Introduction to unsupervised learning

Dimensionality reduction and clustering

Herman Kamper

http://www.kamperh.com/

Supervised learning

vs.

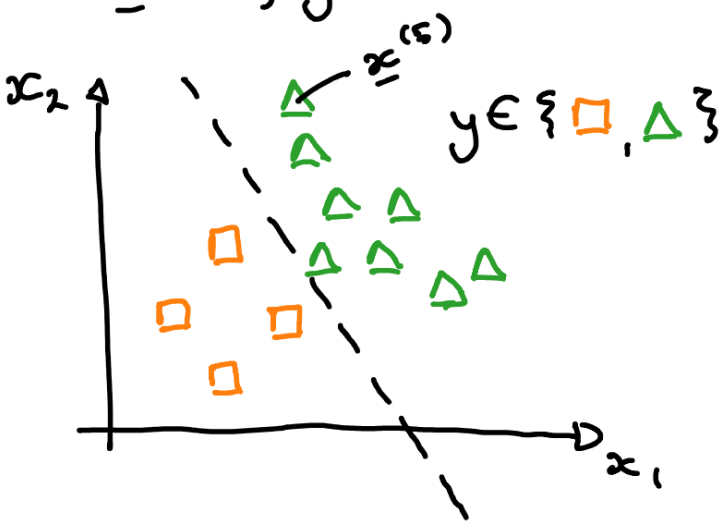
Unsupervised learning

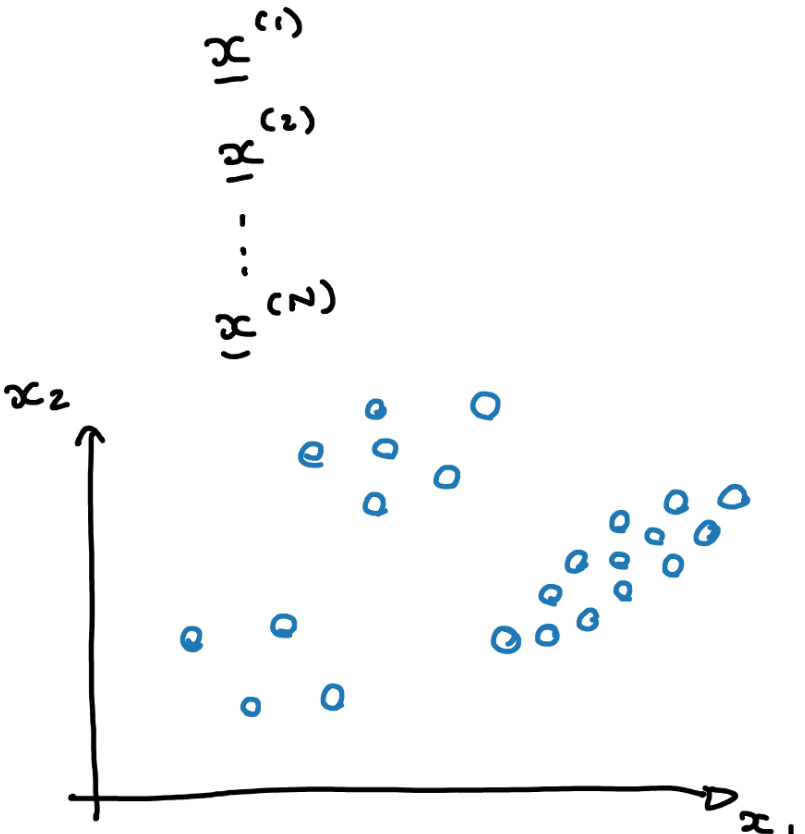
$\underline{x}^{(1)}, y^{(1)}$

$\underline{x}^{(2)}, y^{(2)}$

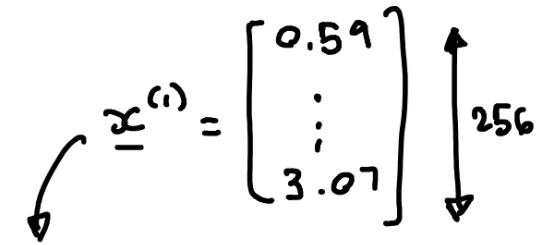
$\vdots$

$\underline{x}^{(N)}, y^{(N)}$





Dimensionality reduction



$\underline{x} \in \mathbb{R}^{256}$ → $\underline{z} \in \mathbb{R}^2$

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x[1]: [0.59, 4.35, 4.80, 7.60, ..., 3.48, 4.93, 5.13, 3.07]

