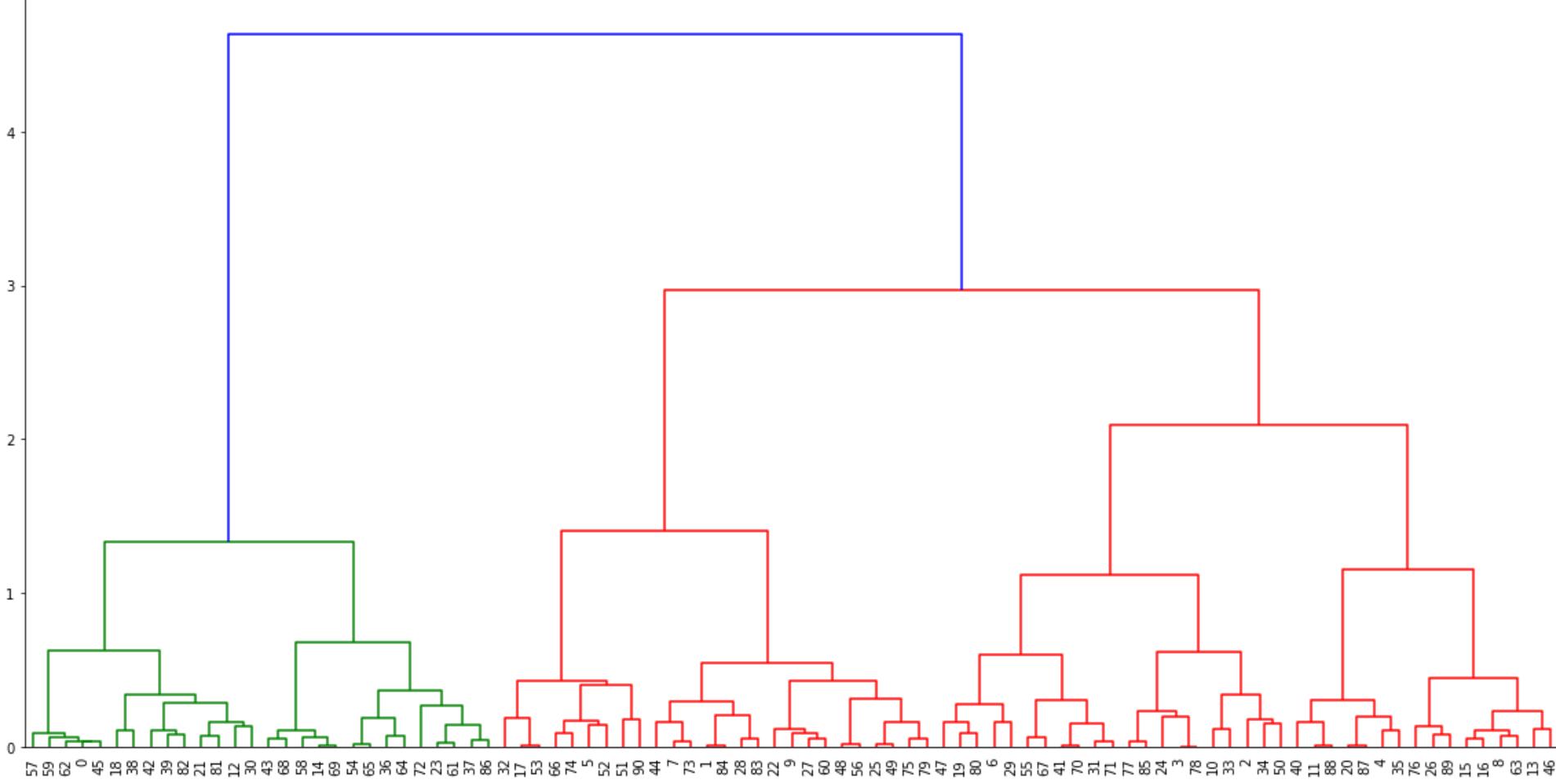
Figure 6d: PSP



Visualizing the Objective space

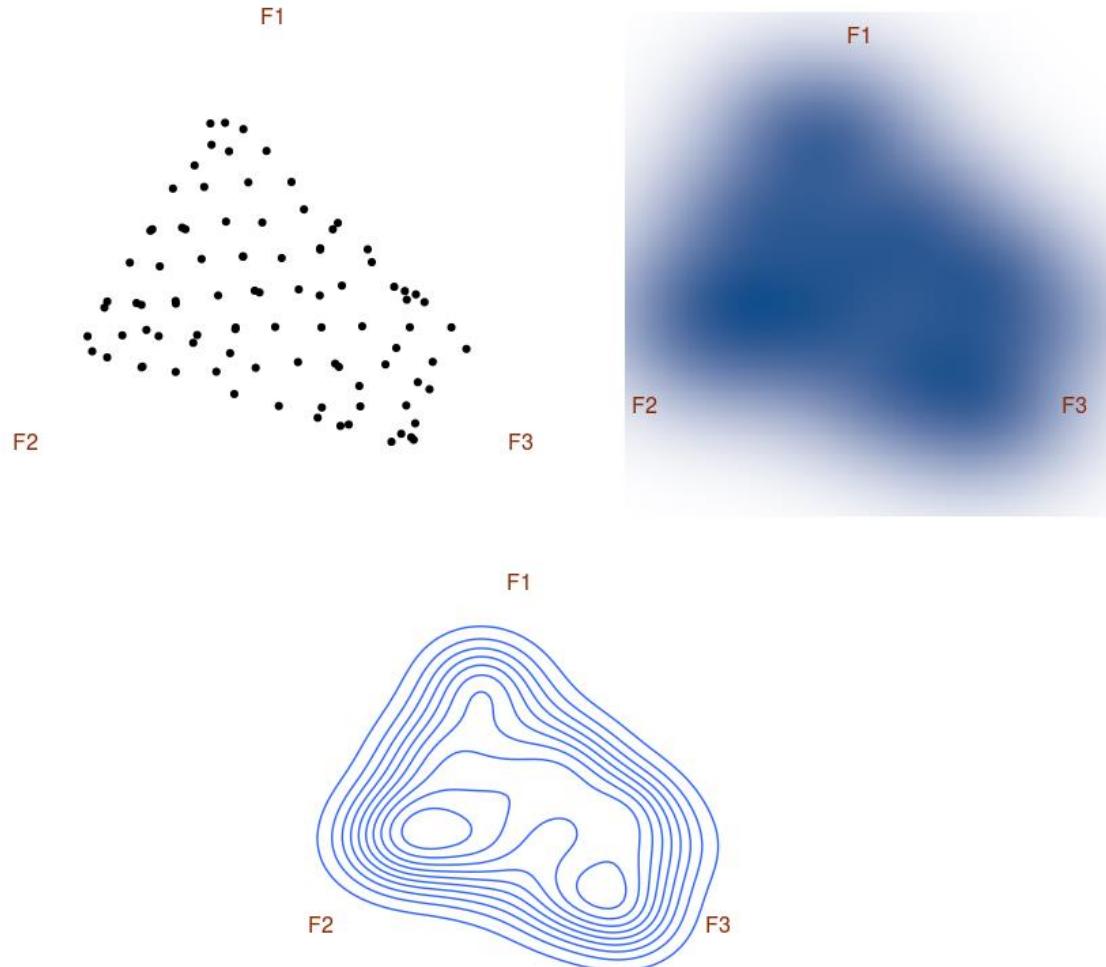
Figure 6e: Dendrogram

Dendograms



Visualizing the Objective space

Figure 6f: Radvis and contour plot

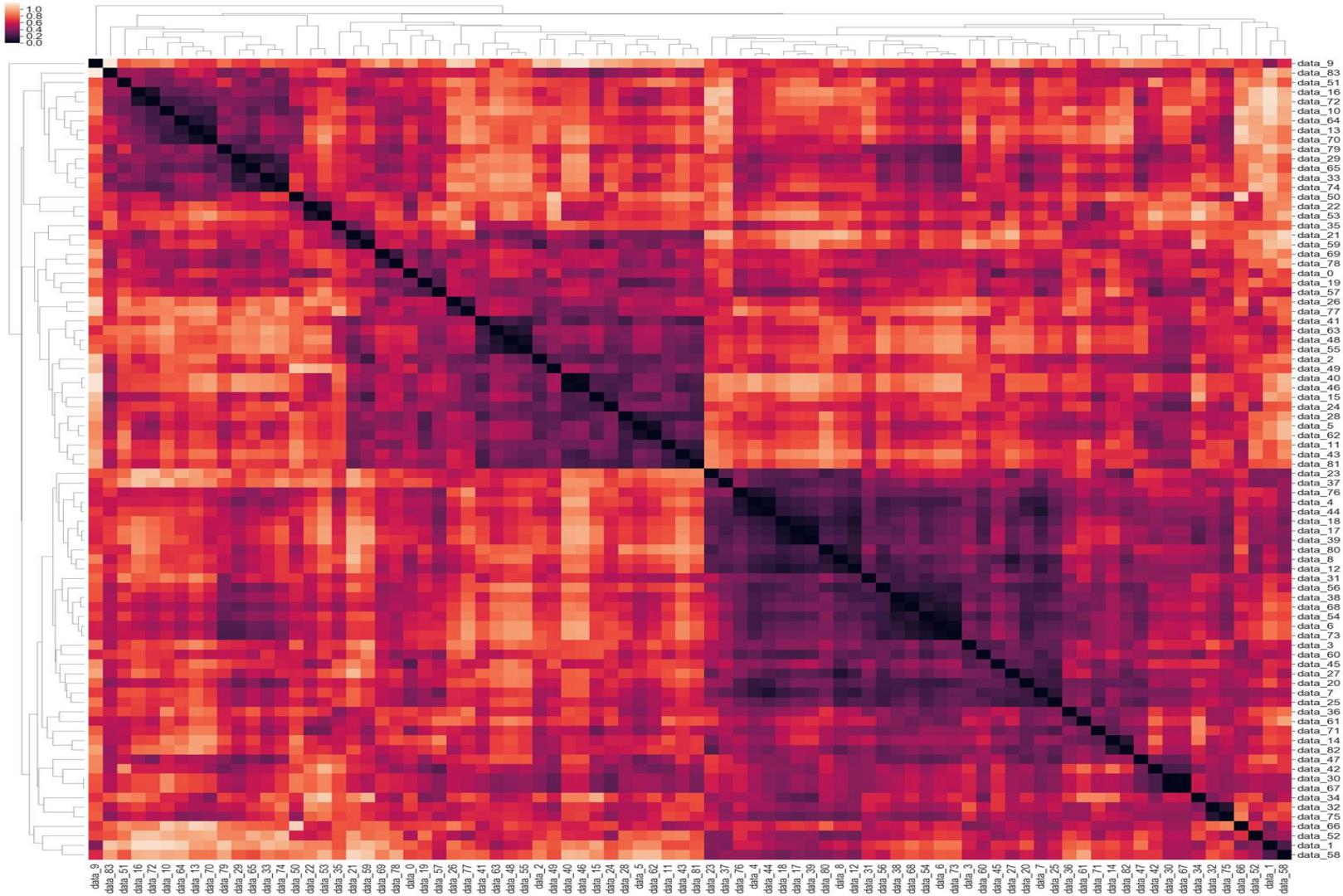


7.MaF2

No of
Objective = 5

Visualizing the
Decision space

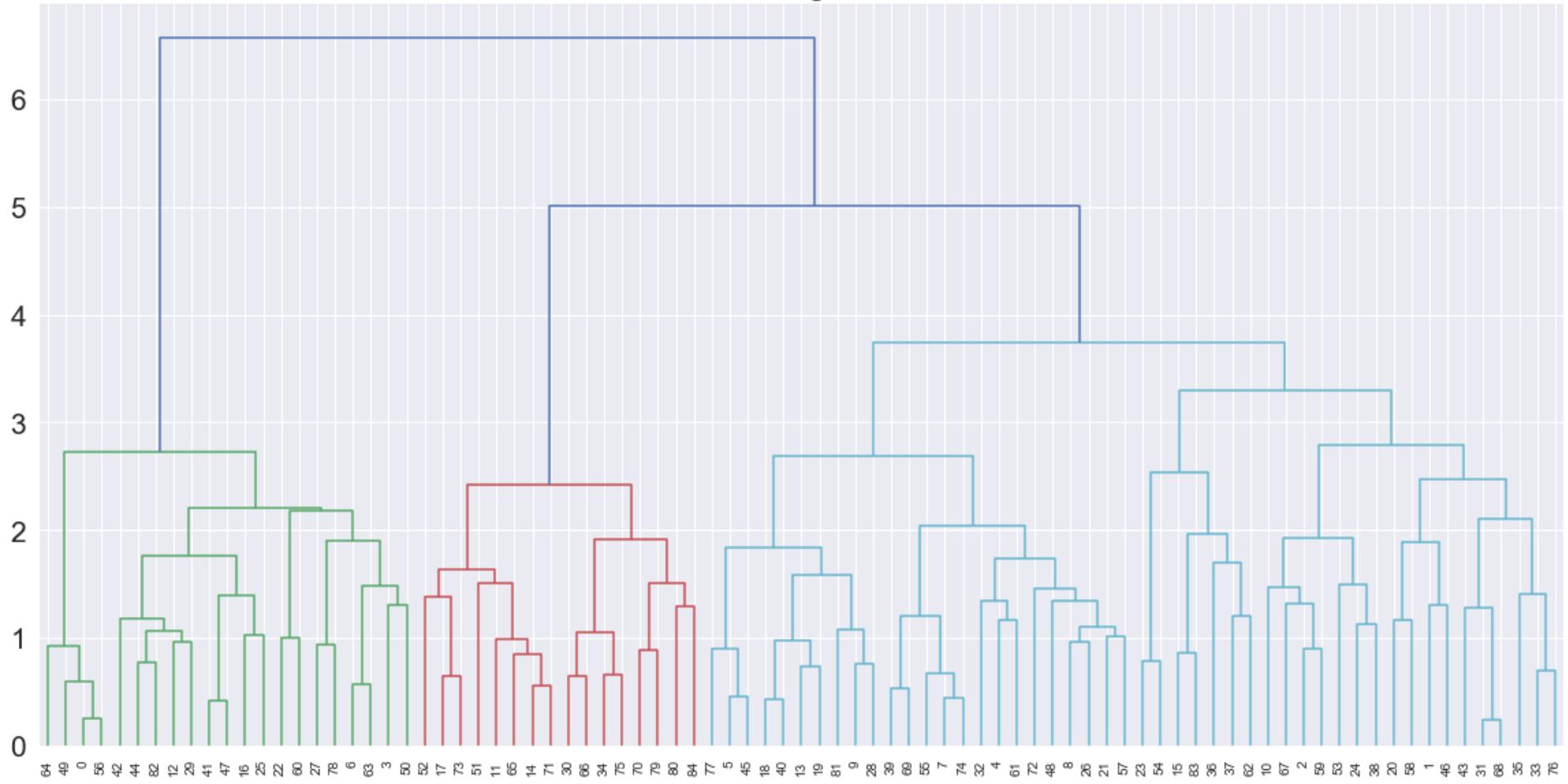
Figure 7a: Clustermap



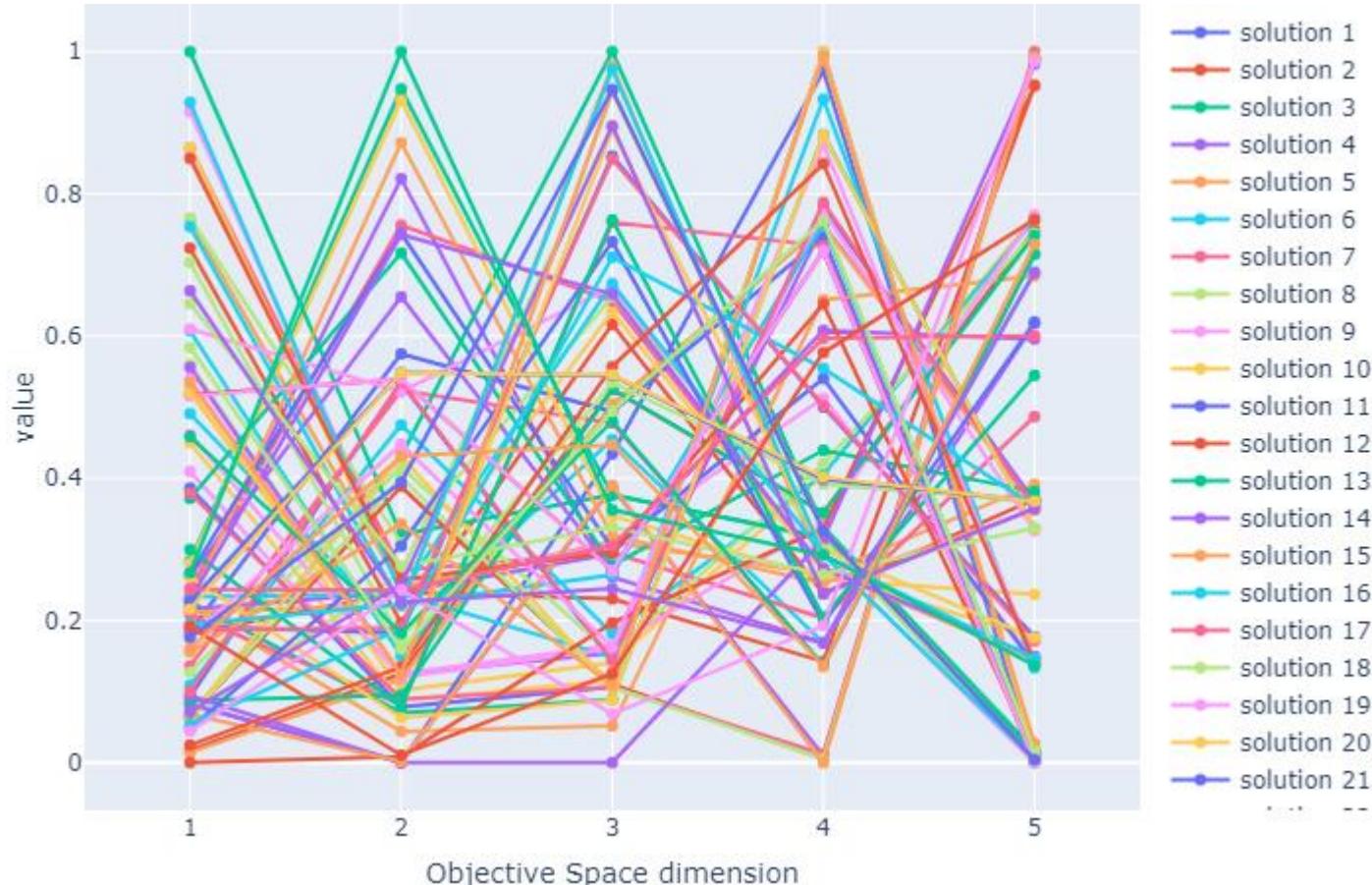
Visualizing the Decision space

Figure 7b: Dendogram

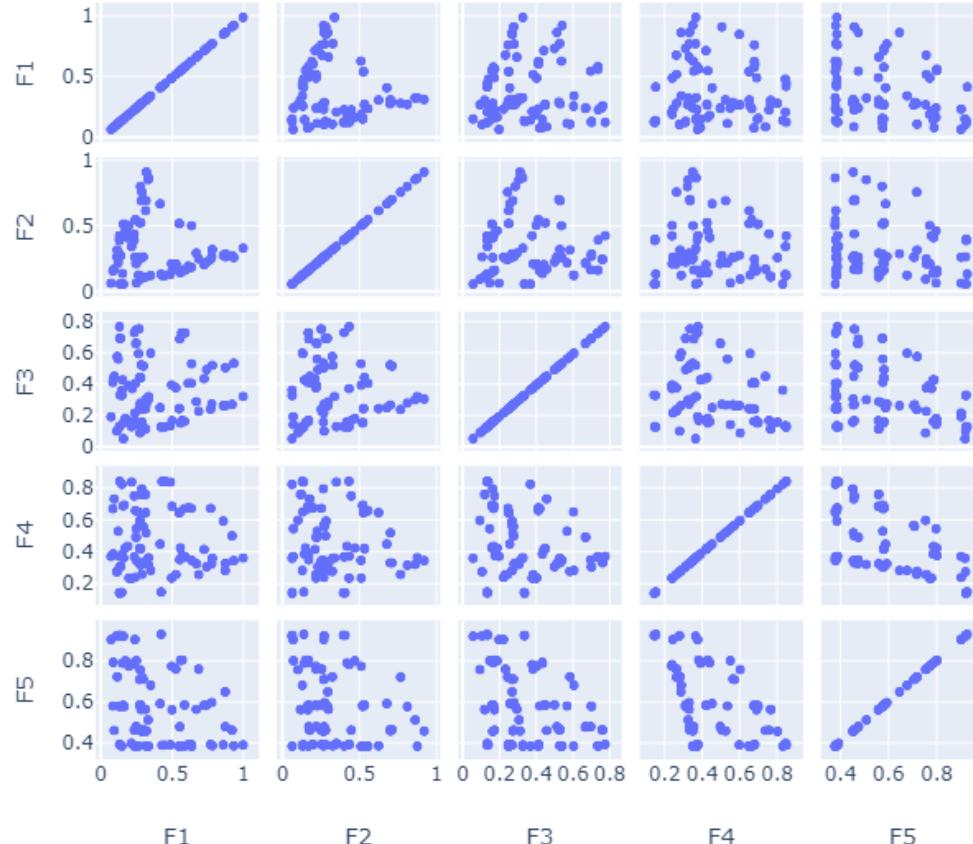
Dendograms



Visualizing the Objective space

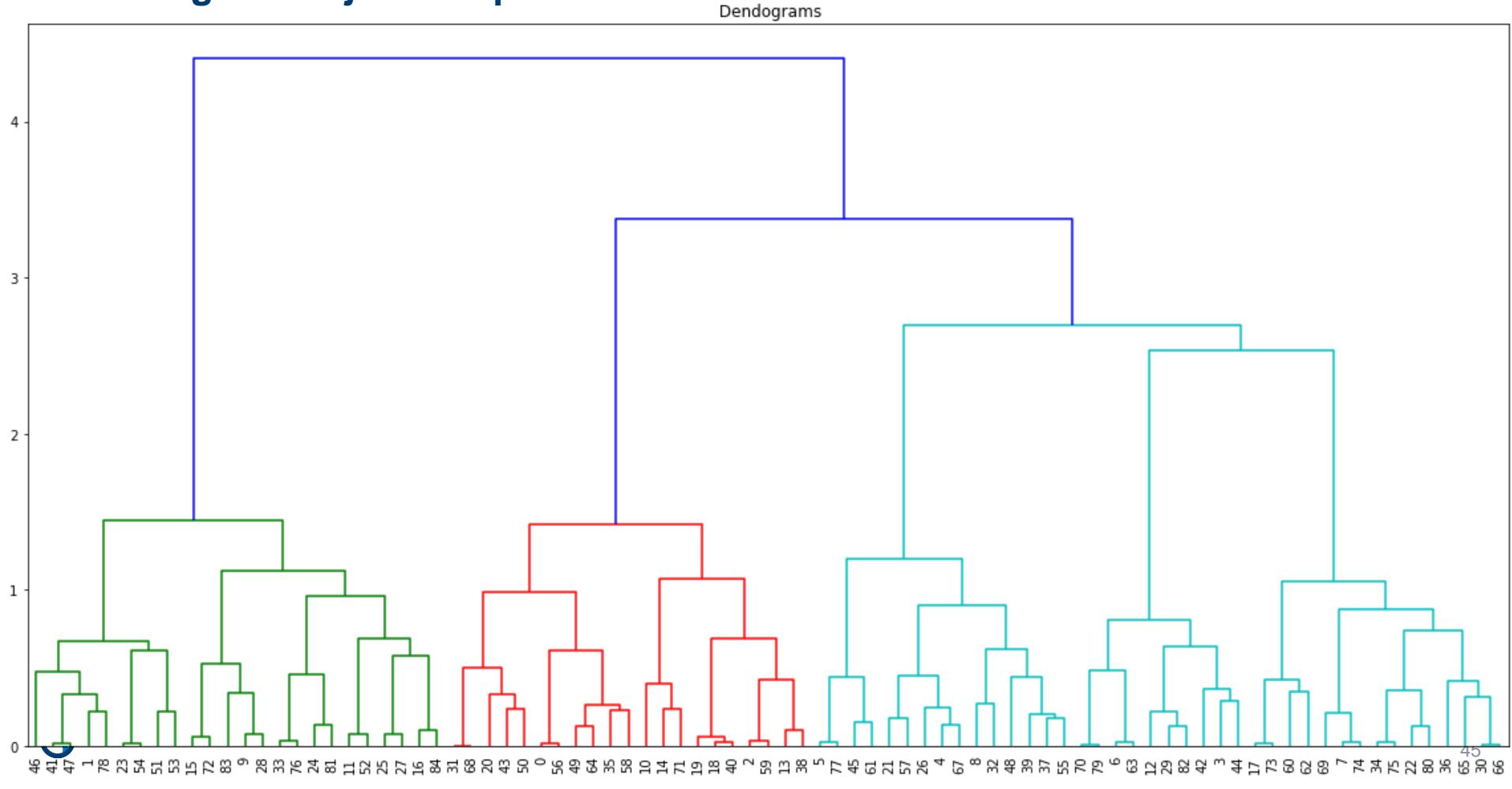


Visualizing the Objective space



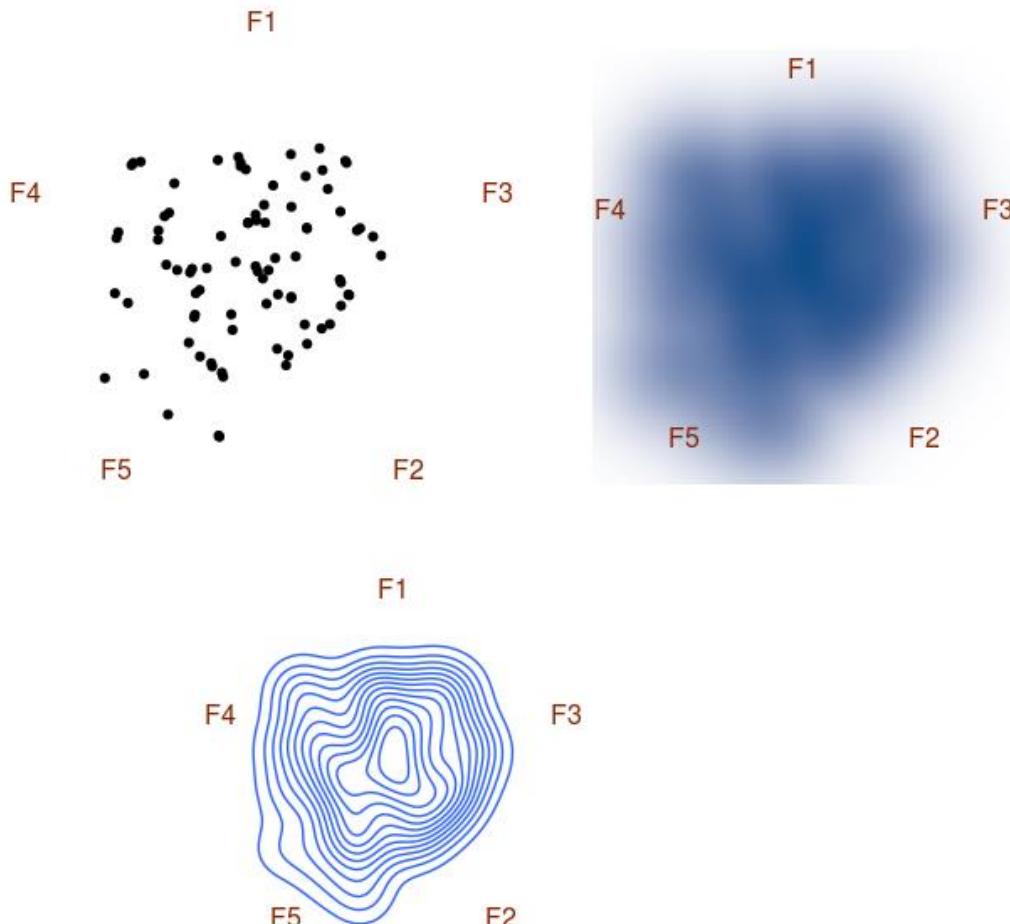
Visualizing the Objective space

Figure 7e: Dendrogram



