PANDA

Extract the structure of datasets with AI and graph theory

17.03.2022, Anthony Cavin

Content

Graph Theory

- Nearest Neighbor Graph
- Limitation

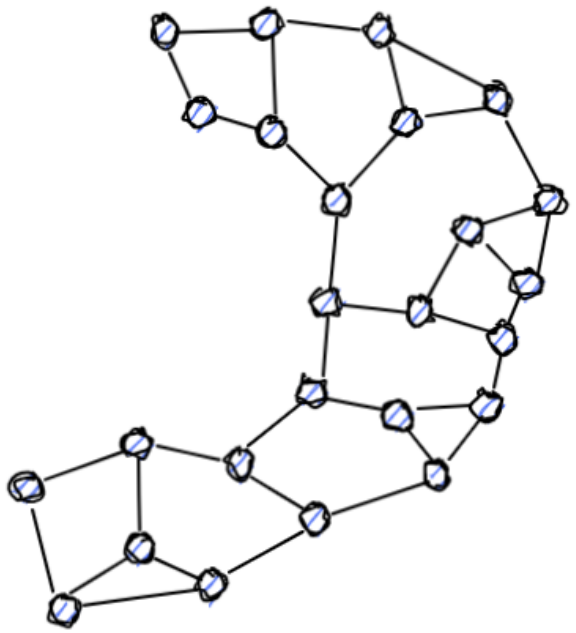
AI

- Curse of Dimensionnality
- Solutions
- Laplacian Auto-Encoder

Combine AI & Graph Theory

- Overview
- Examples

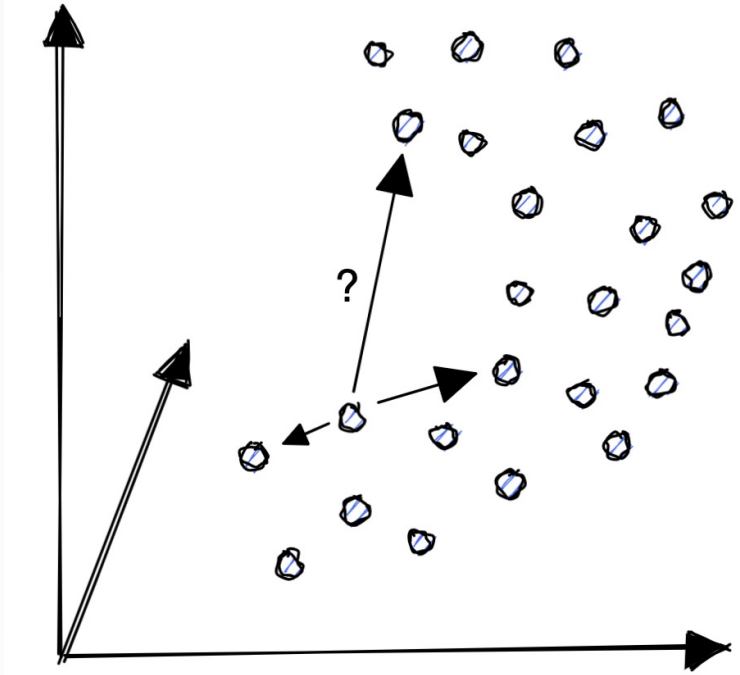