x[2]: [5.93, 4.86, 0.49, 6.84, ..., 2.98, 4.93, 5.93, 2.68]

x[3]: [7.99, 7.74, 3.43, 5.77, ..., 4.57, 3.47, 5.76, 2.33]

x[4]: [0.87, 4.11, 4.74, 1.01, ..., 5.34, 2.97, 3.83, 5.77]

x[5]: [0.64, 4.66, 4.72, 0.51, ..., 6.78, 3.36, 4.39, 5.73]

x[6]: [8.28, 8.85, 3.10, 6.91, ..., 4.26, 3.74, 7.06, 4.33]

...
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$\underline{x}^{(500)}$

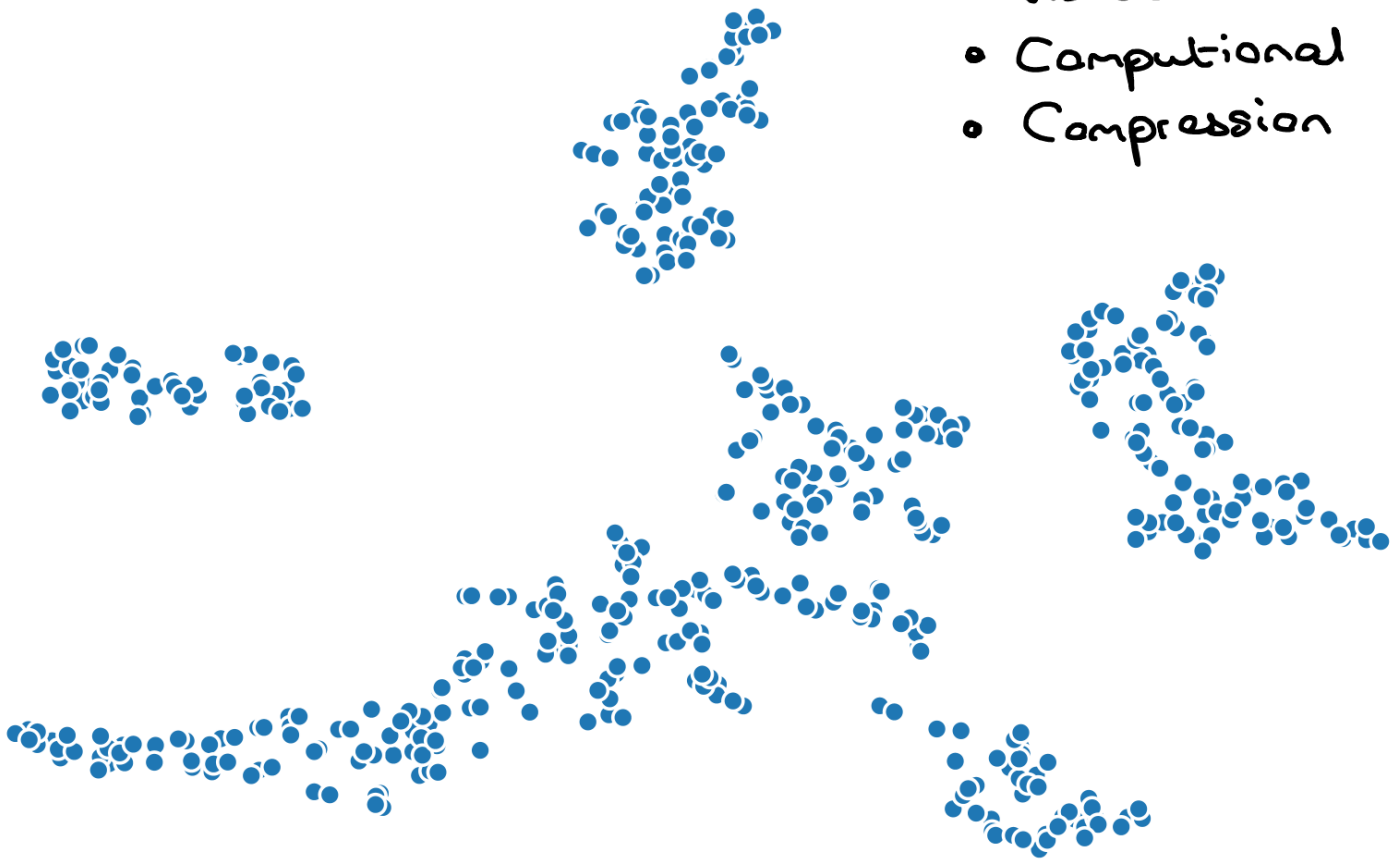
[Kamper et al., SLT'14; http://www.kamperh.com/papers/kamper+jansen+king+goldwater_slt2014.pdf]

