



LAB 1

GEOSPATIAL REPRESENTATION LEARNING

Visualizing high-dimensional
representation spaces

PRESS – OR SPACE. →

Recap: Lecture 1

PCA

A linear projection that captures variance.

Rotate to PCA projection

Reset

☒ Show projections

t-SNE

A nonlinear embedding that preserves local neighborhoods.

Run t-SNE projection

Reset

☒ Show trajectories

Learning outcomes

Explain the core intuition behind PCA and t-SNE

Not comfortable Very comfortable

Click to respond

Interpret the resulting plots and discuss each method's limitations

Not comfortable Very comfortable

Click to respond

Apply both methods to visualize high-dimensional embeddings

Not comfortable Very comfortable

Click to respond

Teach your assigned method and develop two exam questions with proposed answers

Not comfortable Very comfortable

Click to respond

Expert Group Activity

Each group becomes an expert in **one method**, then teaches a group studying the other topic.

PCA

Groups 1, 3, 5, 7, 9

Principal Component Analysis

t-SNE

Groups 2, 4, 6, 8, 10

t-distributed Stochastic Neighbor Embedding

Teaching pairs: 1 & 2, 3 & 4, 5 & 6, 7 & 8, 9 & 10

Lab schedule

Time	Activity	Result
60 min	Self-teaching in expert groups	Understand your method and prepare your group's slides
45 min	Teach the group studying the other method	Both methods, with time for questions and comparison
15 min	Class-wise synthesis	Discuss exam questions selected by the teacher

Total: 120 minutes

Expert group preparation

During the **60-minute preparation phase**, use the notebook and your group's slide deck.

- Explain your method's core idea and how it constructs a low-dimensional representation
- Explore the GloVe embeddings and include plots that support your explanation
- Discuss what the plots reveal, the method's limitations and when to use it
- Develop **two exam questions with proposed answers** and add them to your deck

The teacher will select questions from your decks for the final class discussion.

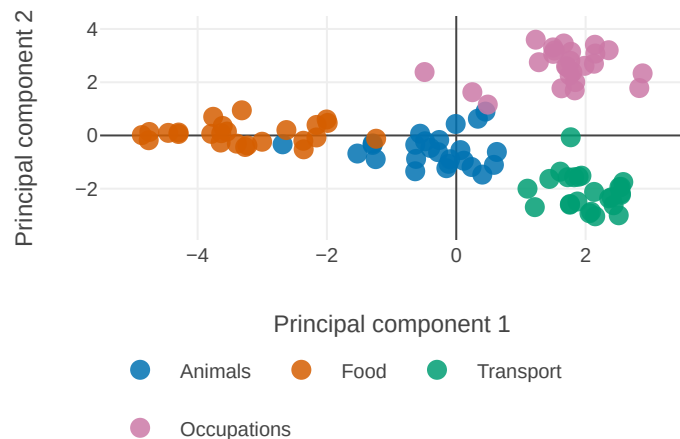
Share the teaching across your group. You have 45 minutes together with your partner group.

Word embeddings with GloVe

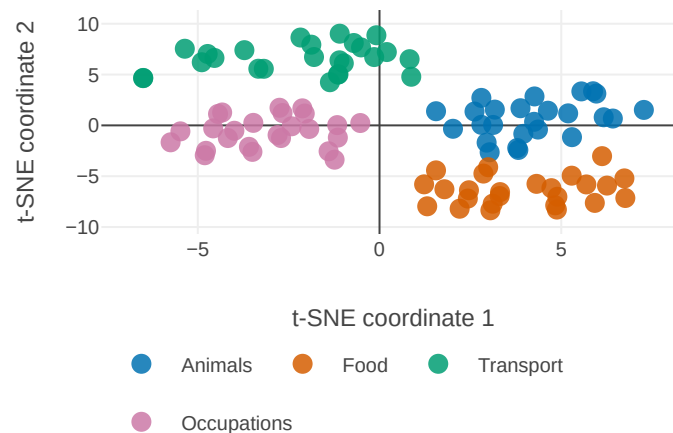
[Open the Google Colab notebook](#) to explore PCA and t-SNE in practice.

GloVe represents words as vectors. Here, both methods project **300-dimensional word embeddings** into 2D.

Principal Component Analysis (PCA)



t-distr. Stochastic Neighborhood Embedding



Group slide decks

Open your assigned deck and add your group's explanations, plots and exam questions directly in Google Slides.

Shared Google Drive folder

Group	Method	Slides	Group	Method	Slides
1	PCA	<u>Edit slides</u>	2	t-SNE	<u>Edit slides</u>
3	PCA	<u>Edit slides</u>	4	t-SNE	<u>Edit slides</u>
5	PCA	<u>Edit slides</u>	6	t-SNE	<u>Edit slides</u>
7	PCA	<u>Edit slides</u>	8	t-SNE	<u>Edit slides</u>
9	PCA	<u>Edit slides</u>	10	t-SNE	<u>Edit slides</u>

Phase 1: Self-teaching

13:00–14:00 · 60 minutes

Work on your group's slide deck. Use the notebook to explore your method and prepare your explanation and plots.

Add two exam questions with proposed answers. The teacher will select questions for the final discussion.

Group	Method	Slides	Group	Method	Slides
1	PCA	Edit slides	2	t-SNE	Edit slides
3	PCA	Edit slides	4	t-SNE	Edit slides
5	PCA	Edit slides	6	t-SNE	Edit slides
7	PCA	Edit slides	8	t-SNE	Edit slides
9	PCA	Edit slides	10	t-SNE	Edit slides

Phase 2: Teach the other group

14:00–14:45 · 45 minutes

Teaching pairs

PCA group	t-SNE group
1	2
3	4
5	6
7	8
9	10

Both groups teach

- Use your slides to explain your method and demonstrate your plots
- Give each group time to teach and answer questions
- Compare what PCA and t-SNE reveal and discuss their limitations

Phase 3: Class-wise synthesis

14:45–15:00 · 15 minutes

The teacher asks selected exam questions from the group decks.

- Discuss the questions together as a class
- Explain the reasoning behind your answers
- Connect the answers to the strengths and limitations of PCA and t-SNE

Use this discussion to clarify anything that remains unclear.

Revisit the learning outcomes

Light gray fill: your group's before responses today · Click to respond again.

Explain the core intuition behind PCA and t-SNE

Not comfortable

Very comfortable

Click to respond

Apply both methods to visualize high-dimensional embeddings

Not comfortable

Very comfortable

Click to respond

Interpret the resulting plots and discuss each method's limitations

Not comfortable

Very comfortable

Click to respond

Teach your assigned method and develop two exam questions with proposed answers

Not comfortable

Very comfortable

Click to respond

