RADIAL VISUALIZATION OF MULTIDIMENSIONAL/MULTIVARIATE DATA: A SURVEY

Gabriel Zhou

RADIAL VISUALIZATION

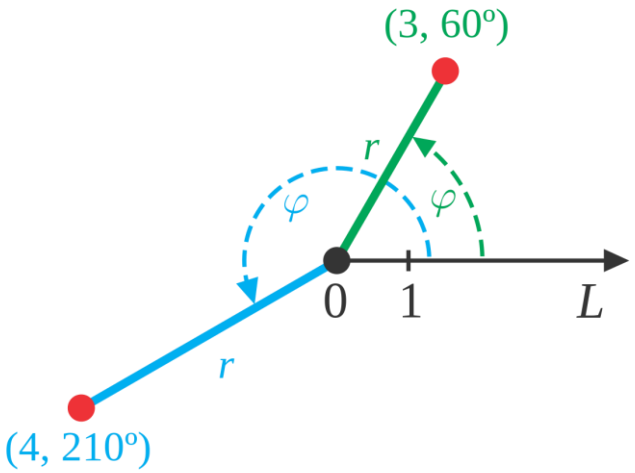
- Radial visualization describes any interactive system that arranges data in a circular fashion.

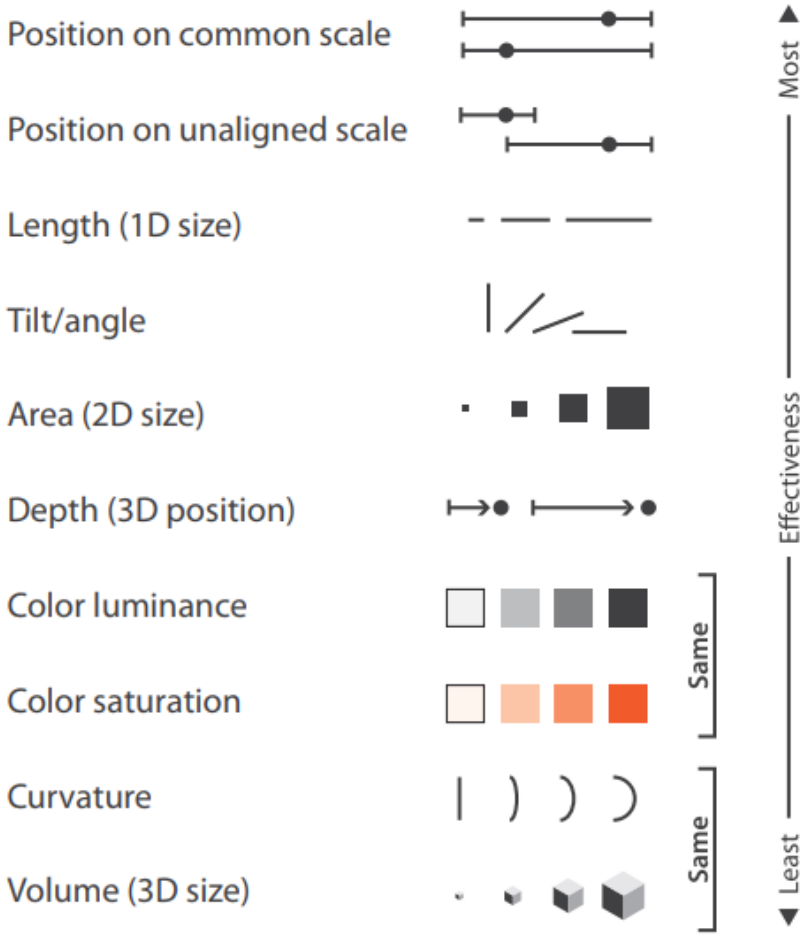
MULTIDIMENSIONAL/MULTIVARIATE

- Key attributes (independent attributes) and value attributes (dependent attributes)
- Key attributes act as index to look up value attributes
- Multidimensional – multiple key attributes
- Multivariate – multiple value attributes

- Attributes, dimensions, and variables are used as synonyms in visualization papers. Multidimensional data are often referred to multivariate data.

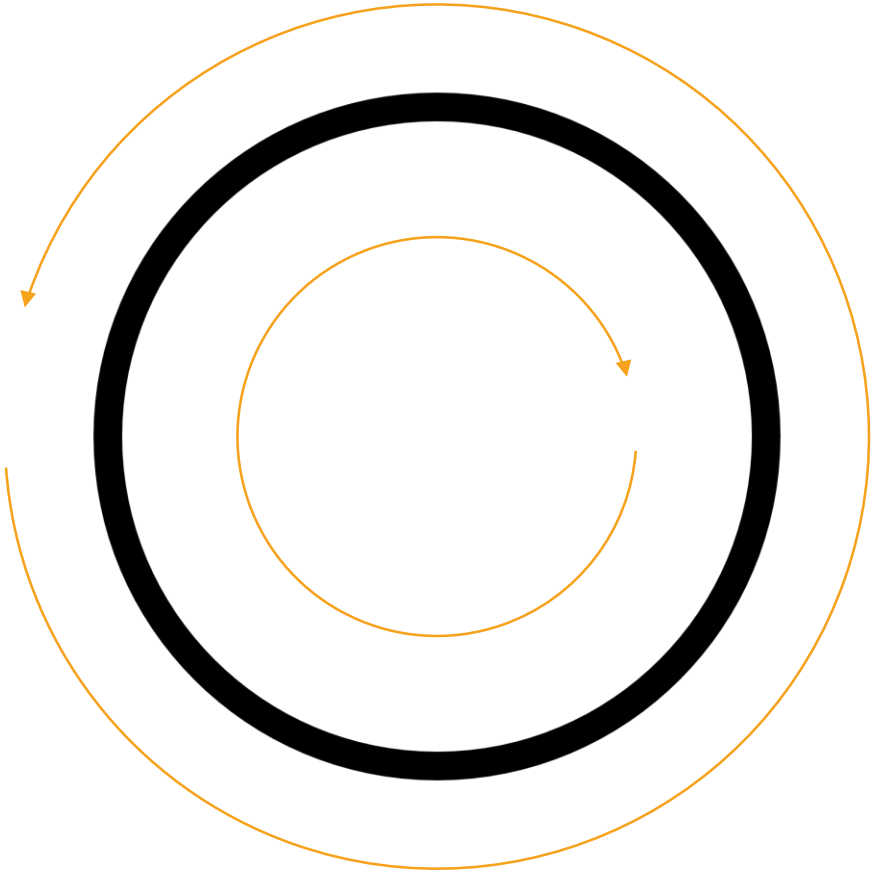
WHY USE RADIAL VISUALIZATION TO PRESENT MULTIDIMENSIONAL/MULTIVARIATE DATA ?