Nearest Neighbor Graph

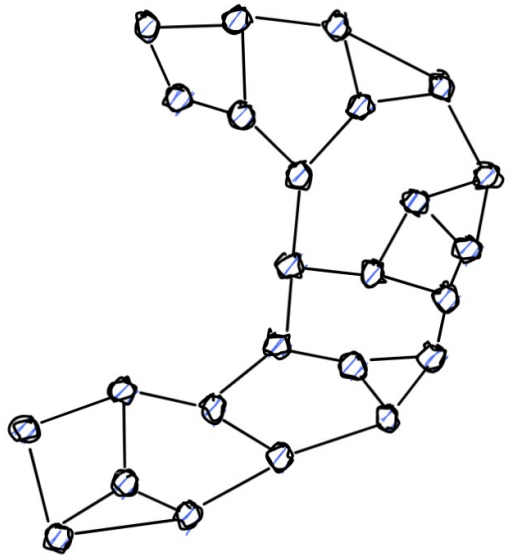


- find local patterns
- detect groups
- navigate the dataset
- detect anomalies

Nearest Neighbor Graph

Mapping based on distance measures

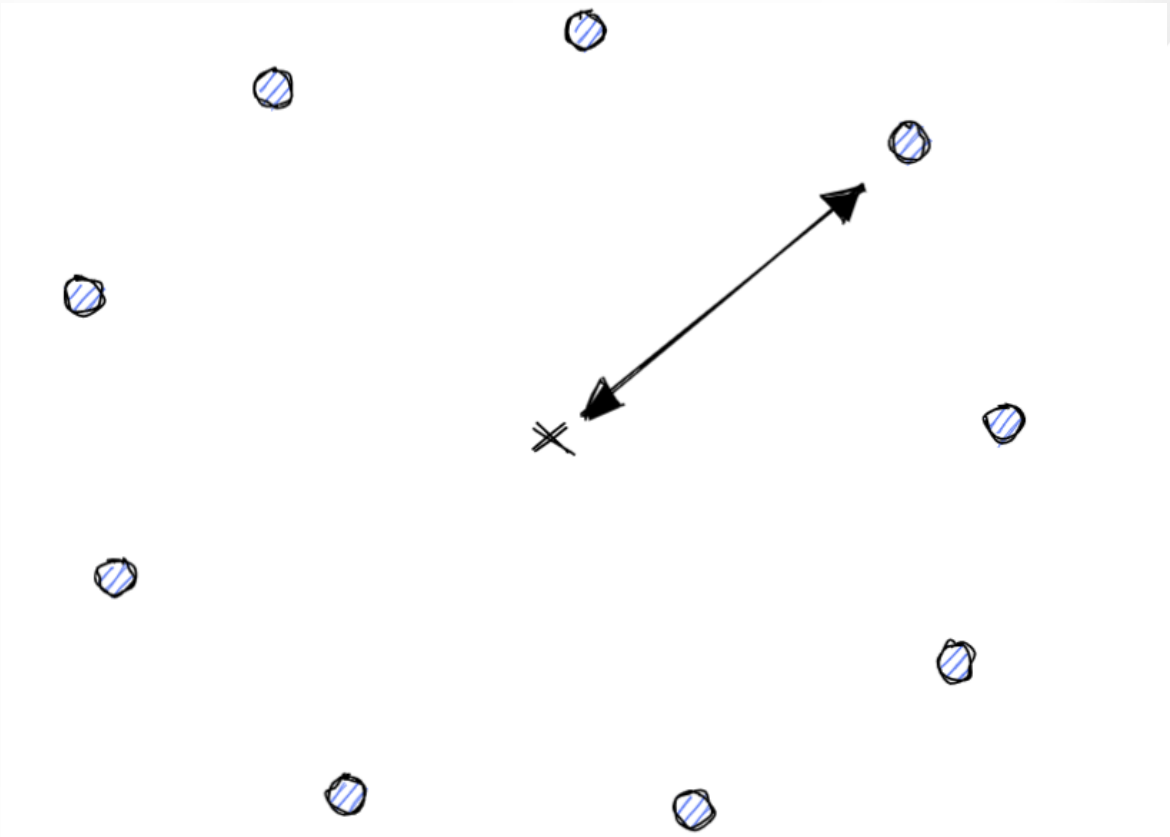




… rely on pairwise distances

Limitation

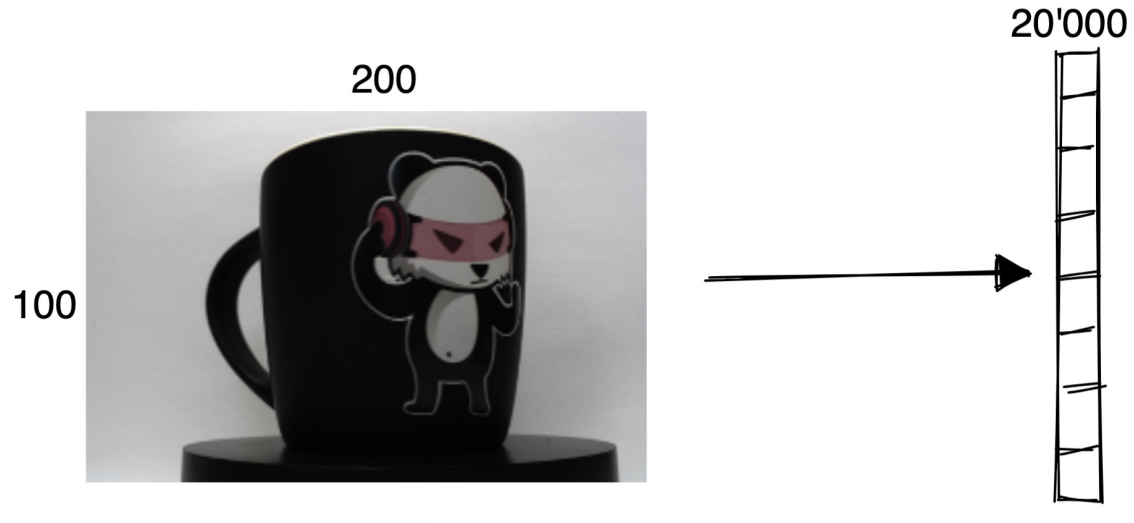
When is nearest neighbour meaningful?