- t-SNE
- PCA

$\underline{x}^{(n)} \in \mathbb{R}^{256} \rightarrow z^{(n)} \in \mathbb{R}^2$

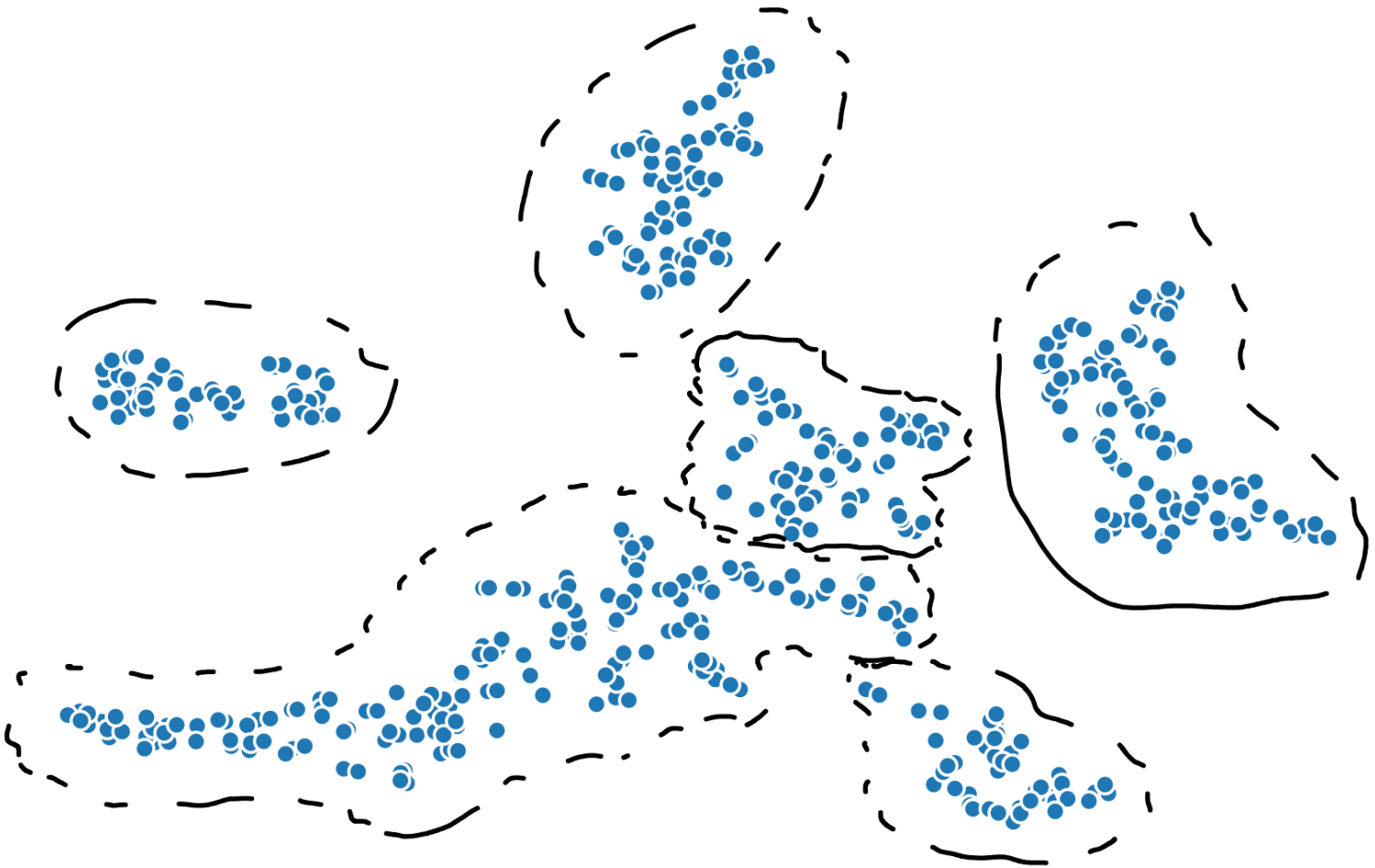
Dimensionality reduction:

