Generalized Sensitivity Scatterplots for Sensitivity Analysis

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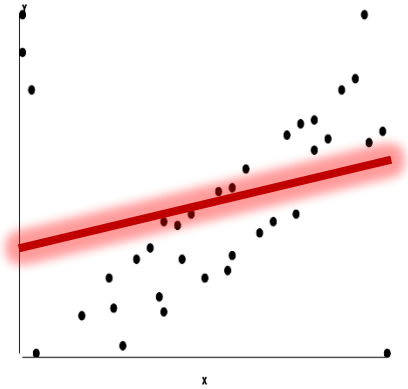
Scatterplot

- Scatterplot is frequently used to reveal correlations between x-y variables.
  - (+) Intuitive
  - (-) Bad projection
  - (-) Limited # of variables

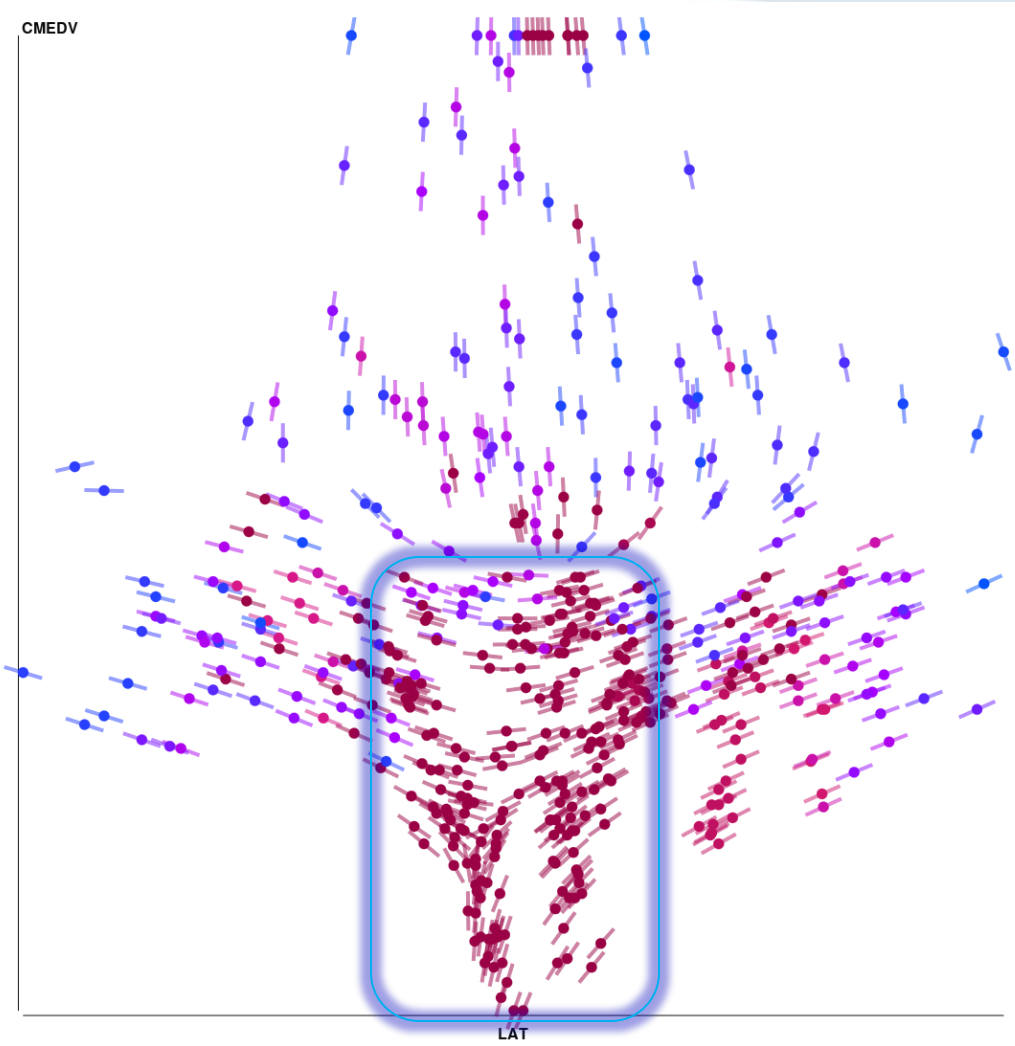


- Scatterplots can potentially show **global trends**.

Courtesy of Wikipedia

Scatterplot

- What are local trends of the dark red nodes?



