DimReader: Using auto-differentiation to explain non-linear projections

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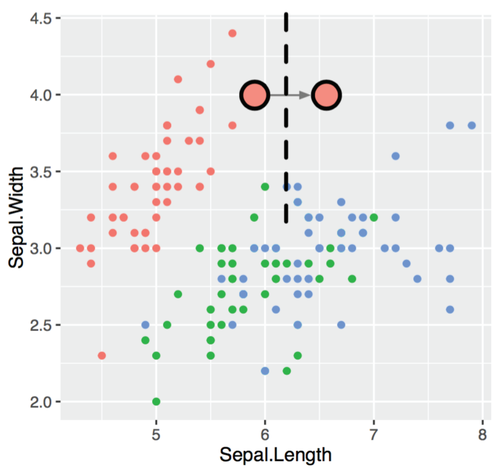
Problem

Non-linear dimensionality reduction (NDR) methods are popular, but hard to interpret. DimReader recovers readable positional legends from these methods. Automatic differentiation makes the calculation of such perturbations efficient and easily integrated into programs written in modern programming languages.

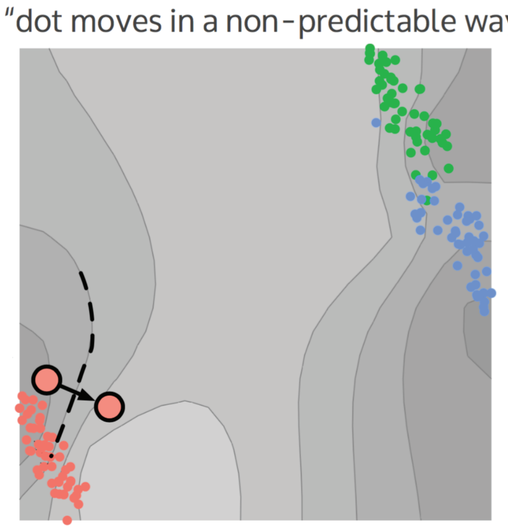
A transformation in the dataset...

... induces transformation in scatterplot:
"dot moves horizontally to the right"



lines of **sepal length** axis
are perpendicular to movement

... induces transformation in t-SNE:
"dot moves in a non-predictable way"



lines of **generalized sepal length** axis
are perpendicular to movement

DimReader finds **generalized axes** with a novel algorithm which uses **automatic differentiation**.

Automatic Differentiation

Algorithm

Results

References

Humans, Data, and Computers
http://hdc.cs.arizona.edu

NSF AT&T The University of Arizona