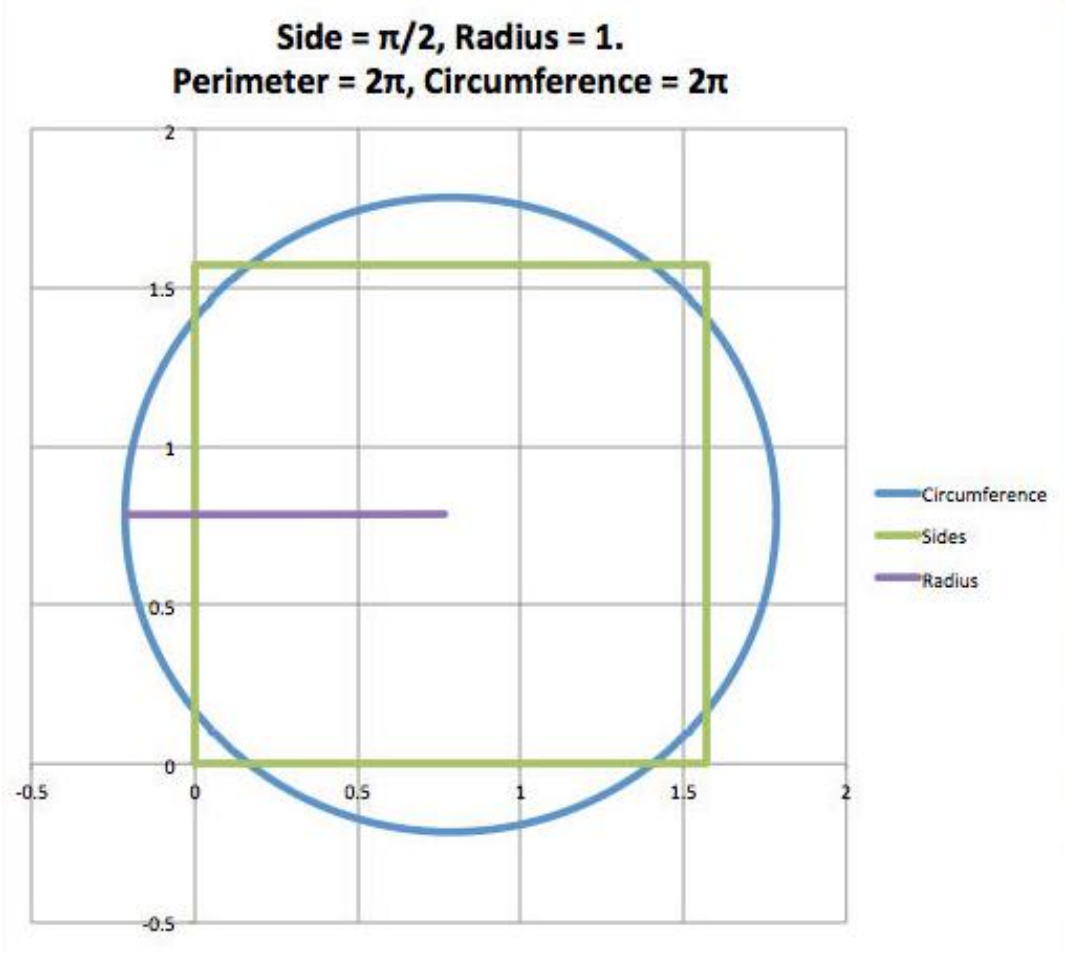
[Fig 5.1. T. Munzner, Visualization Analysis and Design, Florida: A K Peters/CRC Press, 2014.]

WHY USE RADIAL VISUALIZATION TO PRESENT MULTIDIMENSIONAL/MULTIVARIATE DATA ?



- Inherent cyclic

WHY USE RADIAL VISUALIZATION TO PRESENT MULTIDIMENSIONAL/MULTIVARIATE DATA ?



- Compactness

[WikiHow, "How to Determine a Square and Circle of Equal Perimeter," 2019 [Online] Available: https://www.wikihow.com/Determine-a-Square-and-Circle-of-Equal-Perimeter]

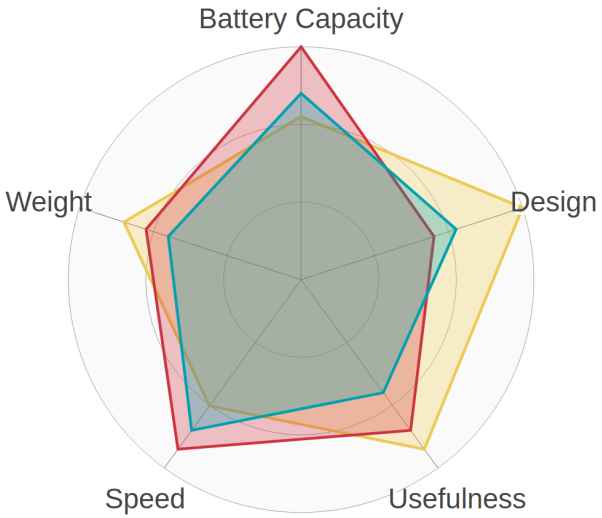
AXIS BASED

SEGMENT BASED

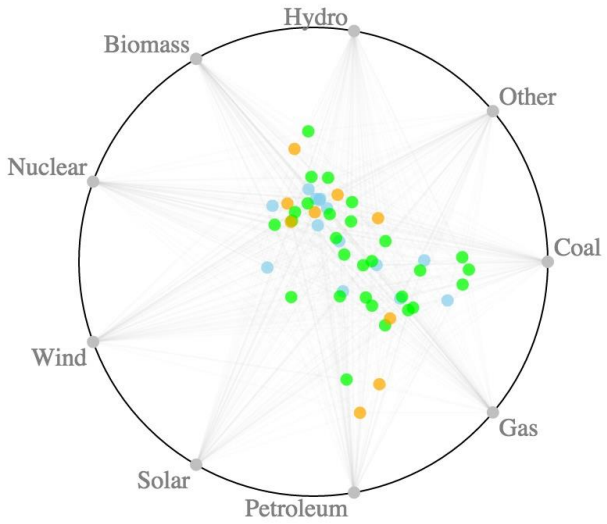
OTHERS

AXIS BASED

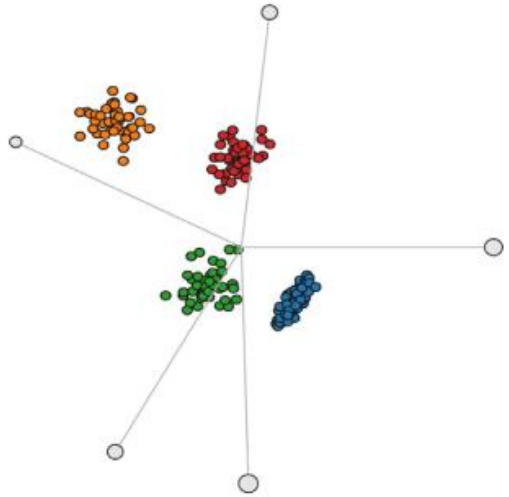
- Compare data
- Discover clusters, patterns, outliers, etc.