The Curse of Dimensionality

By increasing the number of dimensions

- Euclidean distances are less meaningfull
- Data is more difficult to visualize

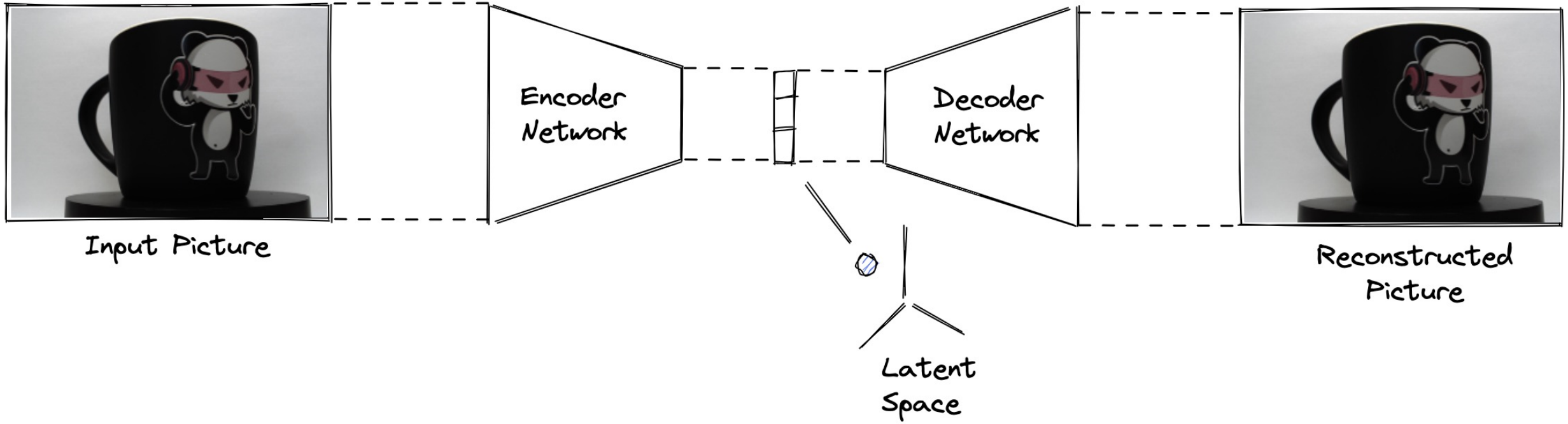


Solutions

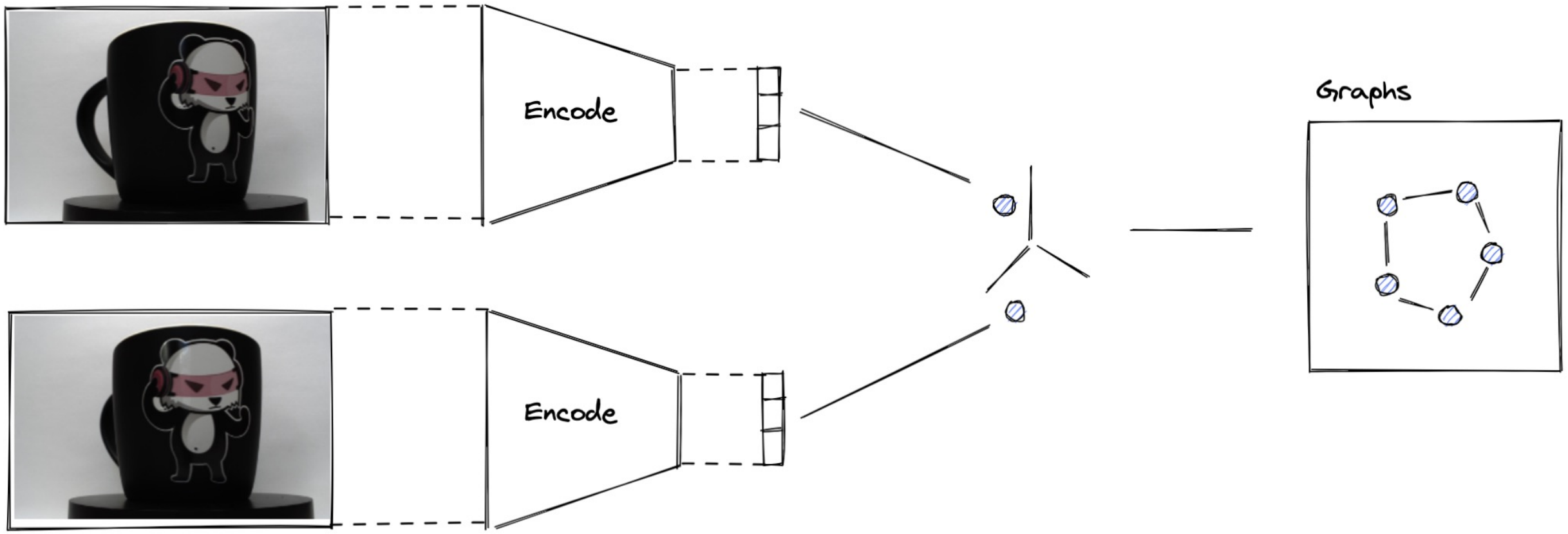
- Rely on pattern recognition techniques that are robust to high dimensions

- Different data representation
  - Hand-crafted features
  - Extract subset of features
  - Linear projection
  - Non-linear projection