Visualizing the Objective space

Figure 7f: Radvis and contour plot



Advantages and Disadvantages

Parallel Coordinates

Clustermaps

Radviz

Dendogram

Conclusion



CLUSTERING IN BOTH
DECISION AND OBJECTIVE
SPACE IS VISIBLE.



MAPPING BETWEEN
DECISION SPACE AND
OBJECTIVE SPACE IS
SHOWN.



MULTI-OBJECTIVE
OPTIMIZATION IS ACHIEVED.



Project#2

RadViz-3d visualization

“Three-dimensional Radial Visualization of High-dimensional Continuous or Discrete Data” – written by(Fan Dai, Yifan Zhu and Ranjan Maitra)

[Github Repository](#)

MRP(Max Ratio Projection) - To utilize grouping info

RadViz-3d

```
'#' 3D Radial Visualization function
#
##' @param data The dataset to visualize. Each row is an observation.
##' @param cl The class identification for each observation. The length of \code{cl} should be the same as the number of rows of \code{data}. If specified, different classes would be visualized with different colors.
##' @param domrp Logical. If true, MRP is applied to the original dataset. The default number of PCs used is \code{npc = 4}.
##' @param doGtrans Logical. If true, Gtrans is applied to the original dataset. @seealso \code{\link{Gtrans}}.
##' @param sqrt_scale Logical. If true, the distance of the points to be visualization will be augmented to square root of the original distance to make points further away from the origin.
##' @param color The colors for different classes. If not specified, \code{rainbow} is used.
##' @param colorblind Logical. The colors for different classes. If true, points are colorblind friendly. If false, \code{rainbow} is used.
##' @param axis Logical. If true, Cartesian axes would be plotted.
##' @param pradius The radius of the data point in RadViz3D. The default value is 0.01.
##' @param with.coord.labels Logical. If true, labels of coordinates will be added to the visualization.
##' @param coord.labels The labels for components of the dataset. When \code{domrp = TRUE}, the coord.labels will be changed to "Xi" representing the the ith direction obtained with MRP.
##' @param coord.font The font for labels of components.
##' @param coord.cex The size of the labels of components.
##' @param with.class.labels Logical. If true, class labels will be added to the visualization.
##' @param class.labels The labels for different classes in the dataset.
##' @param class.labels.locations Locations to put labels for each class. If not specified, an optimal location for each class would be calculated.
##' @param opt.anchor.order Logical. If true, the optimal order of anchor points corresponding to the components would be calculated. This is a very time consuming procedure. Not recommended if the number of components
##' @param ... Some other parameters from \link{mrp} and \link{Gtrans}.
##' @param alpha The alpha value that controls the transparency of the sphere in 3d visualization
##' @param lwd The line width in the visualization
##' @return A list with the elements
##' \item{mrp.res}{The result of MRP is the argument \code{domrp = TRUE}. See also \code{\link{mrp}}.}
```