Radar Chart



RadViz

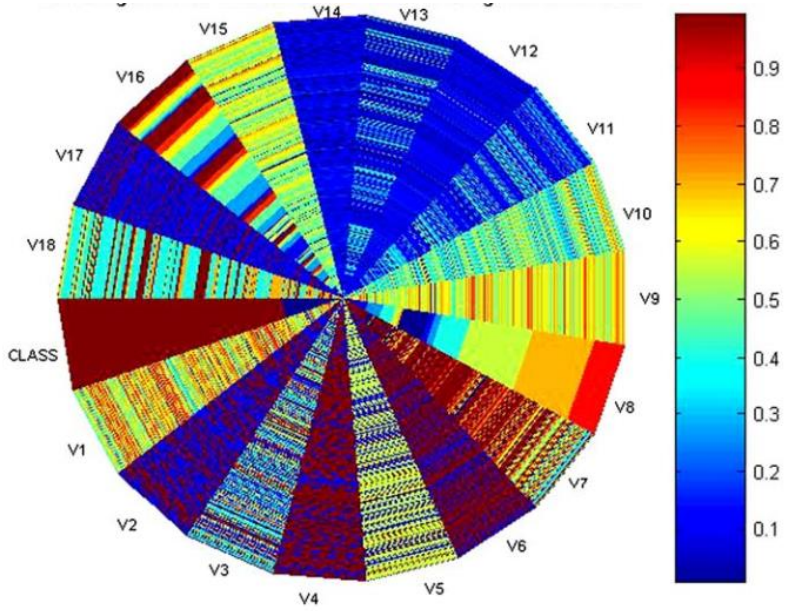


Star Coordinates

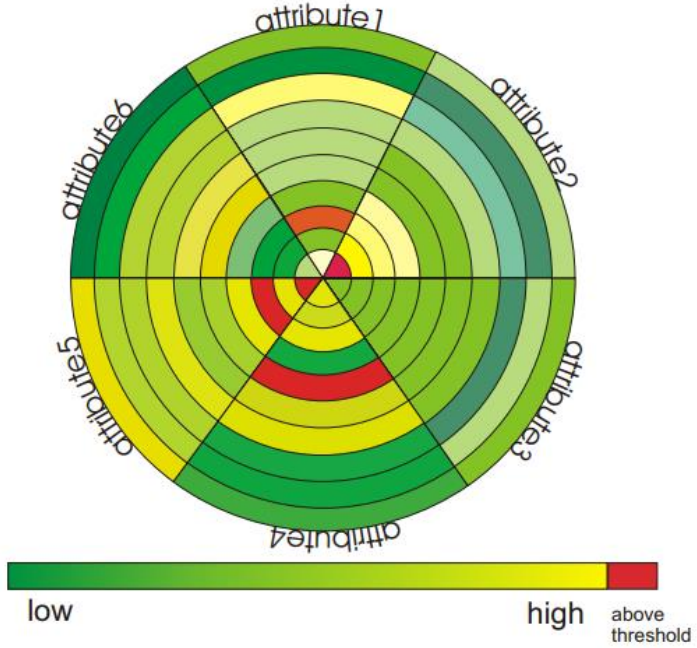
[L. Spyna, "React SVG radar chart," ITNEXT, 2018 [Online] Available: https://itnext.io/react-svg-radar-chart-a89d15760e8]
["Radviz by Biovisualize," [Online] Available: https://recordnotfound.com/radviz-biovisualize-91350]
[Fig 6. G. G. Zanabria, L. G. Nonato, E. G. Nieto, "iStar (i*): An interactive star coordinates approach for high-dimensional data exploration", Computers & Graphics, vol. 60, pp. 107-118, 2016.]

SEGMENT BASED

- Time referenced data
- Periodic property
- Discover trends, patterns, correlations of data over time



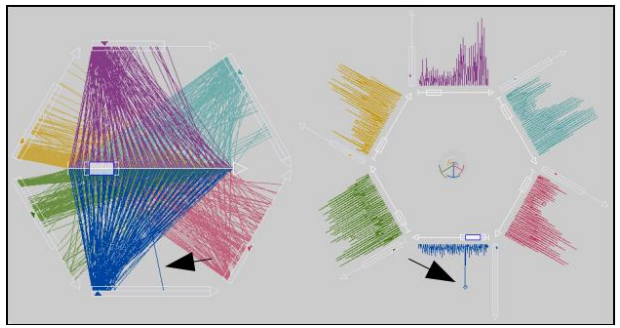
Circle Segments



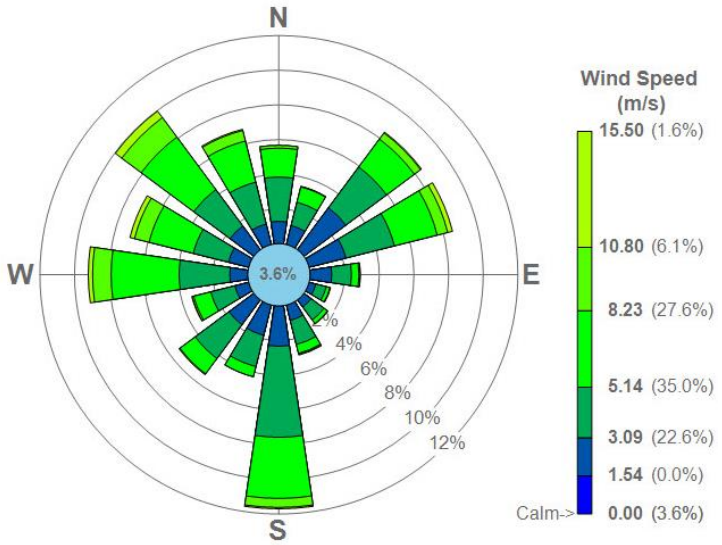
Circle View

[Fig 7. C. P. Lim, S. L. Wang, K. S. Tan, J. Navarro and L. C. Jain, "Use of the Circle Segments Visualization Technique for Neural Network Feature," *Neurocomputing,* vol. 73, no. 4, pp. 613-621, 2010.]
[Fig 2. D. A. Keim, J. Schneidewind and M. Sips, "CircleView: A New Approach for Visualizing Time-related Multidimensional Data Sets," in *In Proc. Advanced Visual Interfaces (AVI)*, 2003.]

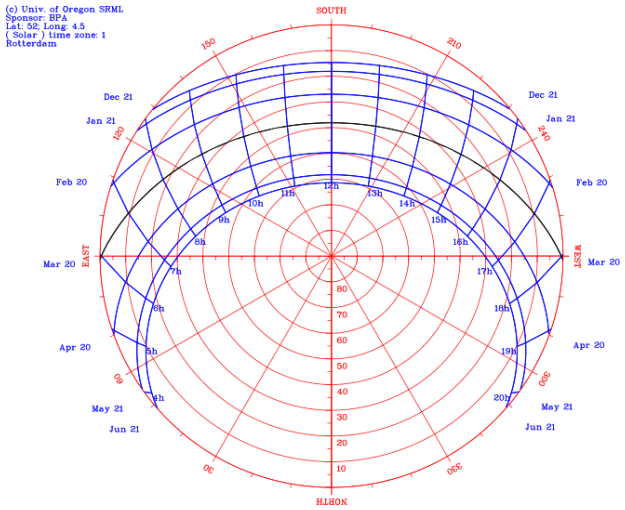
OTHERS



VisAxes



Wind Rose



Sun Path
Polar Chart

[Fig 10. C. Tominski, J. Abello and H. Schumann, "Axes-Based Visualizations with Radial Layouts," in *In Proc. of ACM Symp. on Applied Computing (SAC)*, 2004.]
[BREEZE Software, "Wind rose plot for LaGuardia Airport (LGA), New York, New York," 2008. [Online] Available: http://www.breeze-software.com/]
[University of Oregon, "Sun path polar chart for any location at the latitude of Rotterdam," 2010. [Online] Available: http://solardat.uoregon.edu/PolarSunChartProgram.html]

OVERVIEW

Origin

Encoding

Limitations and drawbacks

Improvement

Comparison

Case Study

THANK YOU!

QUESTIONS?