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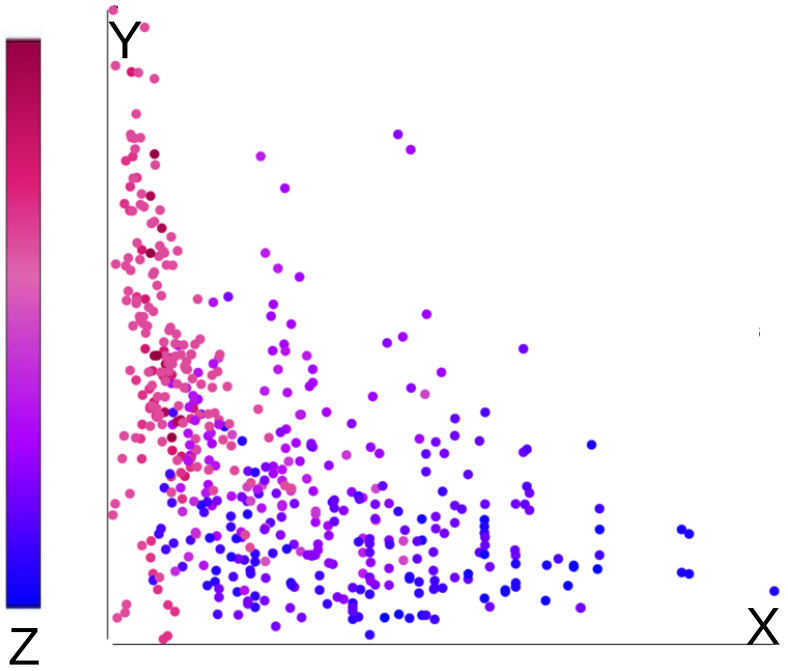
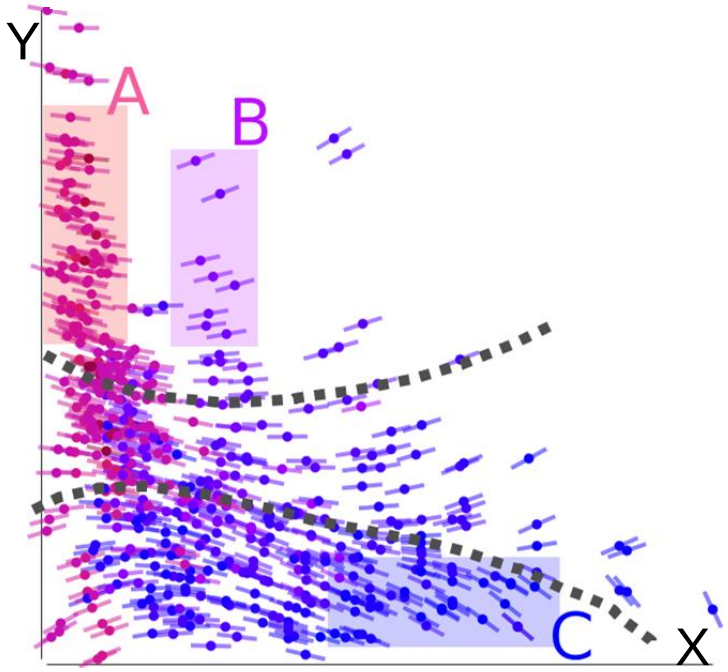
Flow-based Scatterplots



Scatterplot



Flow-based Scatterplot

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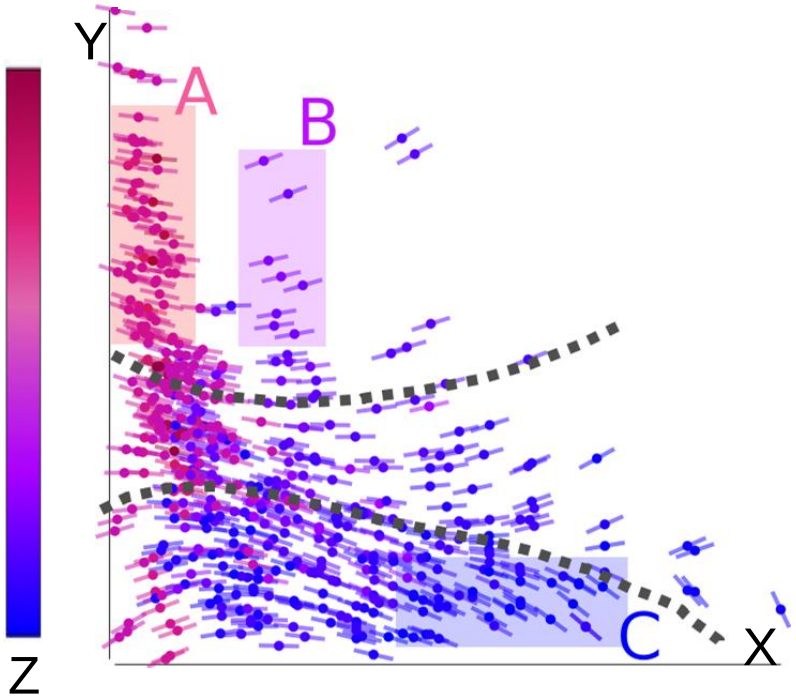
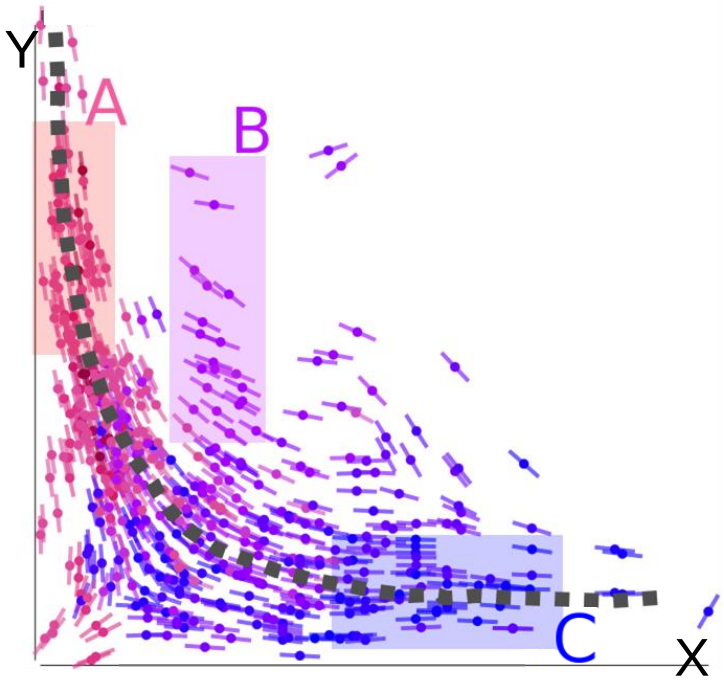
Generalized Sensitivity Scatterplot