1. Iris Dataset

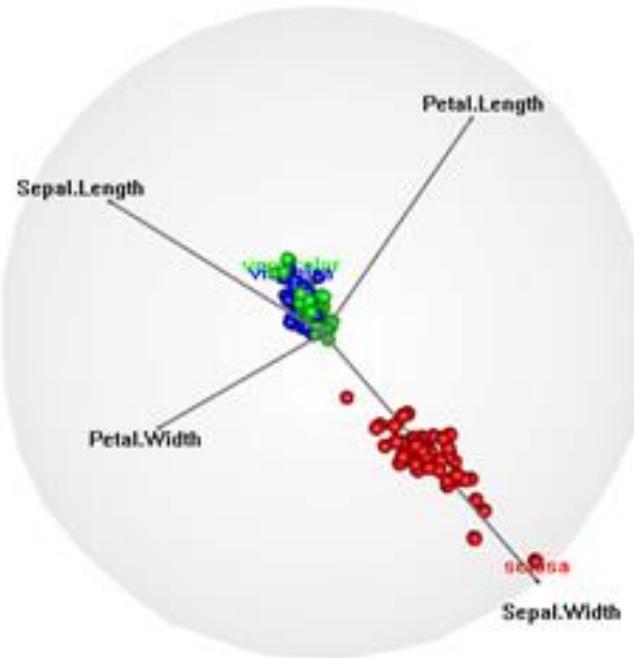
No. of Instances: 50 each

No. of Attributes: 4

Use: To predict iris plant type

Columns: sepal length, sepal width, Petal length
and petal width

Dataset Info



2. Adult Dataset

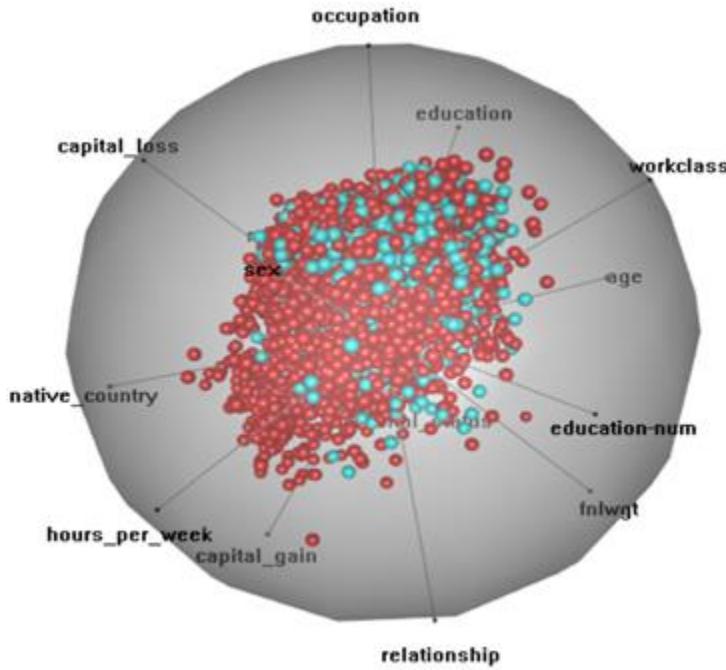
Use: To predict if income will exceed \$50k/yr or not

No. of attributes: 14

No. of instances: 48842

Columns: age, work class, fnlwgt, education, education-num, marital-status, occupation, relationship, race, sex, capital-gain, capital-loss, hours-per-week, native-country and salary

[Dataset Info](#)



3. Wine dataset

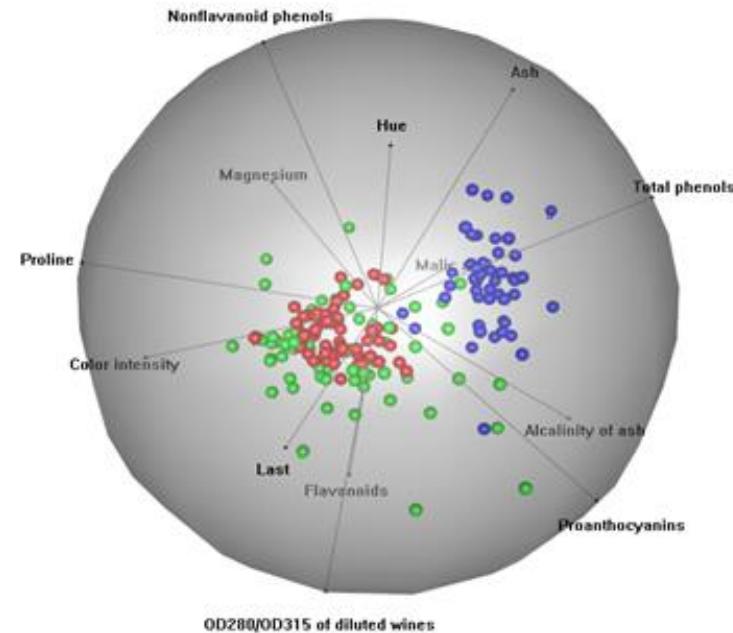
Use: To predict the origin of wine

No. of attributes: 13

No. of instances: 178

Columns: "Alcohol", "Malic acid", "Ash", "Alcalinity of ash", "Magnesium", "Total phenols", "Flavanoids", "Nonflavanoid phenols", "Proanthocyanins", "Color intensity", "Hue", "OD280/OD315 of diluted wines" and "Proline"

[Dataset Info](#)



4. Breast Cancer Wisconsin (Diagnostic) dataset

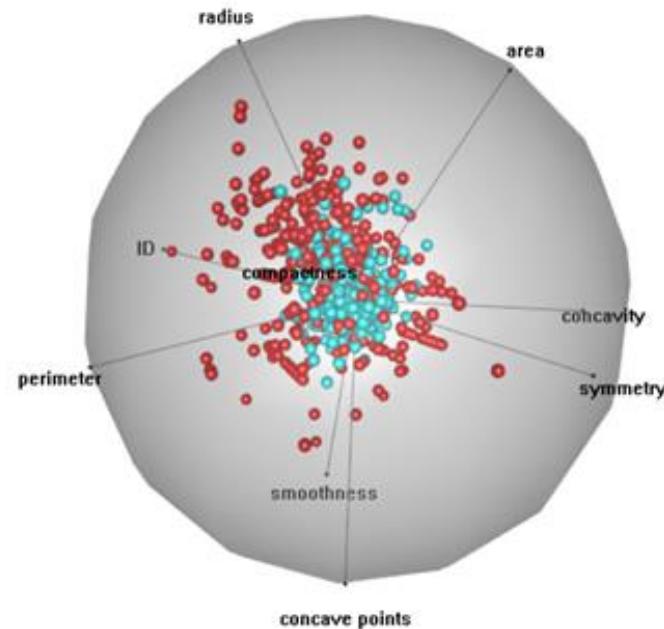
Use: to predict two types of cancer

No. of attributes: 32

No. of instances: 569

Columns: "Alcohol", "Malic acid", "Ash", "Alcalinity of ash", "Magnesium", "Total phenols", "Flavanoids", "Nonflavanoid phenols", "Proanthocyanins", "Color intensity", "Hue", "OD280/OD315 of diluted wines" and "Proline"

[Dataset Info](#)



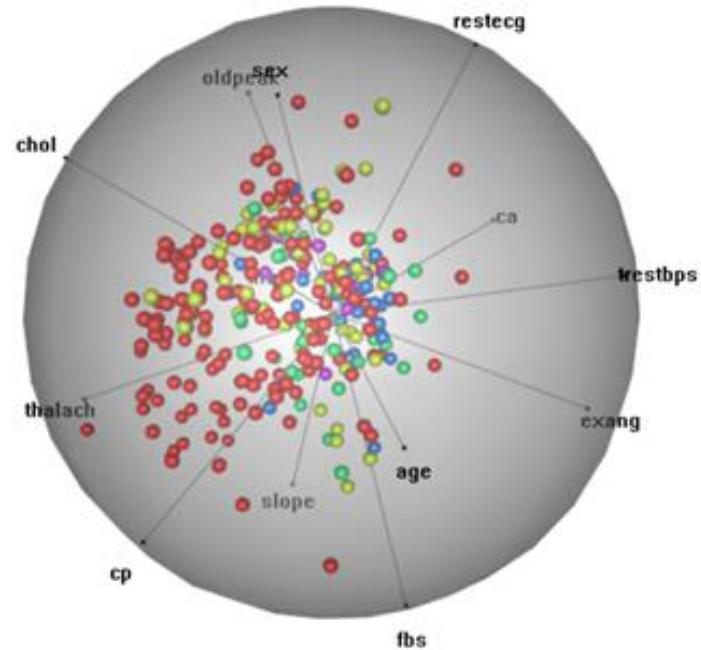
5. Heart disease dataset

Use: to predict heart disease presence

No. of attributes: 75

No. of instances: 303

[Dataset Info](#)