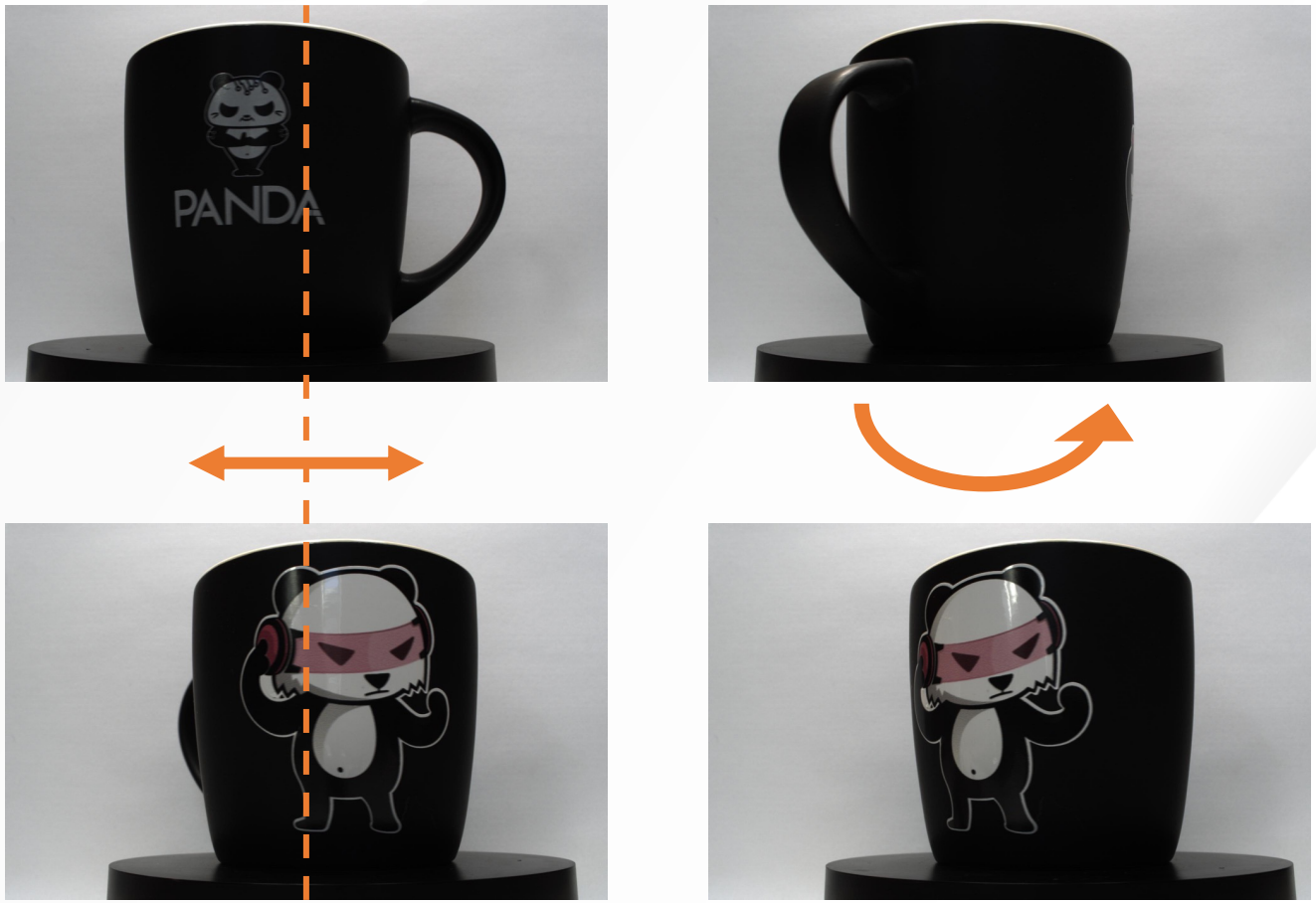
Laplacian Auto-Encoder



Latent Space Graph



Cup Example