Flow-based Scatterplot



Generalized Sensitivity Scatterplot

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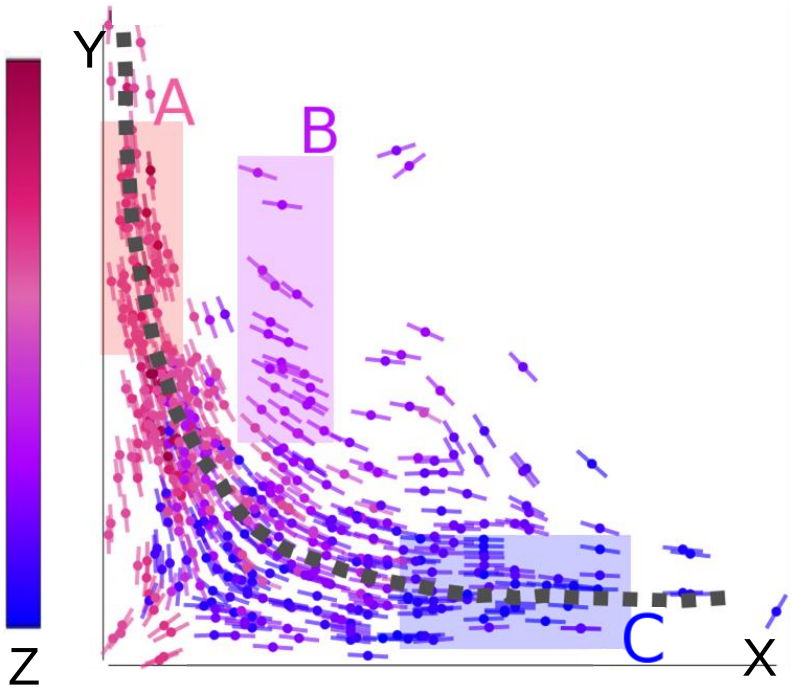
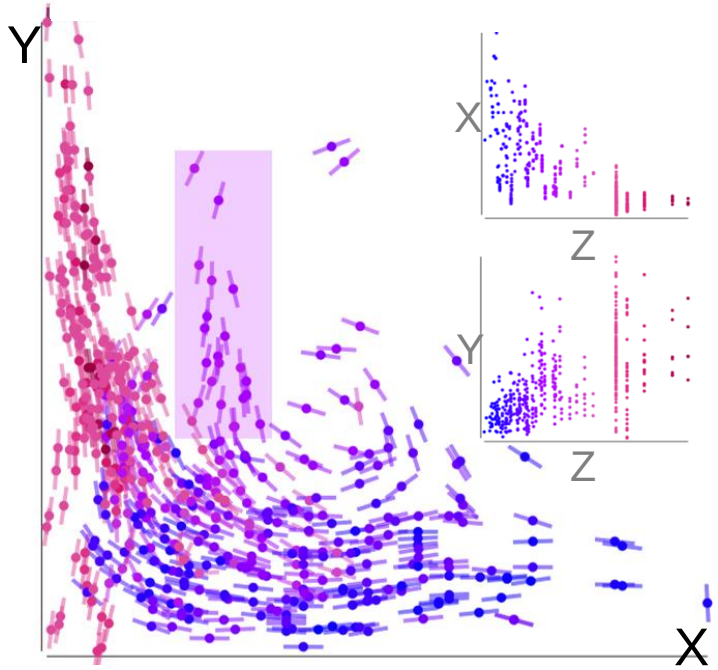
Generalized Sensitivity Scatterplot w/ Z



Generalized Sensitivity Scatterplot



Generalized Sensitivity Scatterplot with Z

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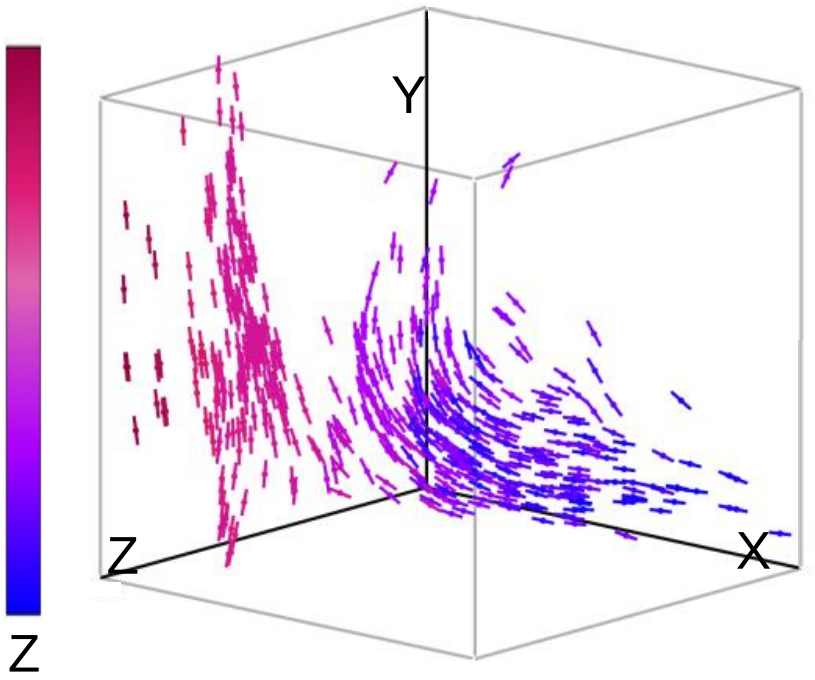
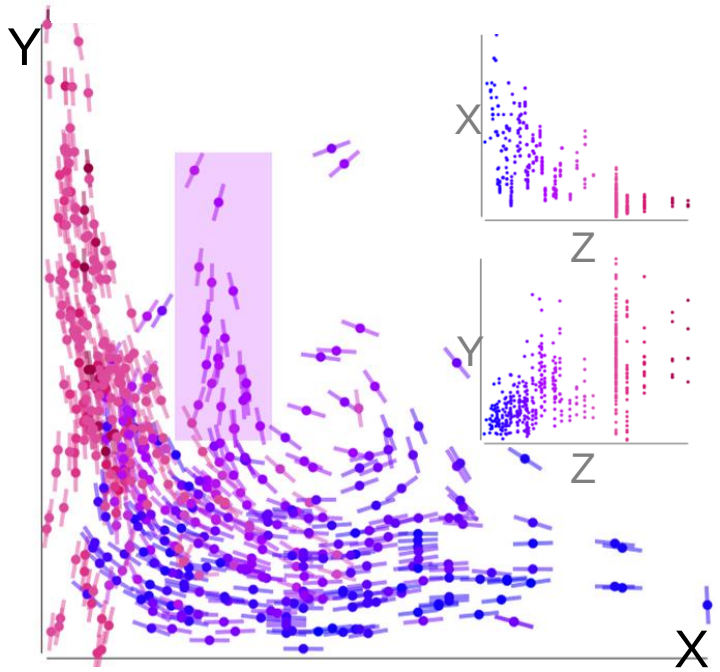
Generalized Sensitivity Scatterplot w/ Z