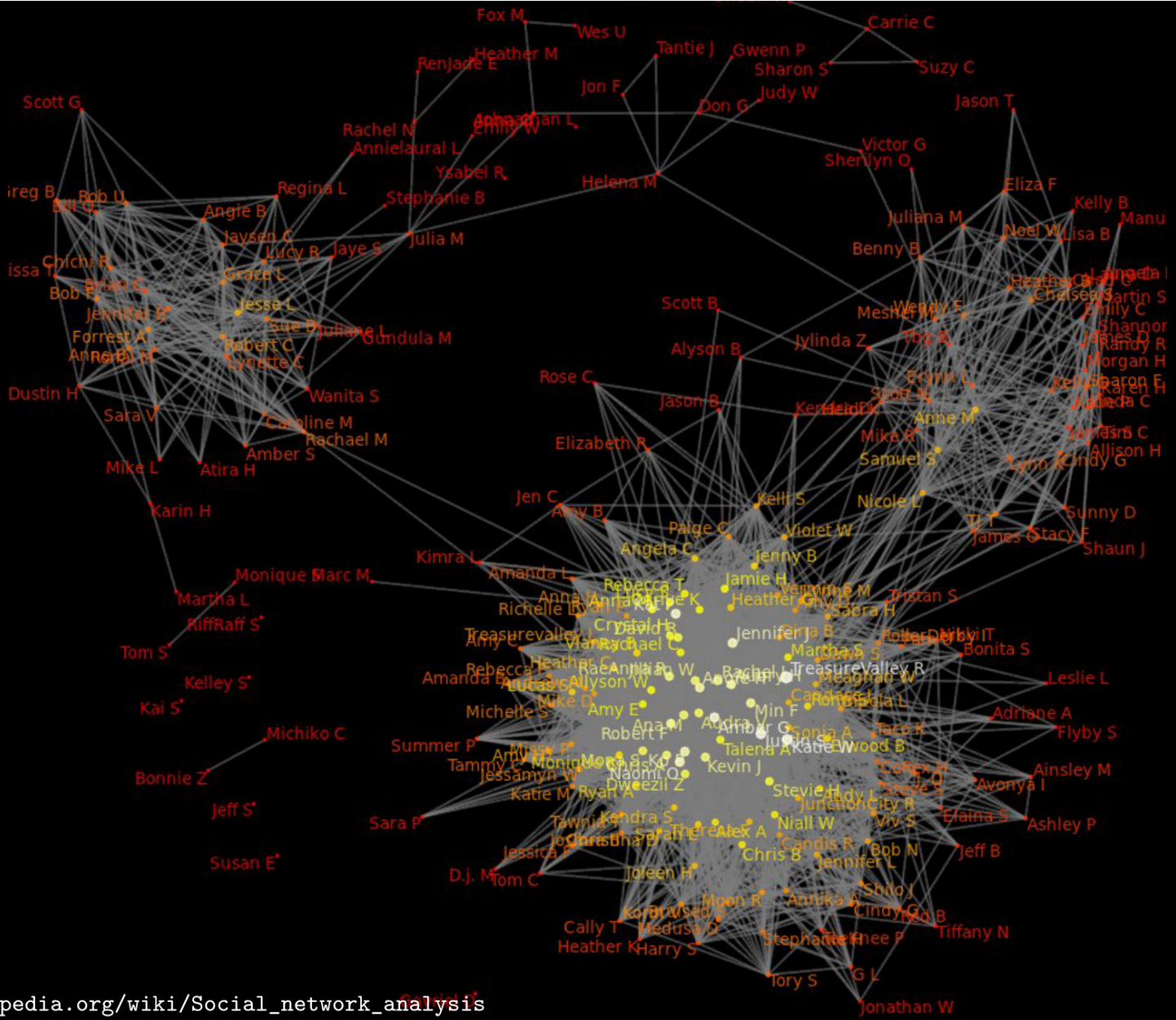
- Visualisation
- Computional cost
- Compression