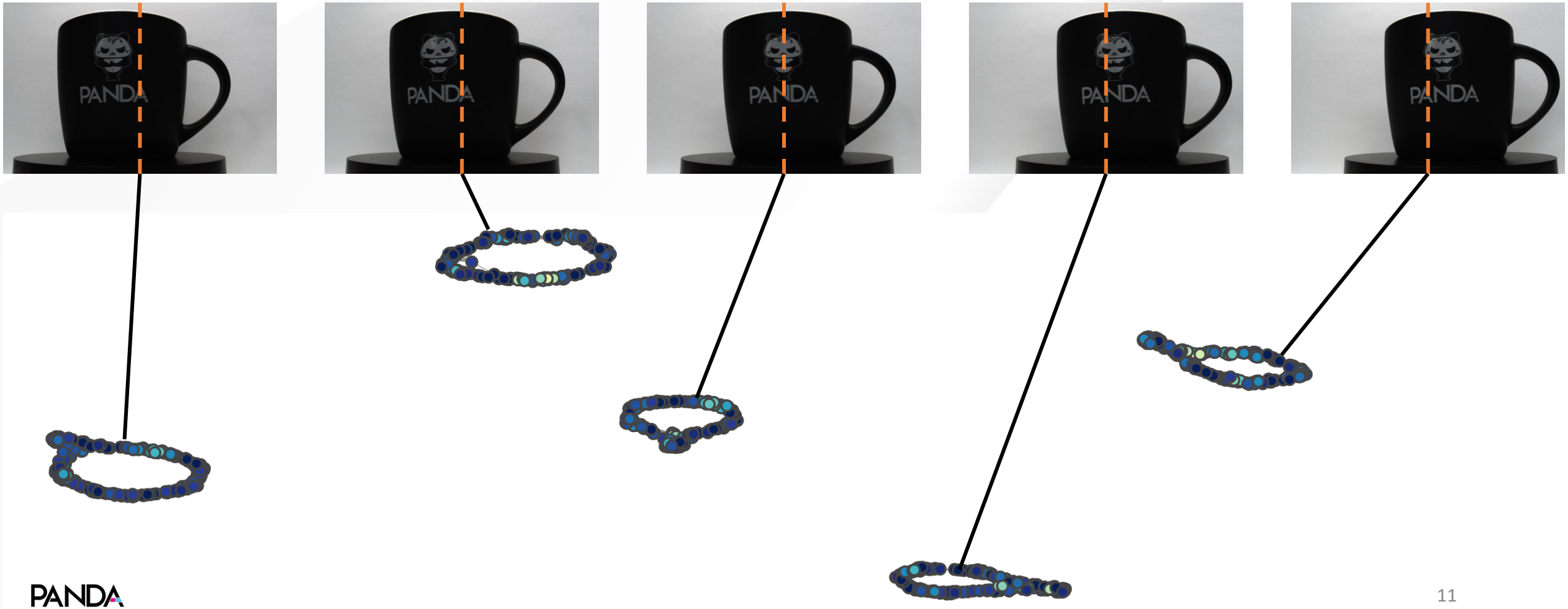
Dataset

- 10’000 pictures
- No labels

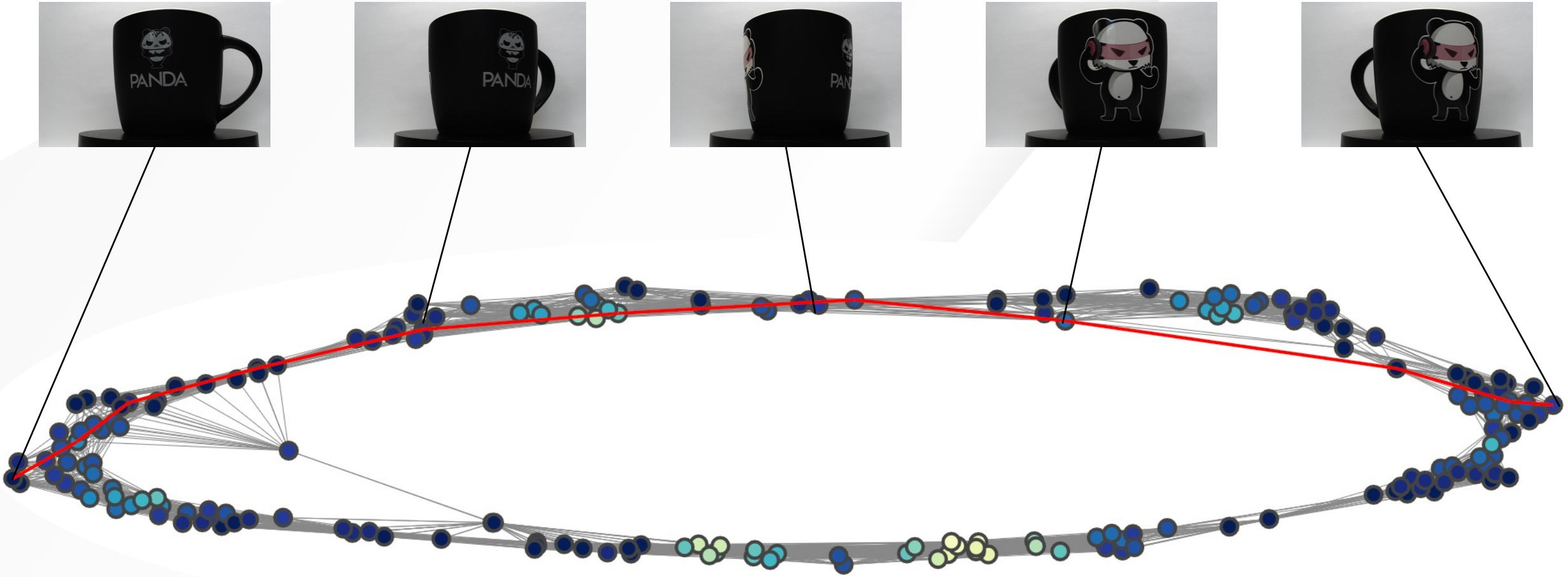