Generalized Sensitivity Scatterplot with Z

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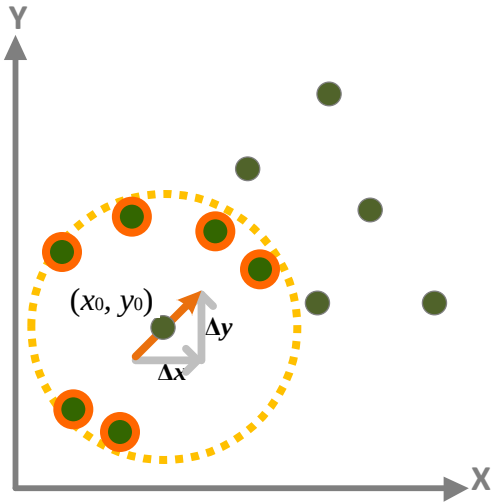
Sensitivity

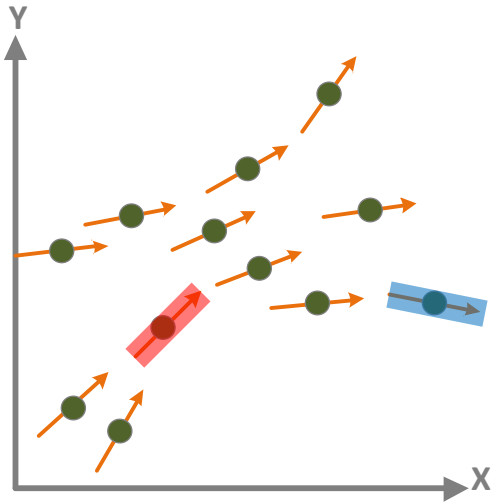


Scatterplot

Position $= (x_0, y_0)$

Sensitivity Derivatives

$$\frac{\delta Y}{\delta X}$$



Sensitivity-augmented scatterplot

a scattered collection of **position** and **velocity** measures.

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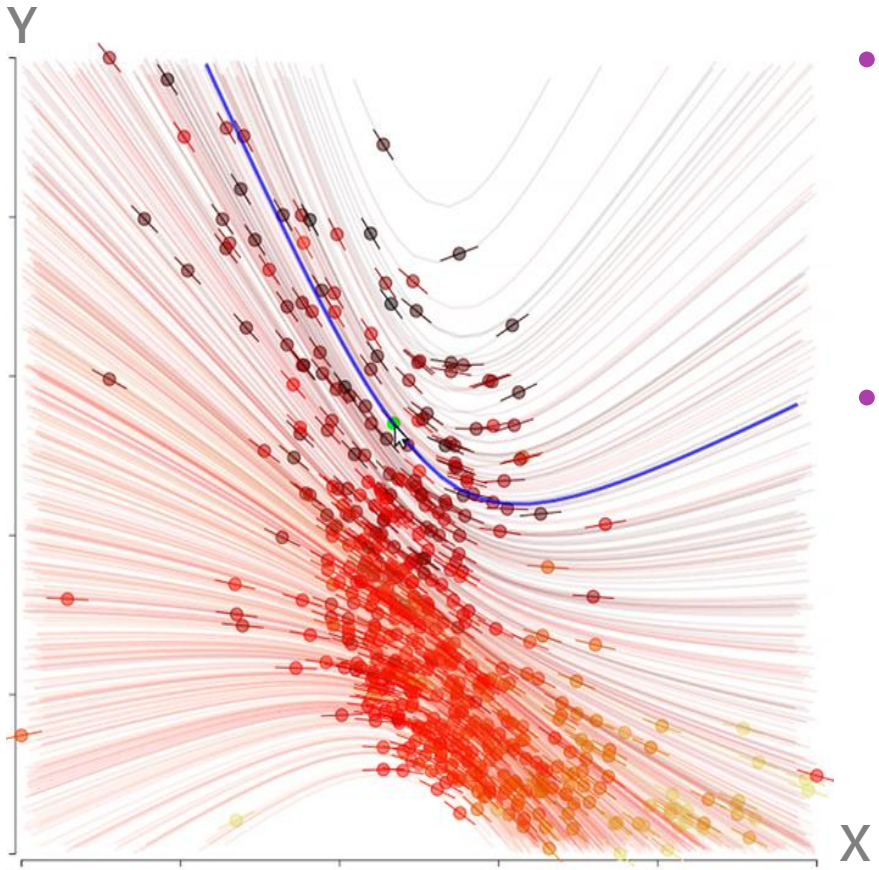
Streamlines



- Streamline: integrate sensitivity along a given direction.
- More coherent view