[Kamper et al., SLT'14; http://www.kamperh.com/papers/kamper+jansen+king+goldwater_slt2014.pdf]

Clustering

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Wes U
Carrie C
Heather M
RenJade E
Tantie J
Gwenn P
Sharon S
Suzy C
Jon F
Judy W
Don G
Jason T
Scott G
Rachel N
Annielaural L
Victor G
Sherilyn O
Ysabel R
Helena M
Eliza F
Kelly B
Juliana M
Noel W
Lisa B
Benny B
Regina L
Stephanie B
Angie B
Julia M
Jaysen C
Lucy R
Jaye S
Grace L
Jesse L
Robert C
Gundula M
Wanita S
Caroline M
Rachael M
Amber S
Atira H
Mike L
Sara V
Dustin H
Karin H
Martha L
Monique M
Marc M
RiffRaff S
Tom S
Kelley S
Kai S
Michiko C
Bonnie Z
Jeff S
Susan E
Scott B
Alyson B
Rose C
Jason B
Elizabeth R
Jylinda Z
Anne M
Mike R
Samuel S
Allison H
Cindy G
Sunny D
Shaun J
Jen C
Amy B
Kelli S
Nicole L
Paige C
Violet W
Angela C
Jenny B
Kimra L
Amanda L
Jamie H
Tristan S
Sara H
Jennifer J
Bonita S
Leslie L
Adriane A
Flyby S
Ainsley M
Avonya I
Ashley P
Jeff B
Tiffany N
Jonathan W
Tory S
Harry S
Heather K
Cally T
Tom C
D.j. M
Sara P
Summer P
Michelle S
Amy E
Min F
Robert F
Kevin J
Naomi O
Dweezil Z
Katie M
Ryan A
Talena A
Katie W
Niall W
Chris B
Joleen H
Shilo J
Moon R
Annika A
Cindy G
Bob B
Stephanie K
Knee P
Medusa D
Kendra S
Alex A
Candis R
Bob N
Jennifer L
Jessica P
Ana M
Sonia A
Taco S
Wood B
Elaina S
Viv S
Junction City R
Meagan W
Candace L
Rondalia L
Treasurevalley R
Rachael C
Crystal R
David R
Heather C
Allyson W
Mike D
Rebecca T
Anna W
Richelle R
Kat K
Treasurevalley I
Vianey C
Amy C
Rachael H
Martha S
Jessamyn W
Monica S
Ko C
Tammy C
Amy C
Missy P
Audrey G
Amber G
Julia S
Jeff S
Shannon D
Randy R
Morgan H
Karen H
Lynn K
Scott N
Kendall D
Mike R
Jylinda Z
Wendy F
Mesheal W
Emily C
Martin S
Heather C
Chelsea S
Shannon D
James D
Randy R
Morgan H
Karen H
Lynn K
Allison H
Cindy G
Sunny D
Shaun J
James G
Stacy F
Tristan S
Sara H