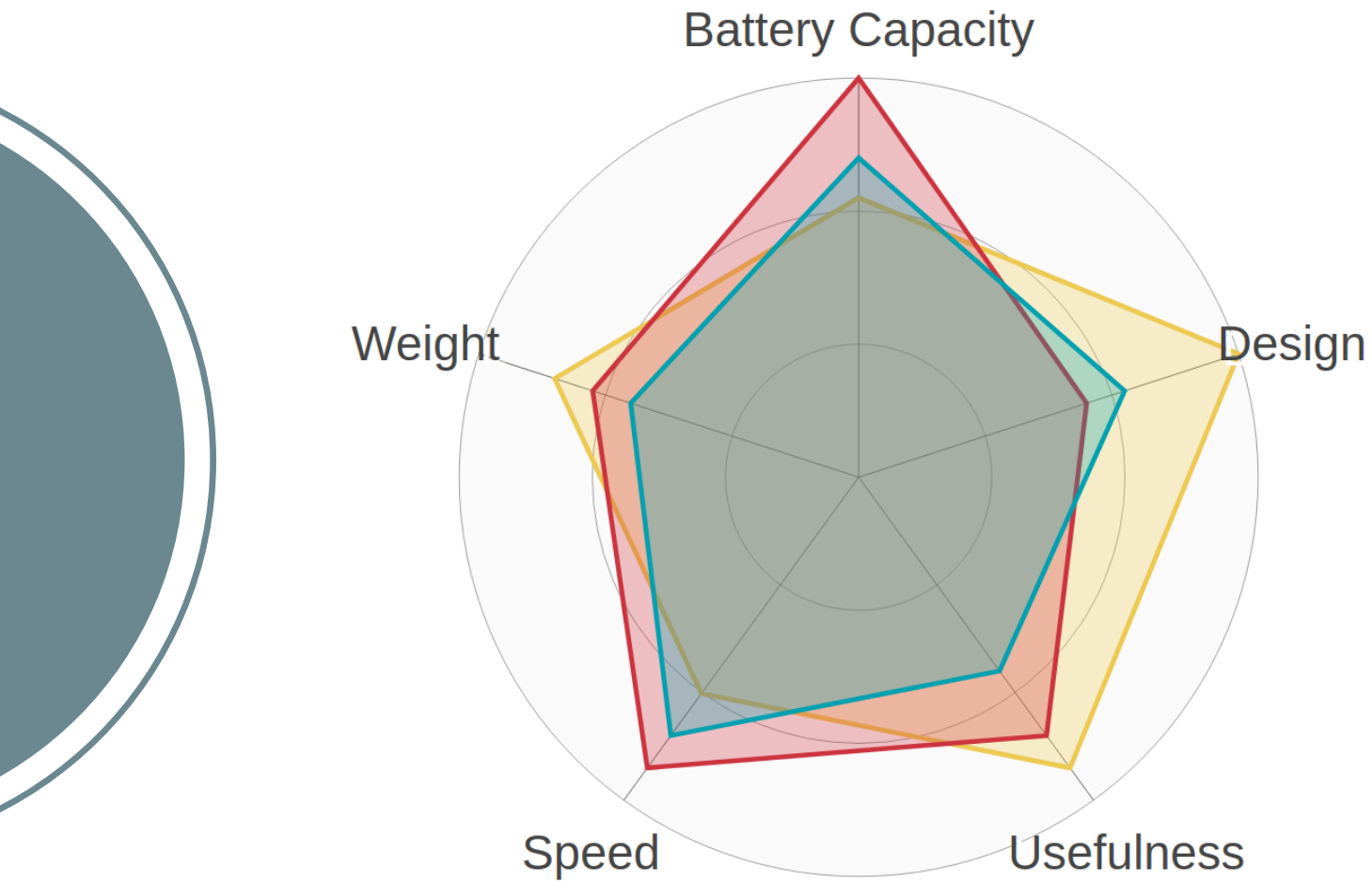
AXIS BASED

RADAR CHART

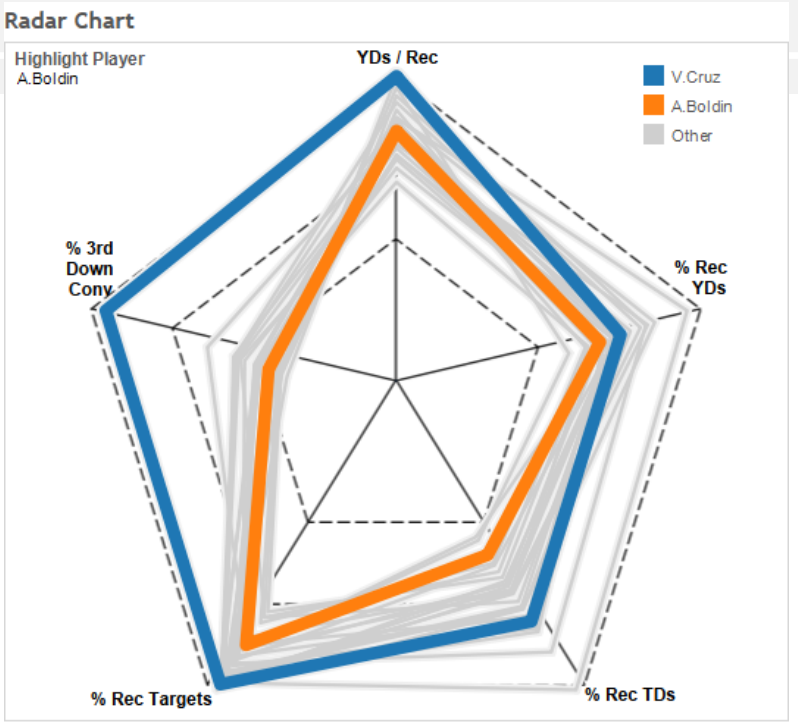
RADVIZ

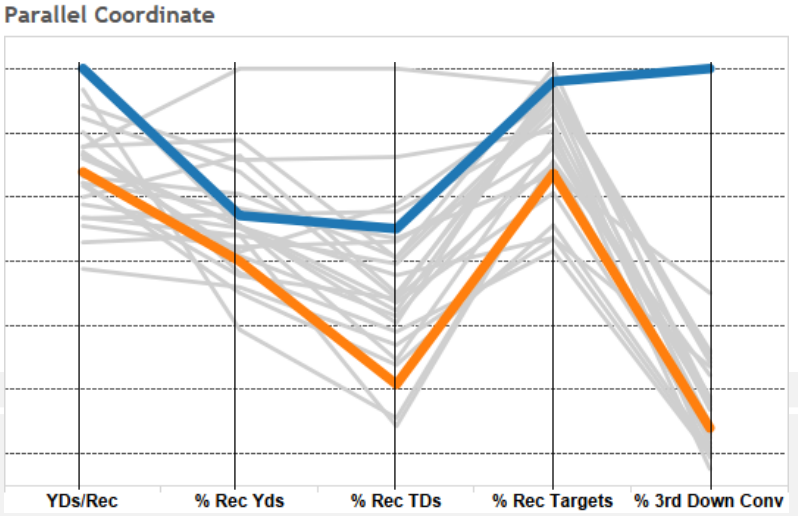
STAR COORDINATES

RADAR CHART