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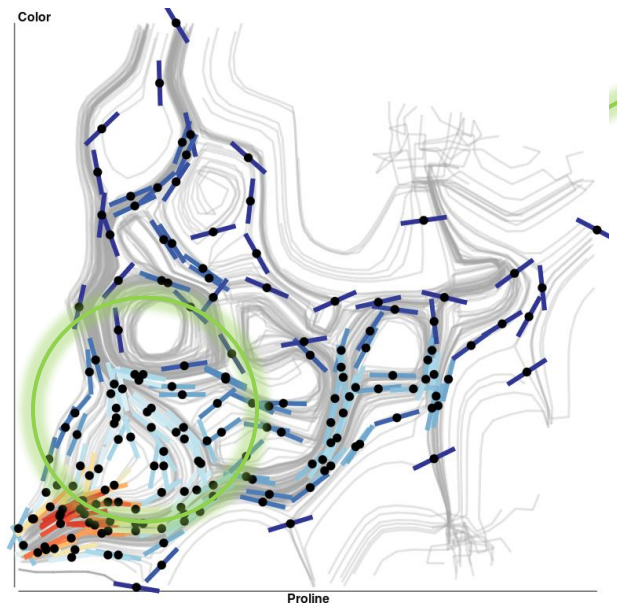
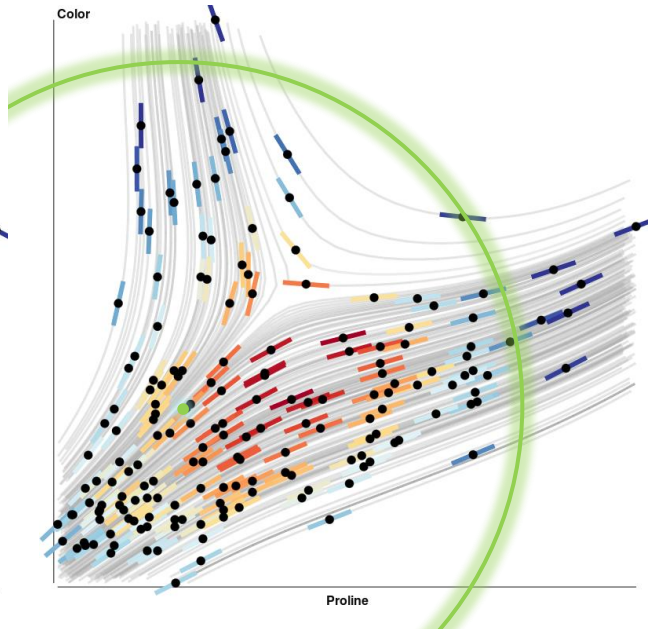
Adjustable Kernel

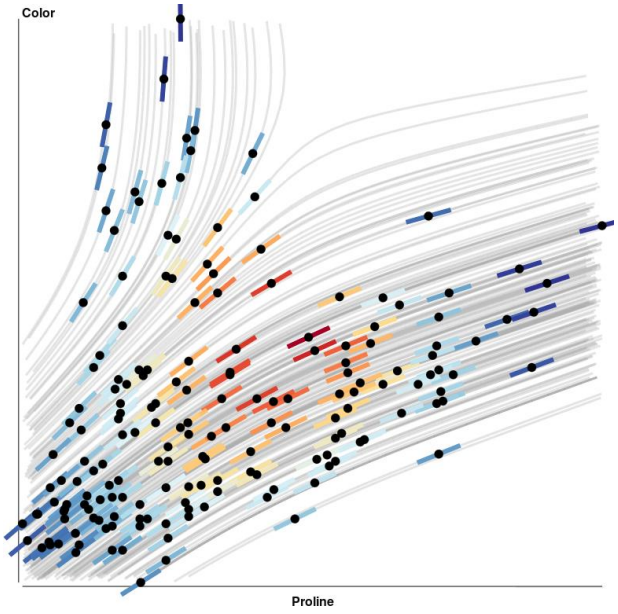
- R: the radius of the neighborhood in computing sensitivity.
  - Increase R to show trend from local to global