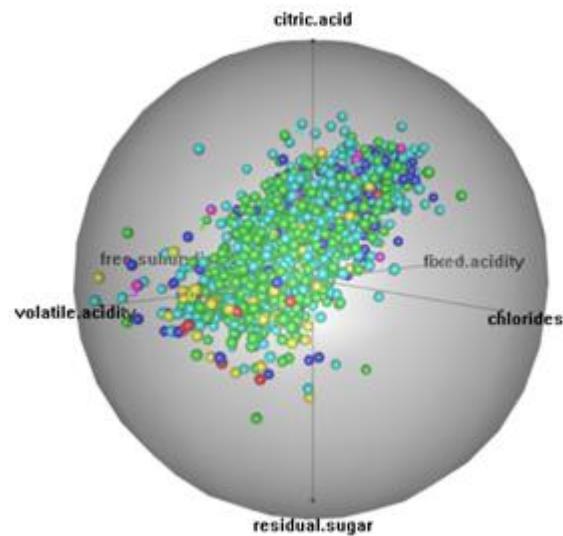


6. Wine Quality Dataset

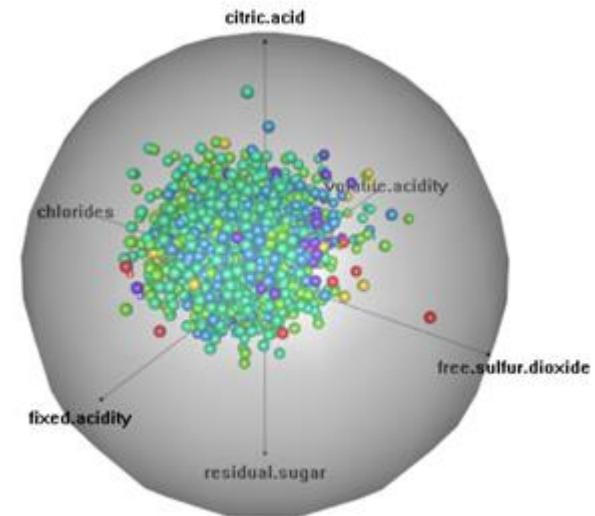
Use: To predict the wine quality

No. of Attributes: 12

No. of Instances: 4898



Red Wine Visualization



White Wine Visualization

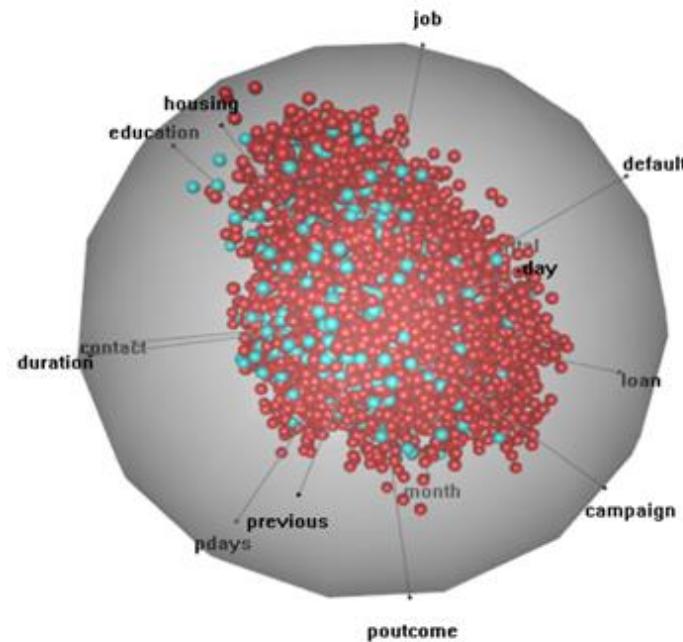
7. Bank Marketing dataset

Use: To predict if the client will subscribe a term deposit

No. of attributes: 17

No. of instances: 45211

[Dataset Info](#)



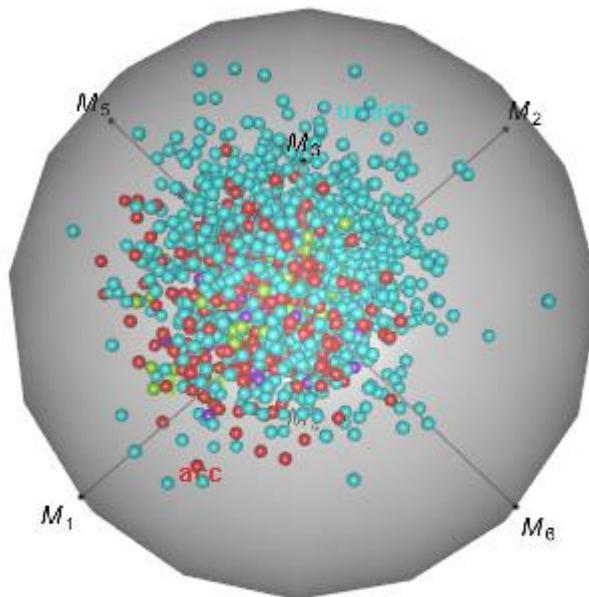
8. Car Evaluation dataset

Use: To predict car condition

No. of Instances: 1728

No. of Attributes: 6

[Dataset Info](#)