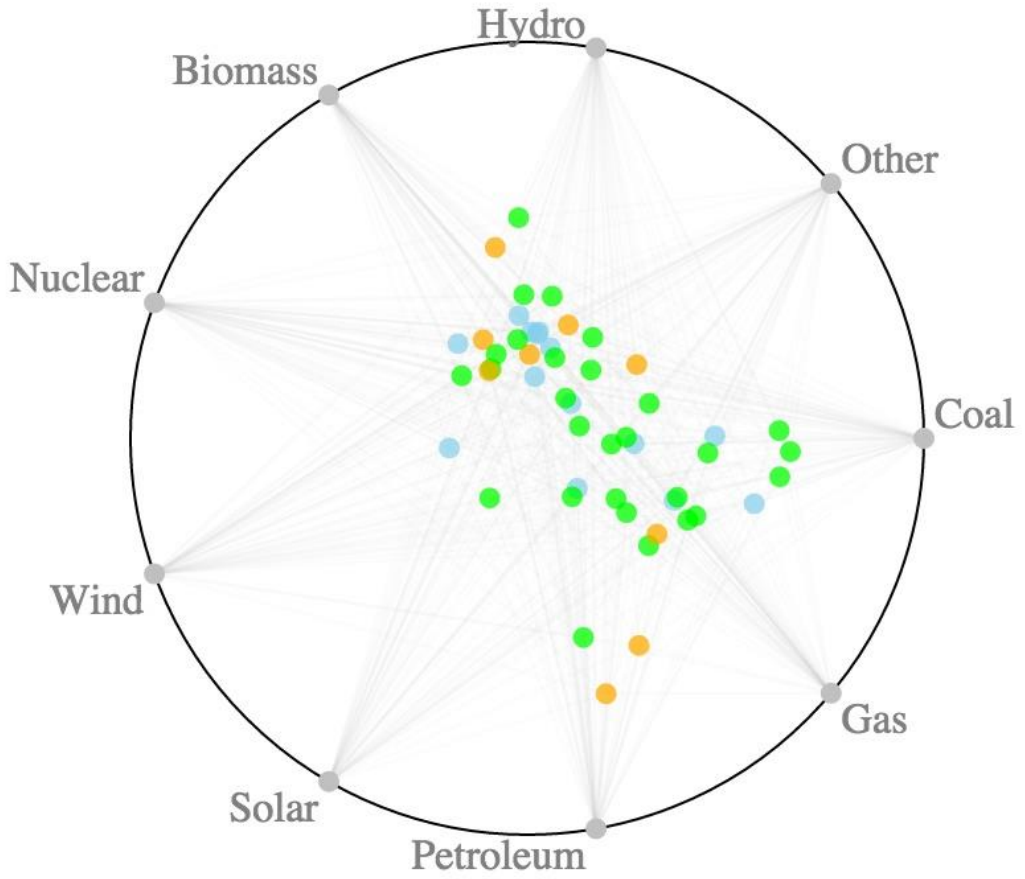


RADAR CHART

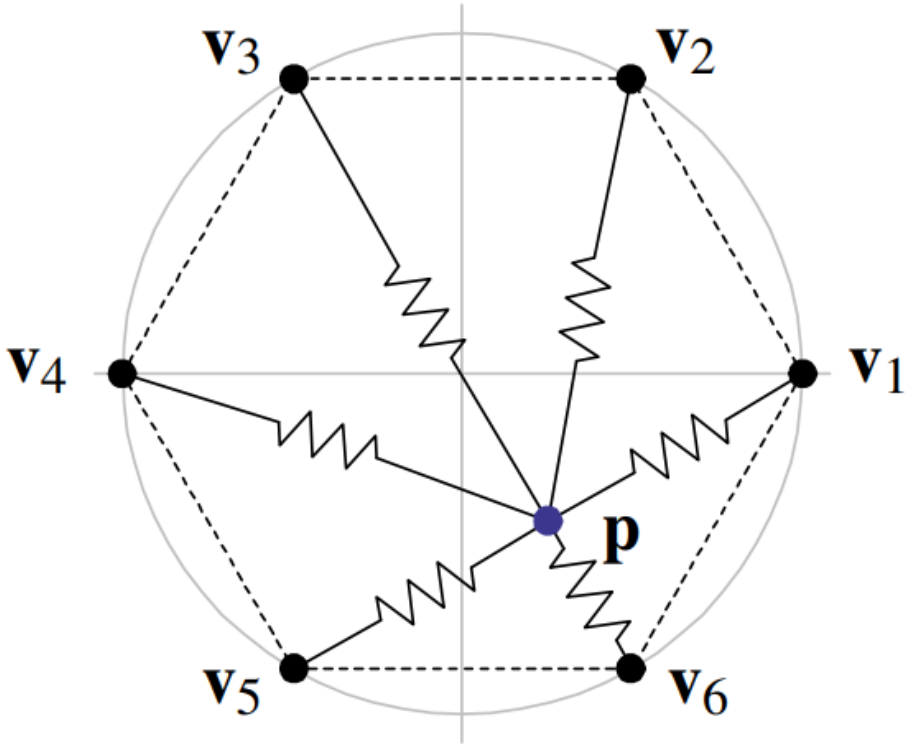

Radar Chart
Highlight Player
A.Boldin
YDs / Rec
V.Cruz
A.Boldin
Other
% 3rd Down Conv
% Rec YDs
% Rec Targets
% Rec TDs