R= 0.2



R= 1.0



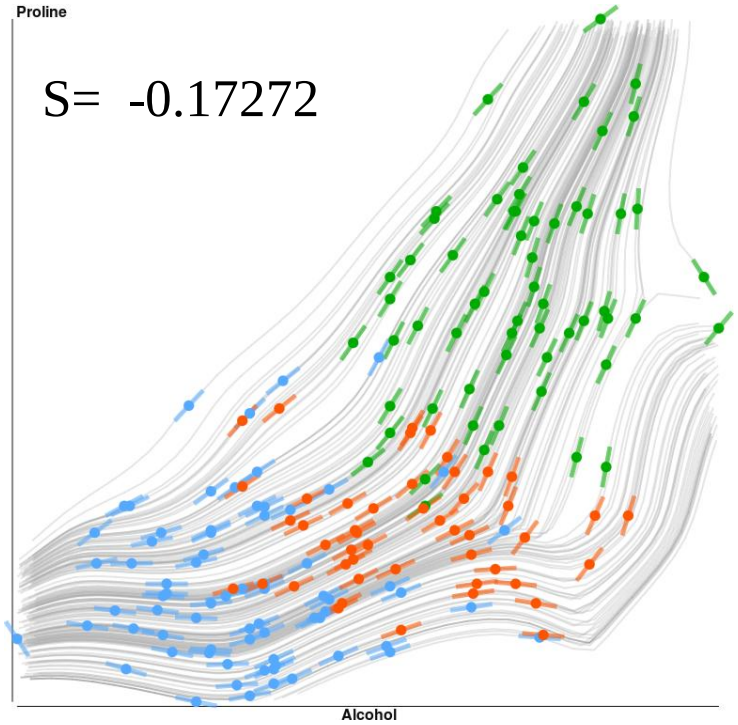
R= 2.0

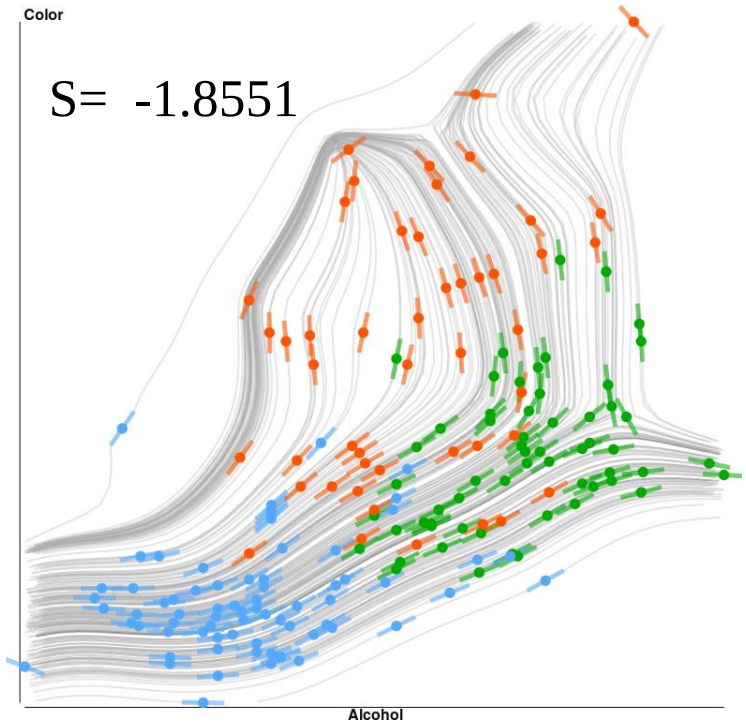
Smoothness of a Projection

- Regions with large variance in sensitivity are not smooth.

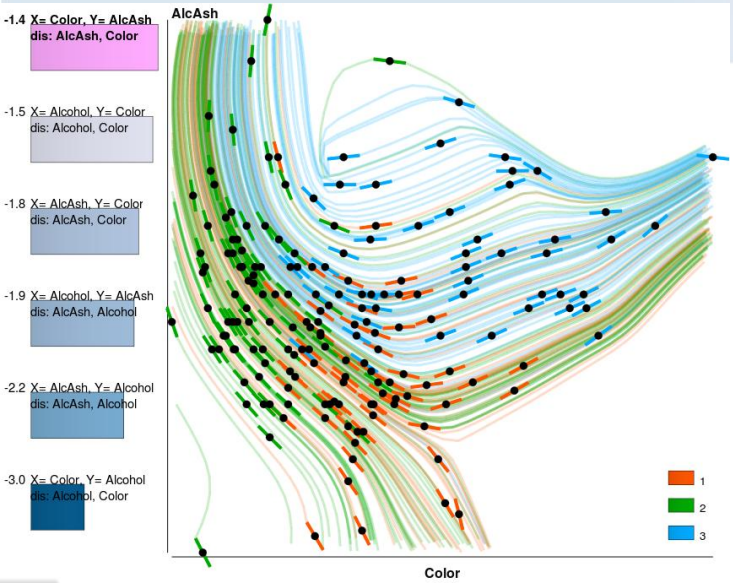
C_i : complexity of a node ***i***

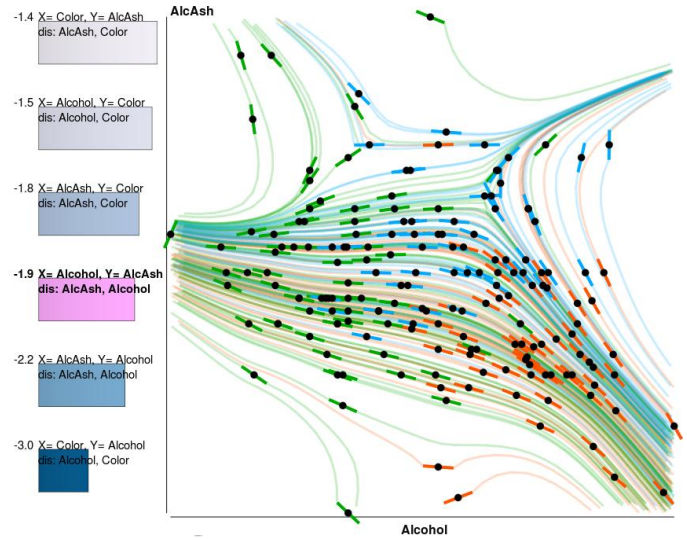
S : smoothness of the projection $= (-1)(\sum_{i=0}^{N} C_i)$