Setup

- Translation
- Rotation

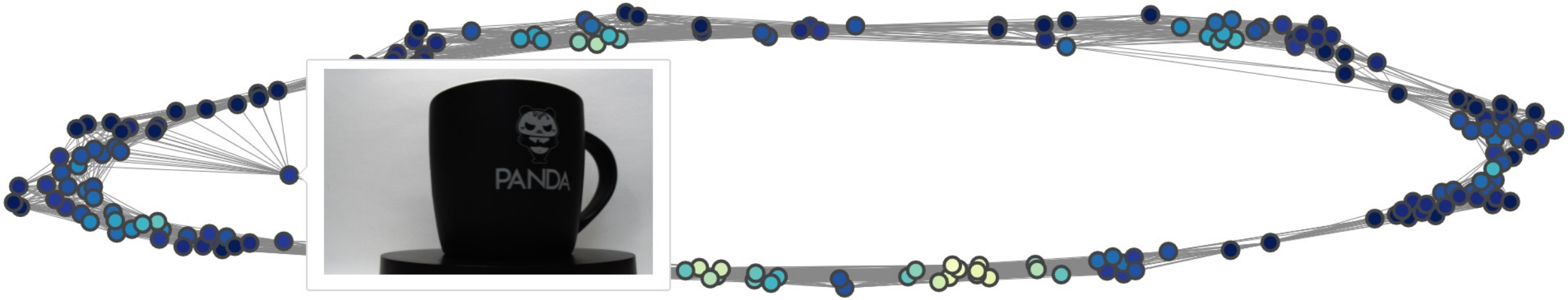
Encode Translation