Parallel Coordinate
YDs/Rec
% Rec Yds
% Rec TDs
% Rec Targets
% 3rd Down Conv

RADVIZ

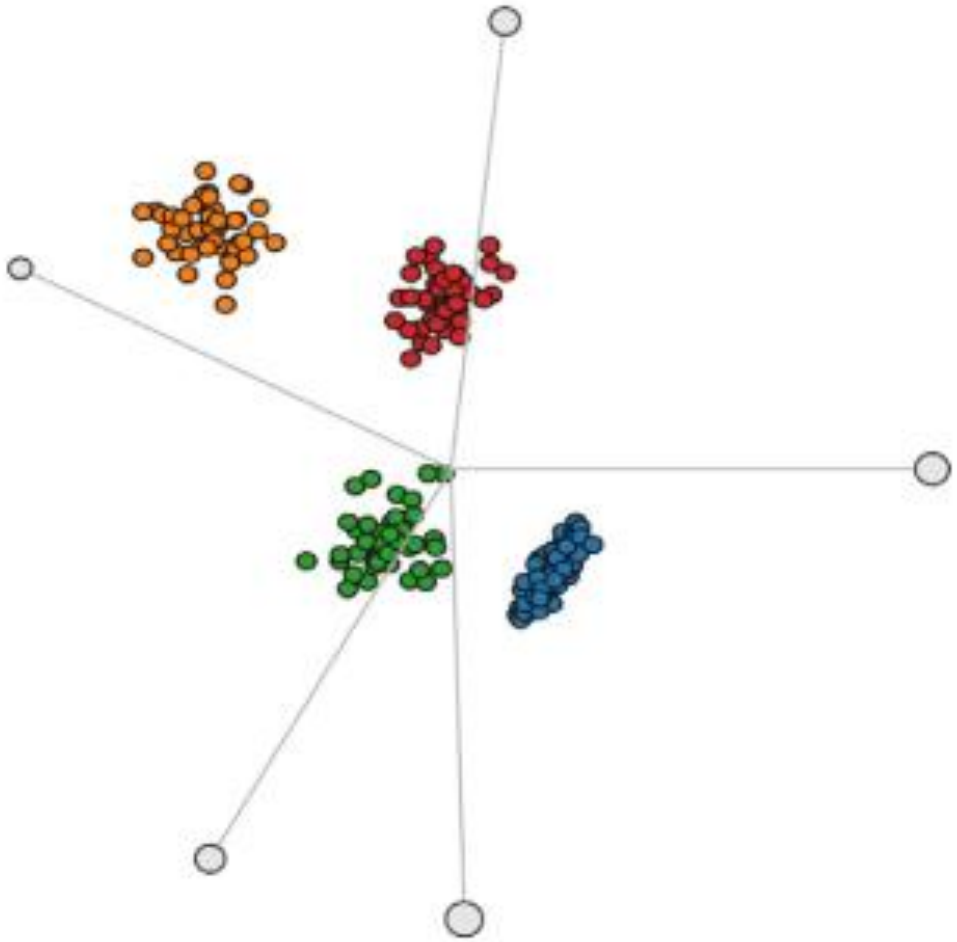


RADVIZ

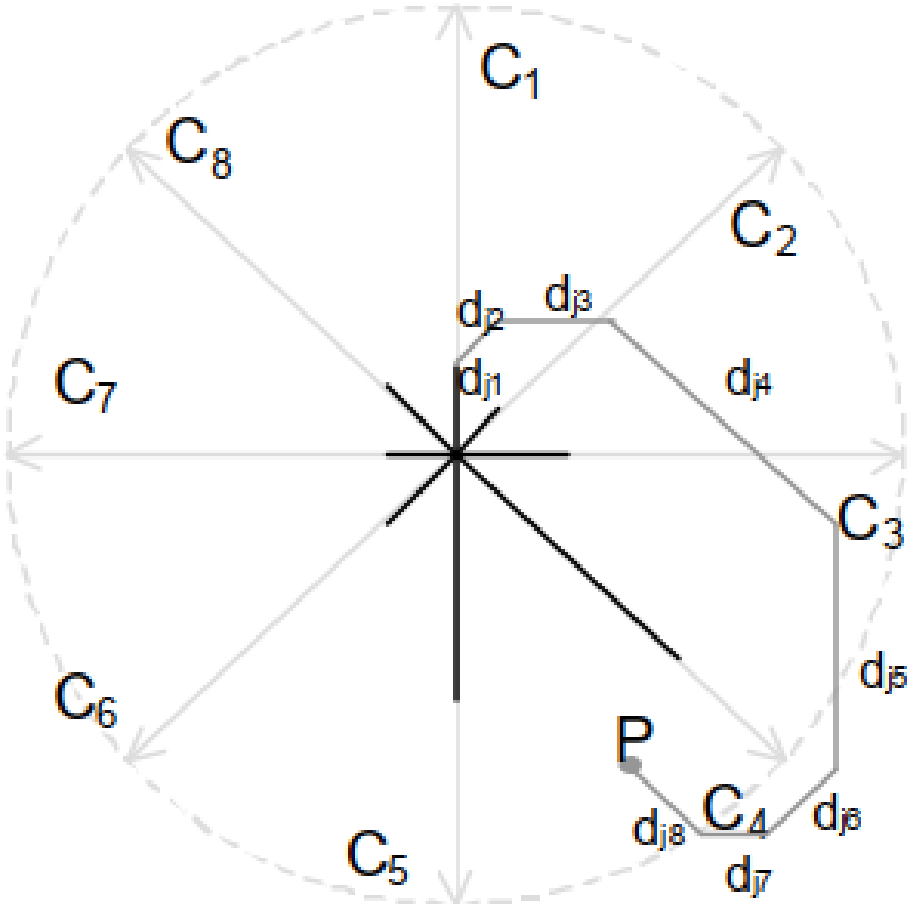


RadViz

STAR COORDINATE



Start
Coordinate



AXIS BASED

SEGMENT BASED

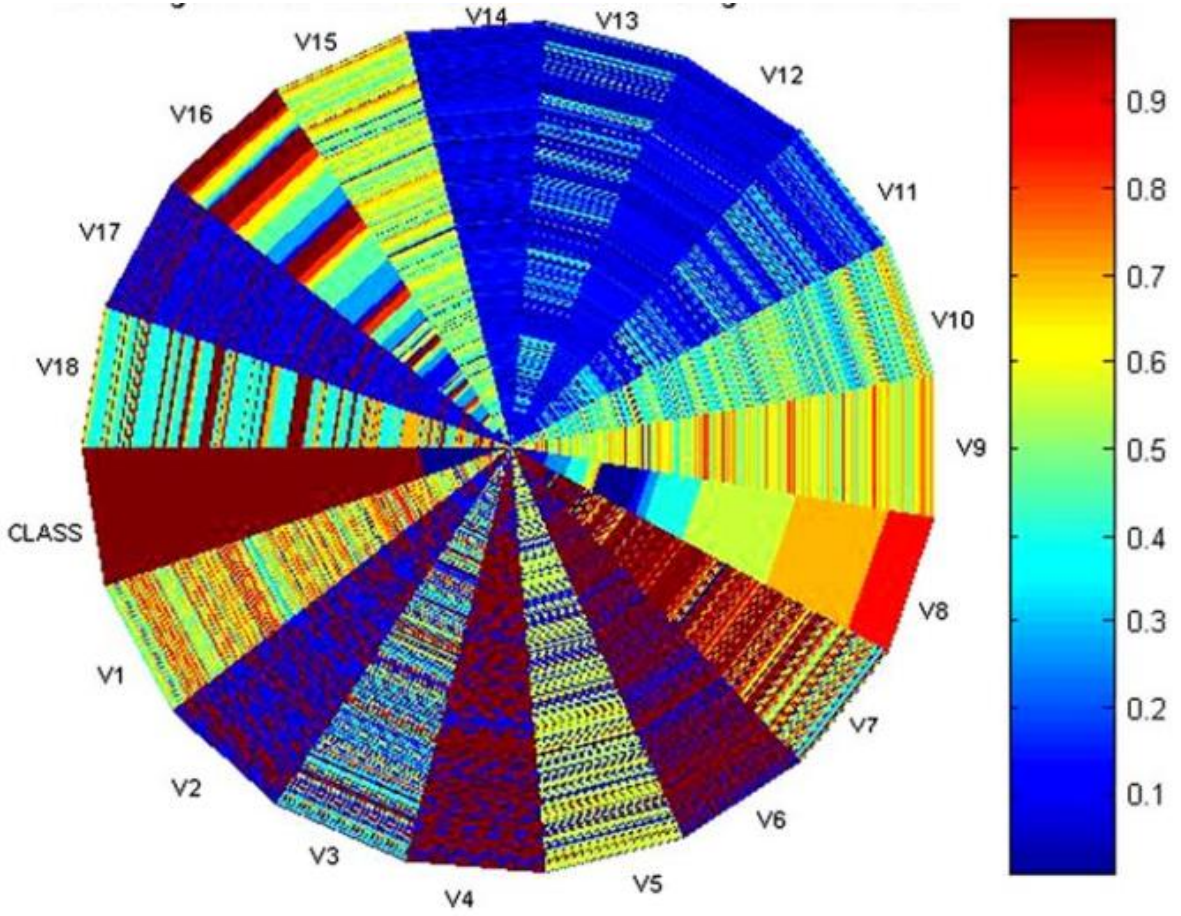
OTHER

SEGMENT BASED

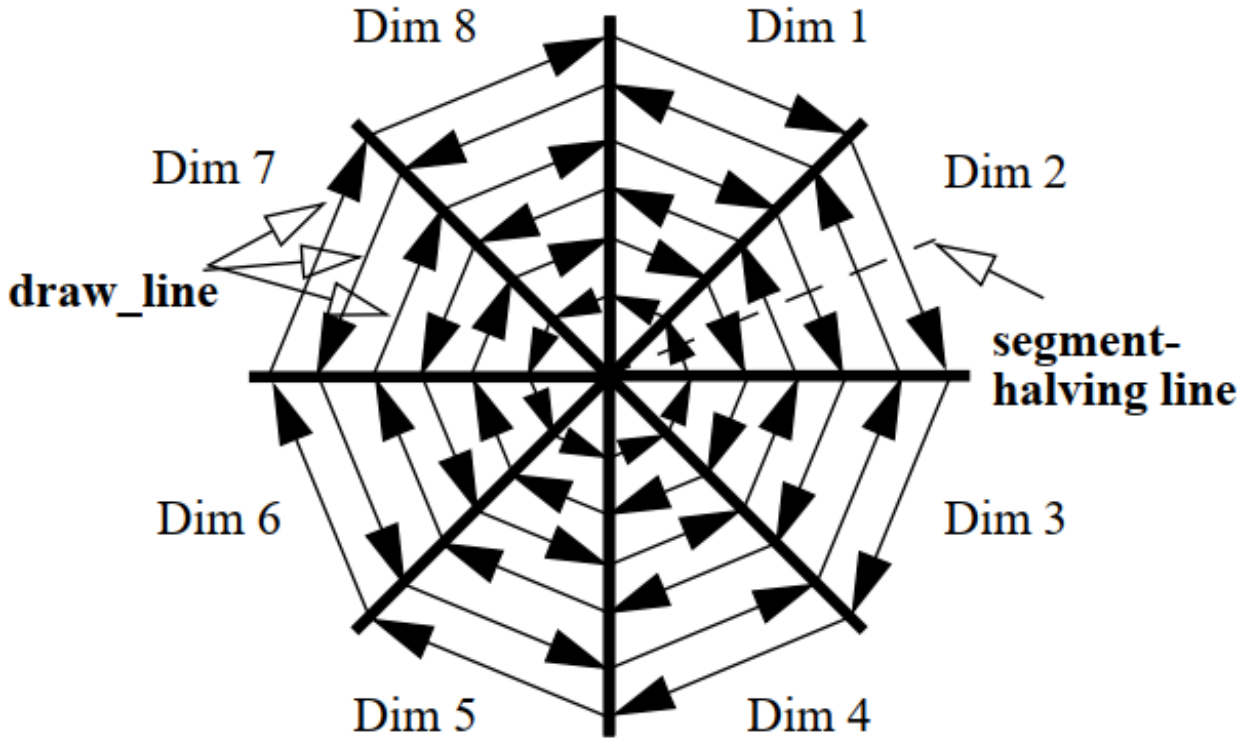
CIRCLE SEGMENT