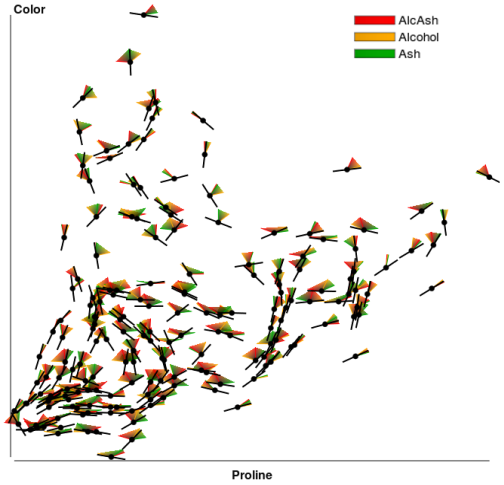


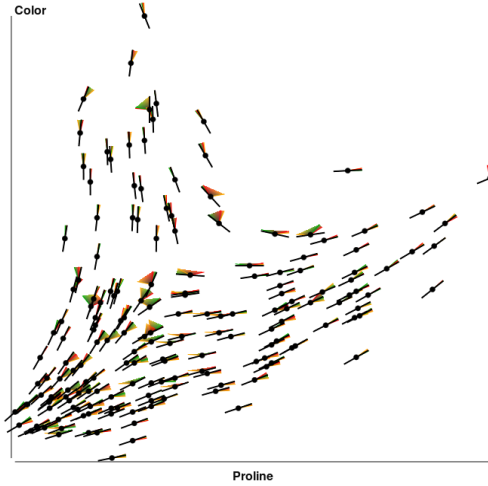
Sensitivity Views and Widgets





Fans

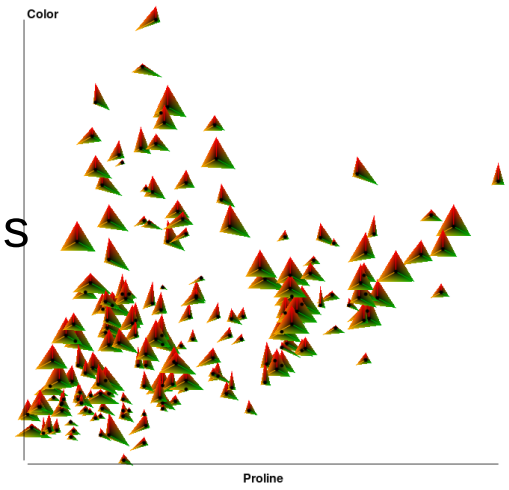


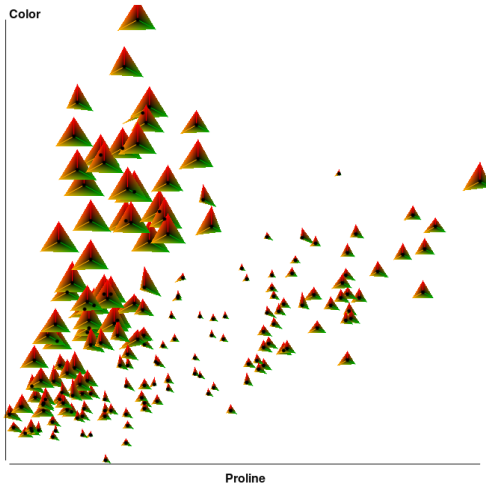


Small Kernel

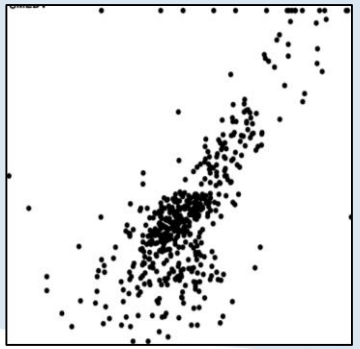
Large Kernel

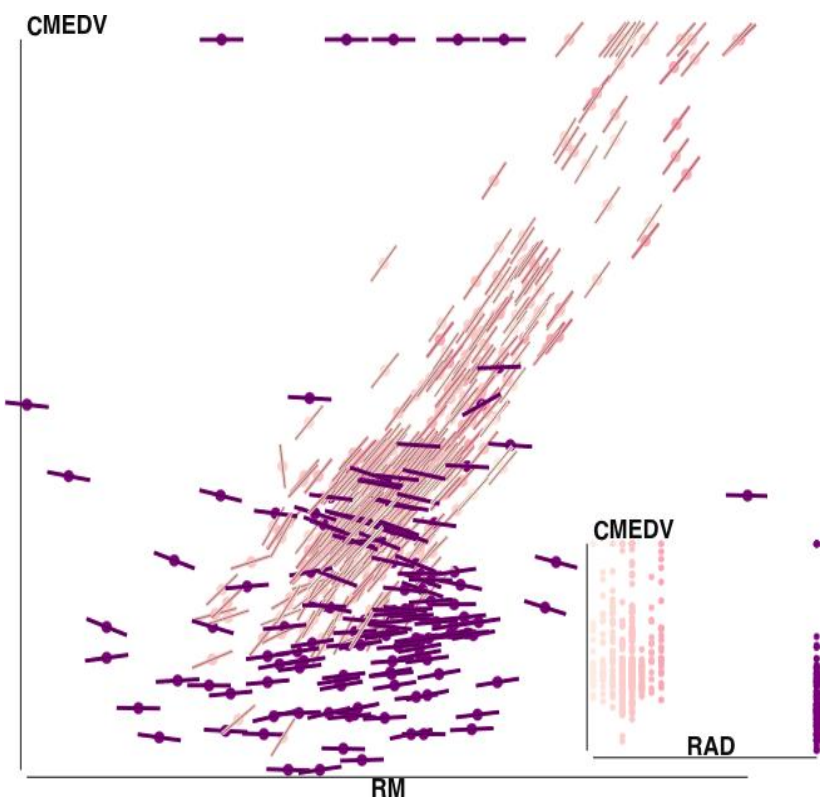
Radar Graphs

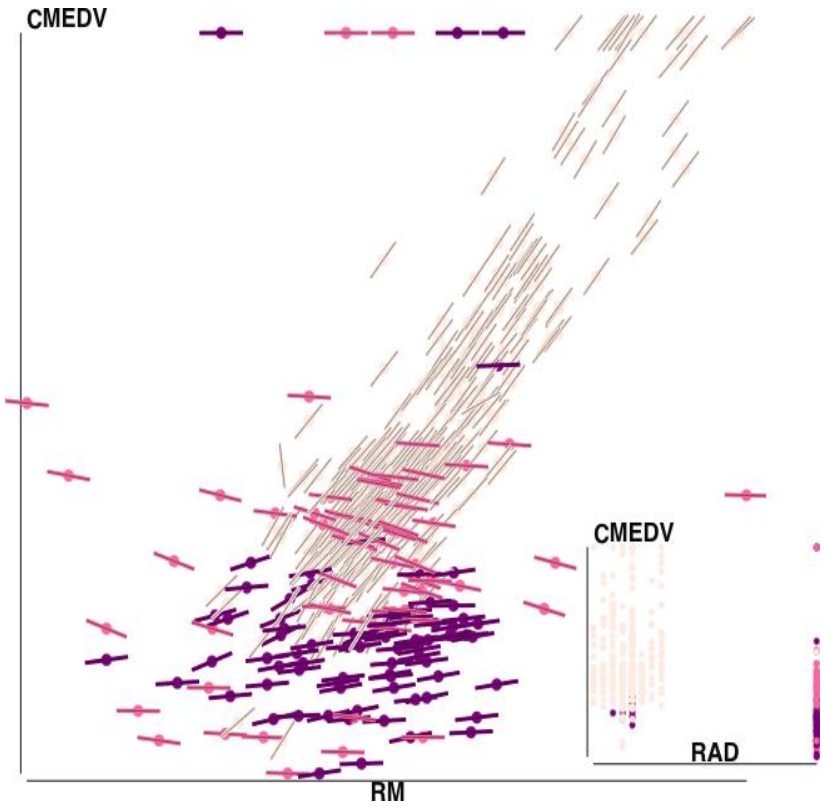




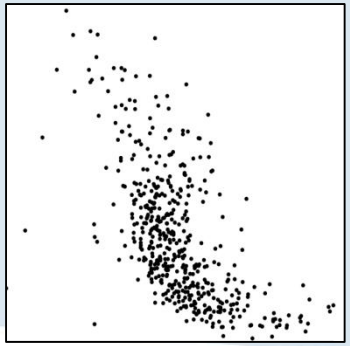
Clustering by Sensitivity

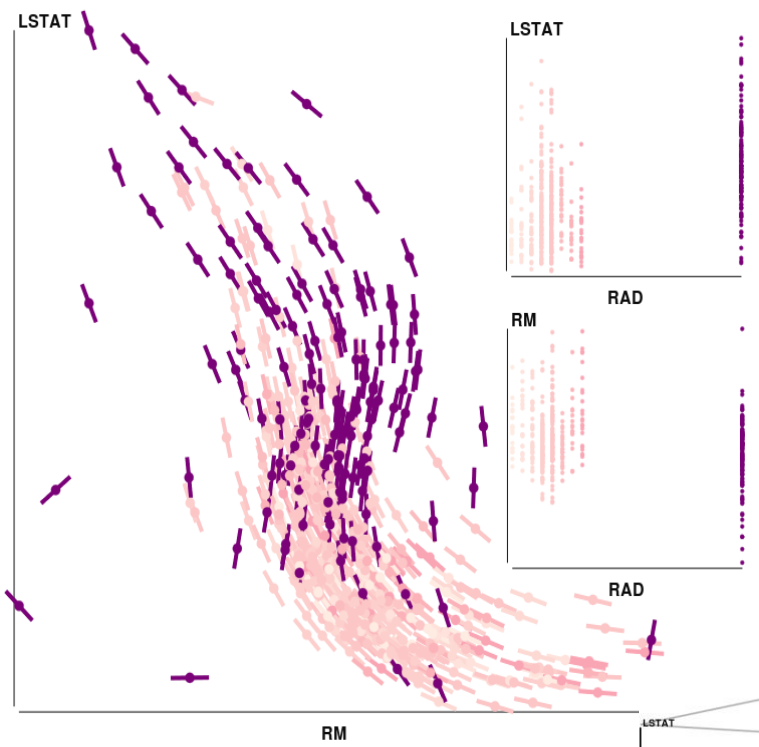


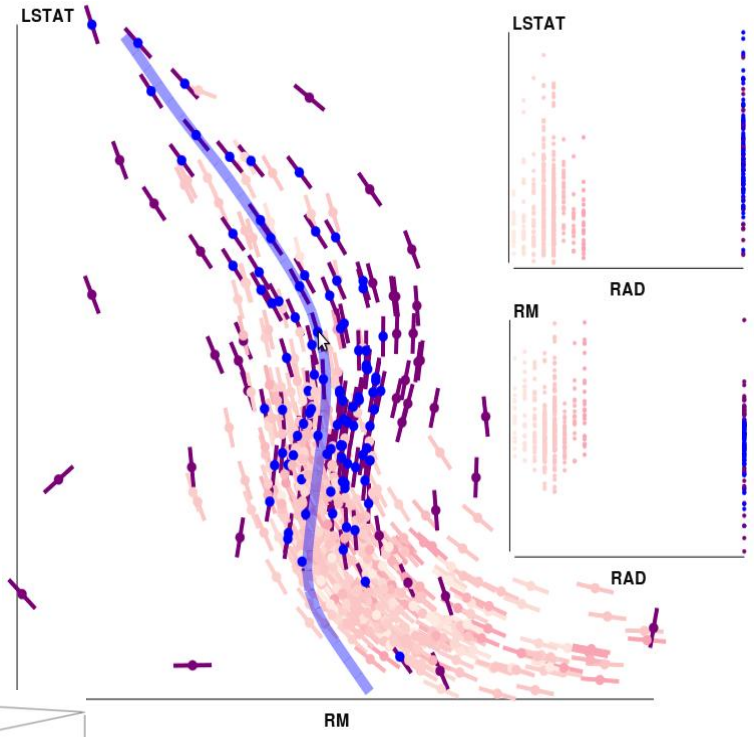


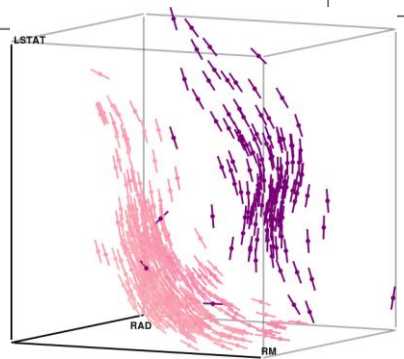


Selection by Streamlines









Conclusion and Future Work

- A novel generalized visual augmentation of scatterplots.
  - Sensitivity Lines
    - local variable correlations
    - differentiation before projection
  - Streamlines: correlation patterns
  - Non-linear transformations: Clustering and Selection
  - View and Visual Widgets:
    - Ranking View
    - Sensitivity Fans and Radar Graphs
- Future Work

Thank you

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- NetZen v1.0 http://vis.cs.ucdavis.edu/software/

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