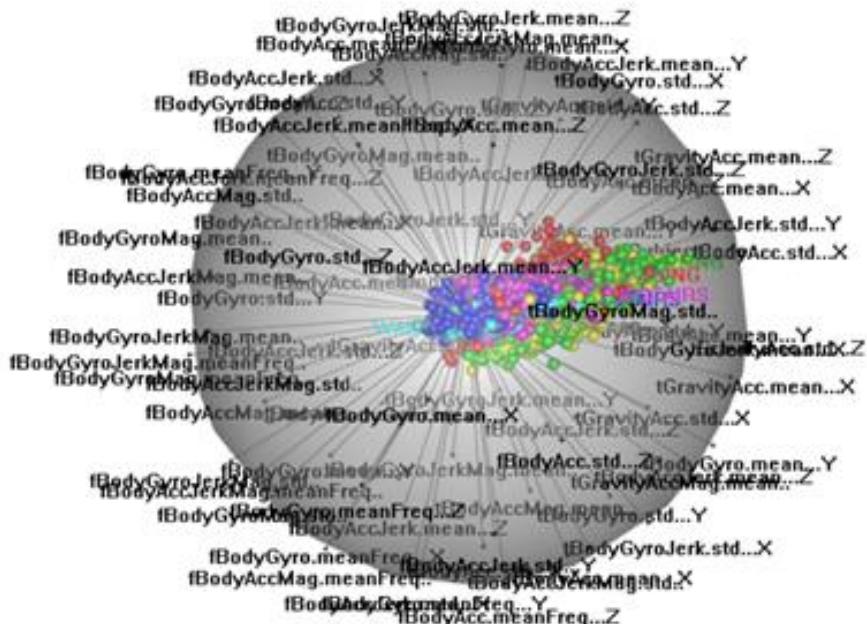


9. Human Activity Recognition Using Smartphone

Use: To predict different human activities using sensors reading

No. of attributes: 561

No. of instances: 10299



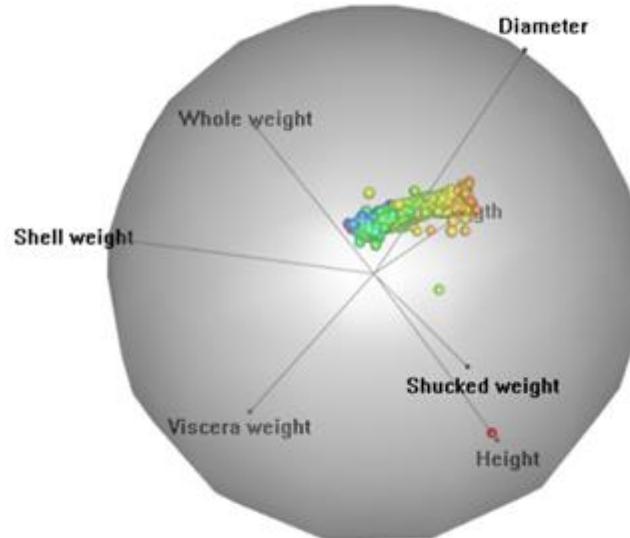
10. Abalone dataset

Use: To predict the age of abalone

No. of attributes: 8

No. of instances: 4177

[Dataset Info](#)



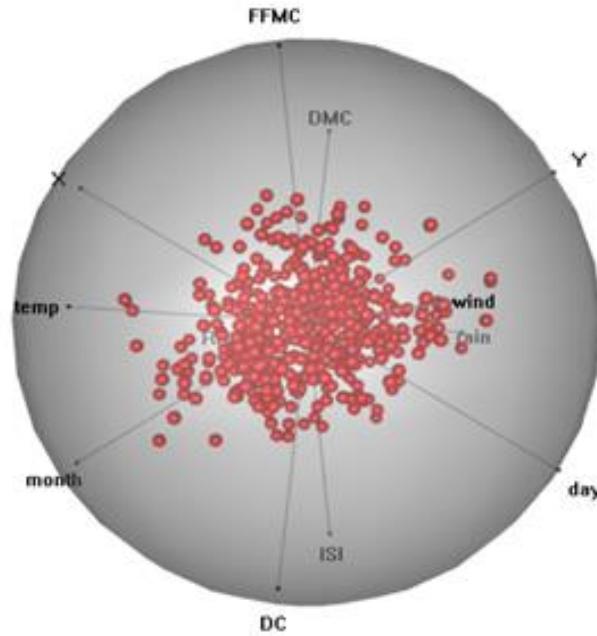
11. Forest fires dataset

Use: To predict the burned area of forest fires

No. of attributes: 13

No. of instances: 517

[Dataset Info](#)



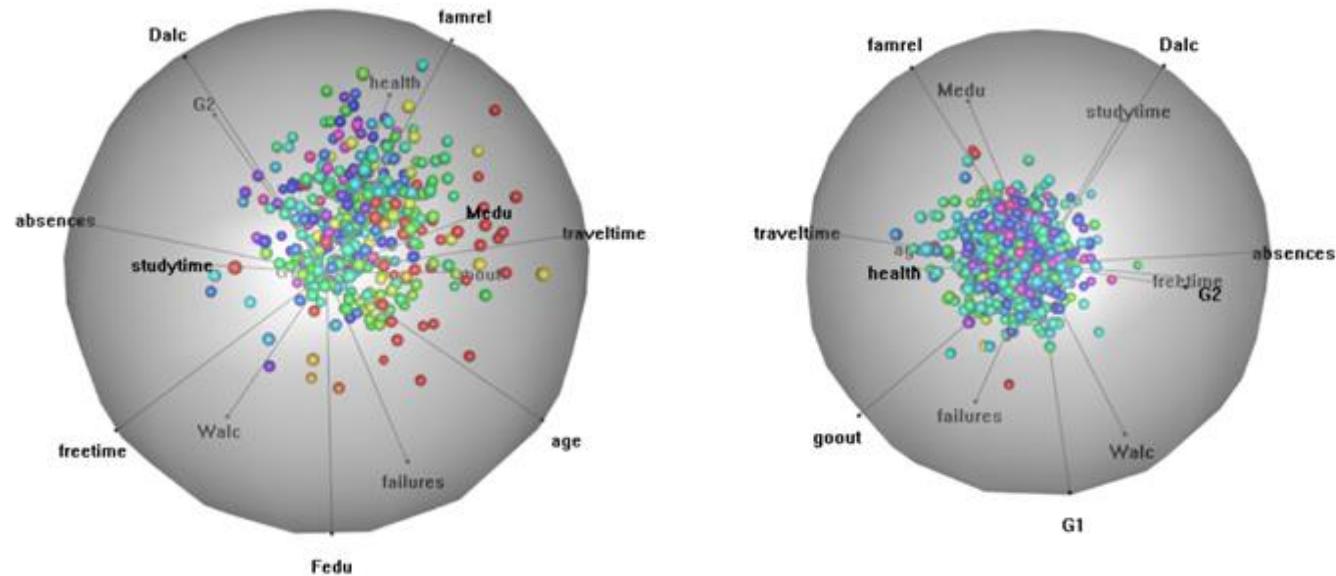
12. Student Performance dataset

Use: To predict the burned area of forest fires

No. of attributes: 33

No. of instances: 649

[Dataset Info](#)



RadViz-3d visualization of Student Maths and Student Por dataset

Conclusion

- RadViz-3d(sphere) provides more insight than 2d radviz.
- It adds 4th dimension by using colors to show the clustering and in clustering.
- If the attributes are nearby then visualizing the relation becomes better using radviz-3d

References

1. GitHub R library: <https://github.com/fanne-stat/radviz3d>
2. Research paper: [Three-dimensional Radial Visualization of High-dimensional Continuous or Discrete Data](#)