CIRCLE VIEW

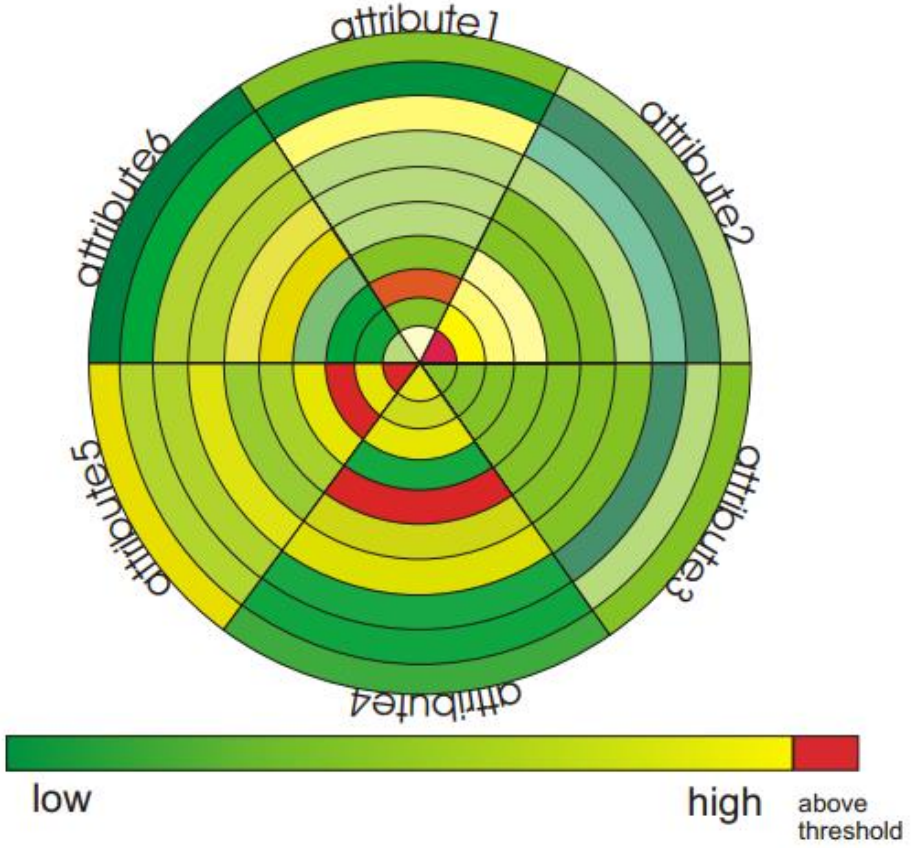
CIRCLE SEGMENTS



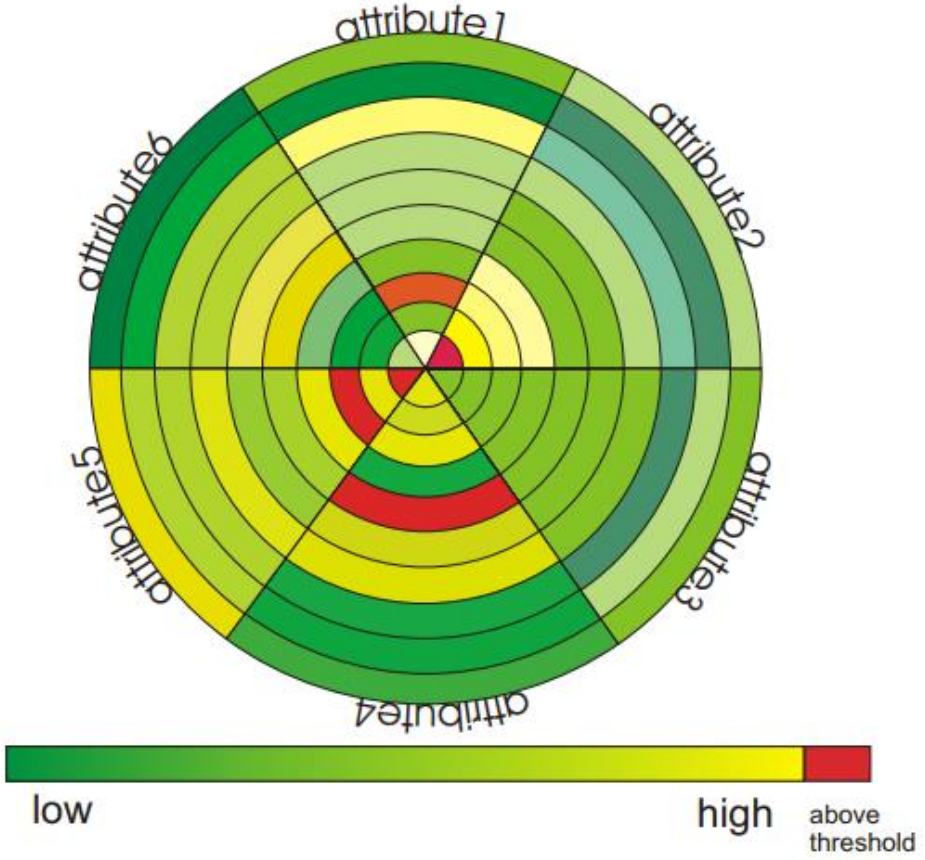
CIRCLE SEGMENTS



CIRCLE VIEW


attribute1
attribute2
attribute3
attribute4
attribute5
attribute6
low
high
above threshold

CIRCLE VIEW

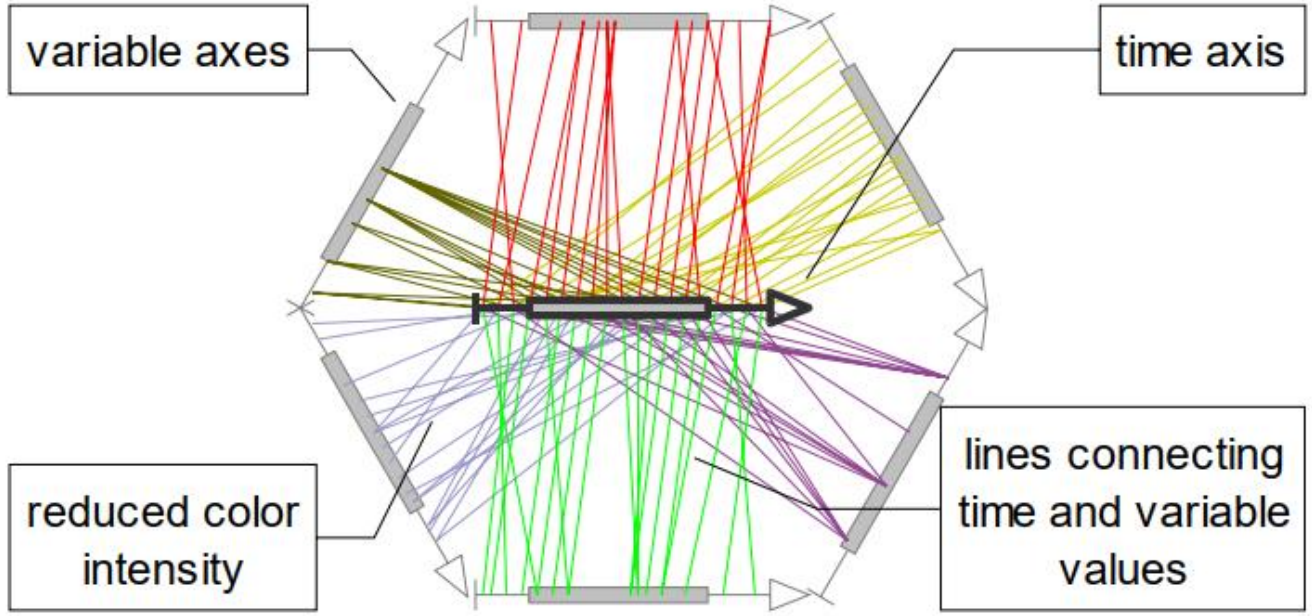

attribute1
attribute2
attribute3
attribute4
attribute5
attribute6
low
high
above threshold

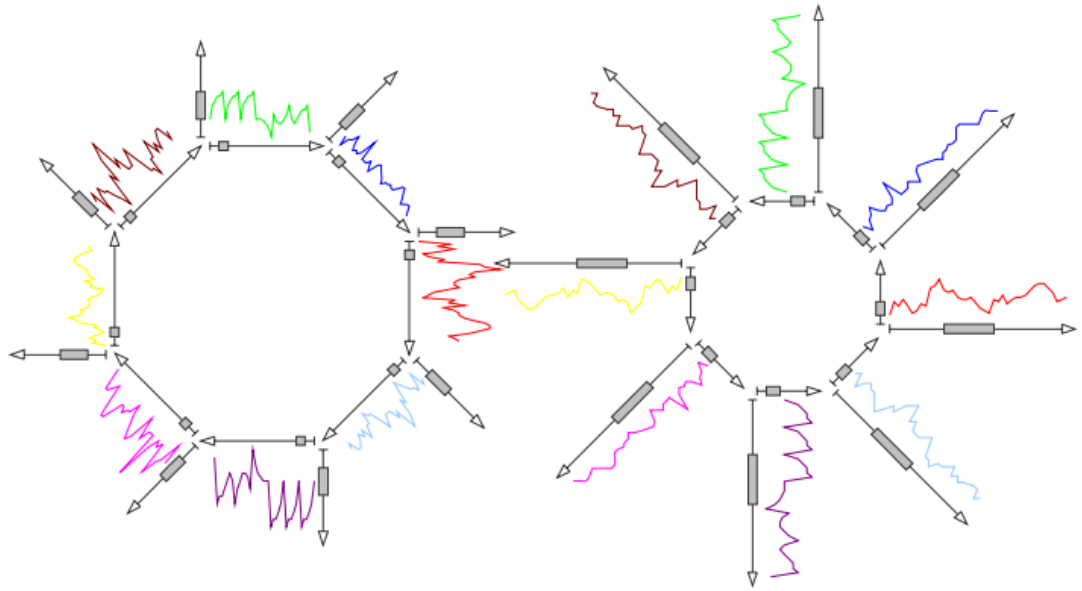
AXIS BASED

SEGMENT BASED

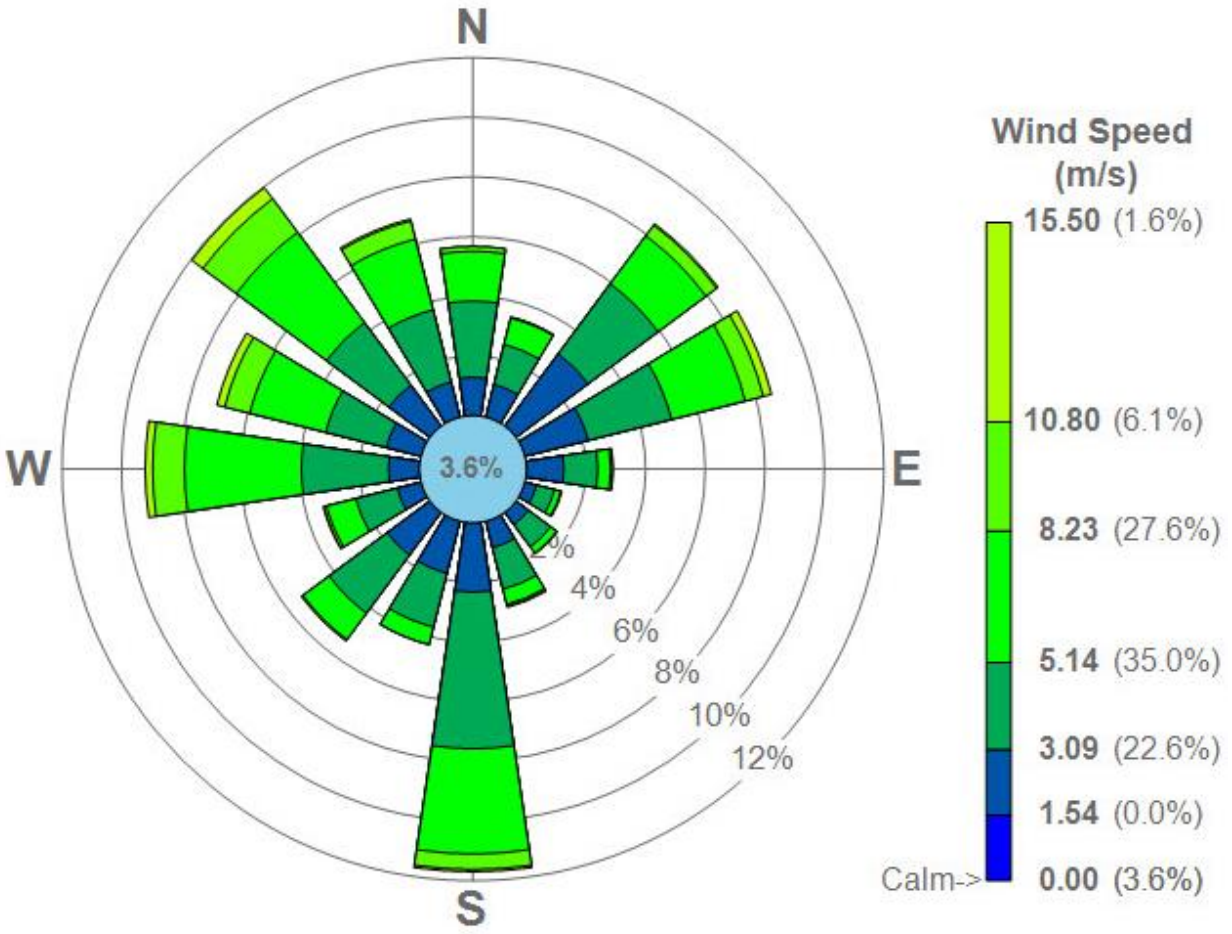
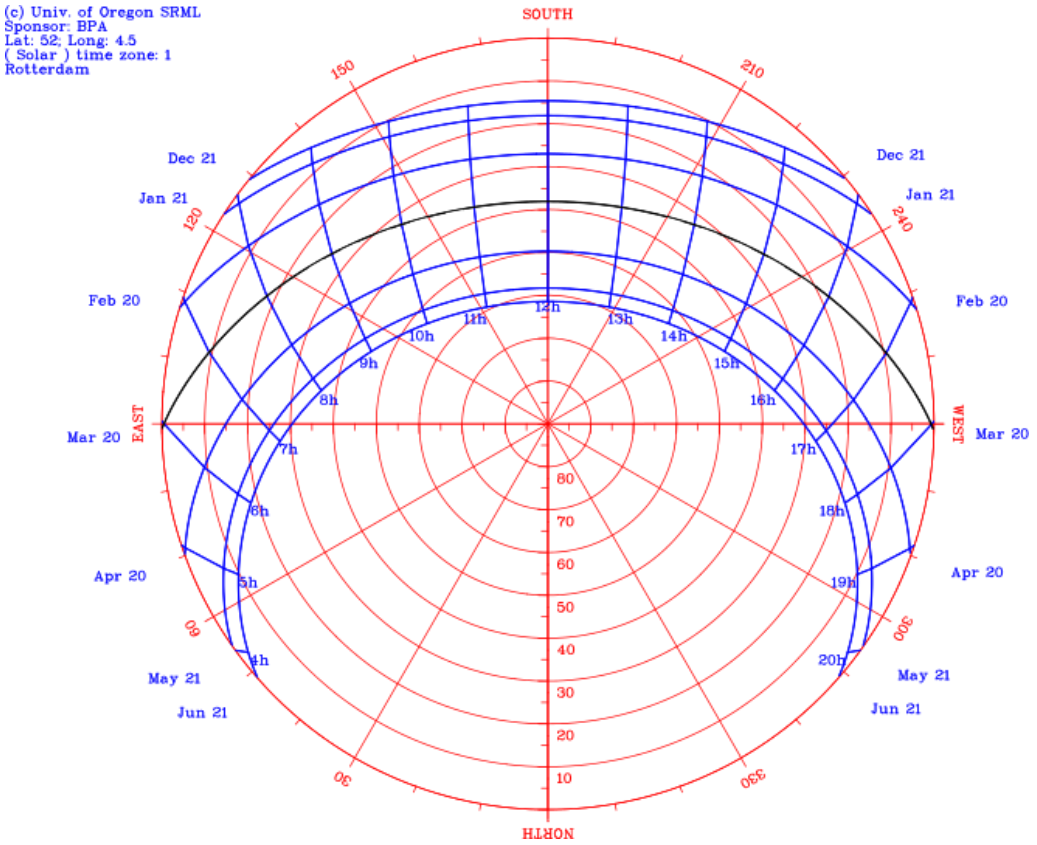
OTHER

VISAXES


variable axes
time axis
reduced color intensity
lines connecting time and variable values



WIND ROSE


N
W
E
S
3.6%
4%
6%
8%
10%
12%
Wind Speed
(m/s)
15.50 (1.6%)
10.80 (6.1%)
8.23 (27.6%)
5.14 (35.0%)
3.09 (22.6%)
1.54 (0.0%)
Calm-> 0.00 (3.6%)

SUN PATH POLAR CHART