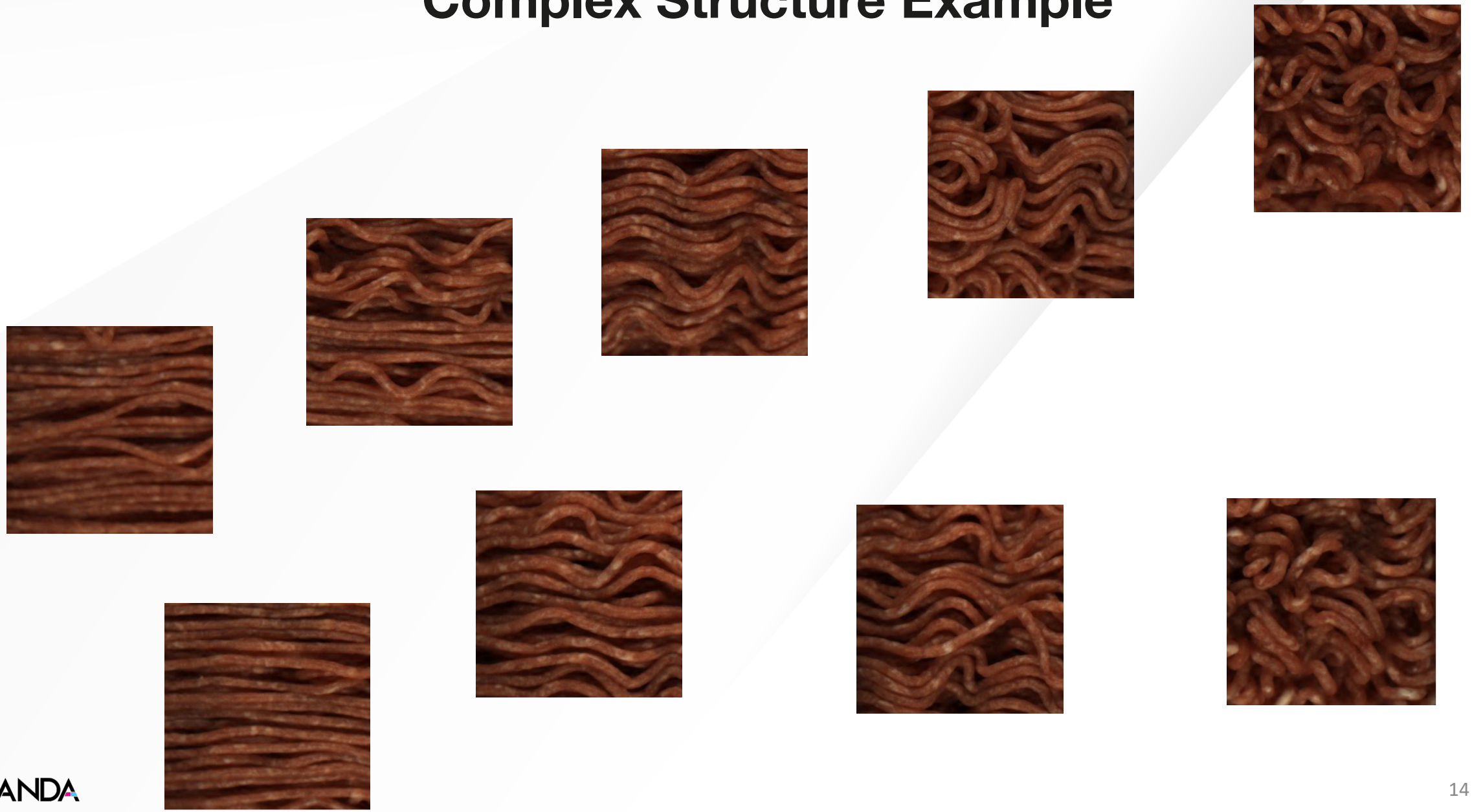
Encode Rotation



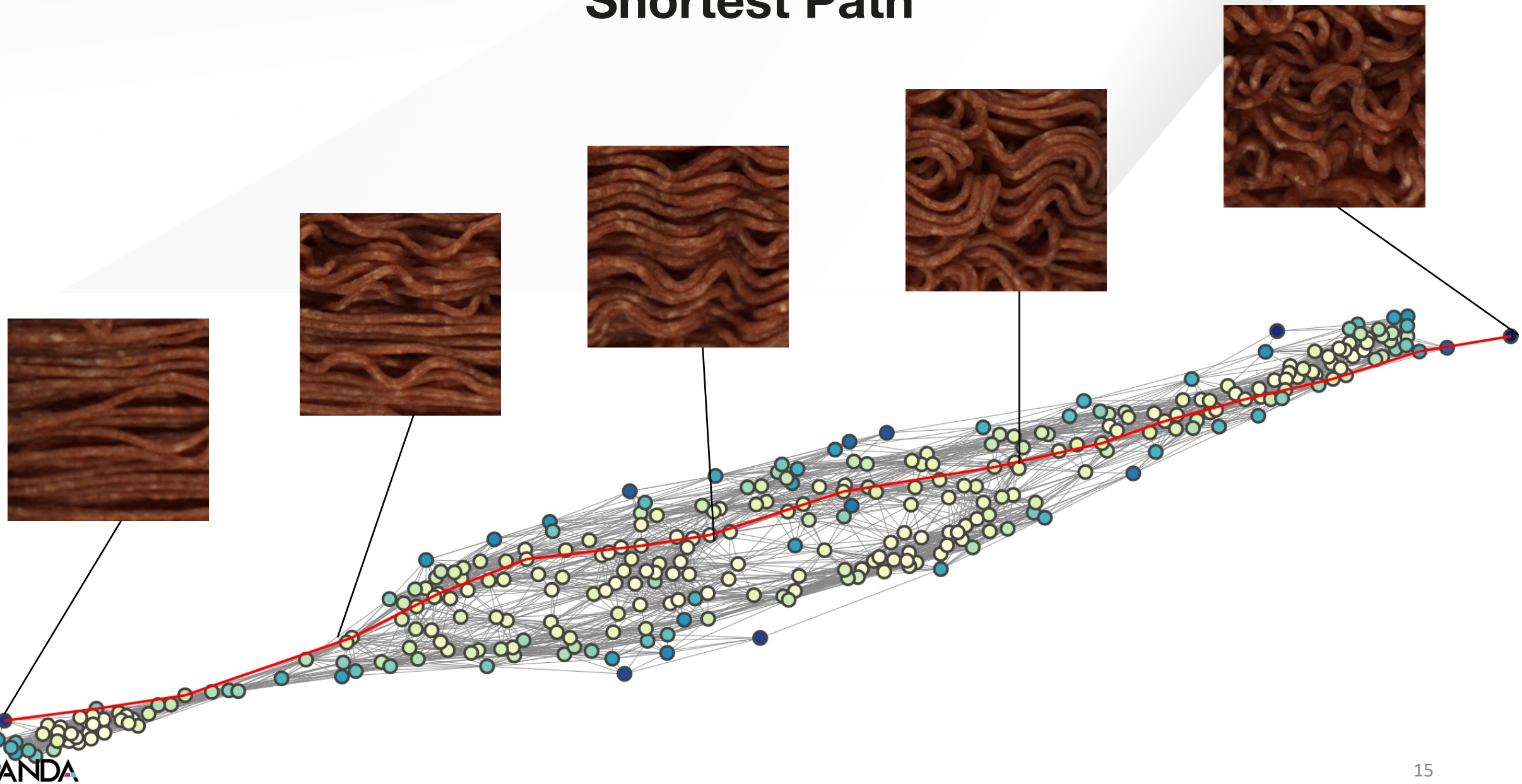
Detect Anomalies



Complex Structure Example



Shortest Path



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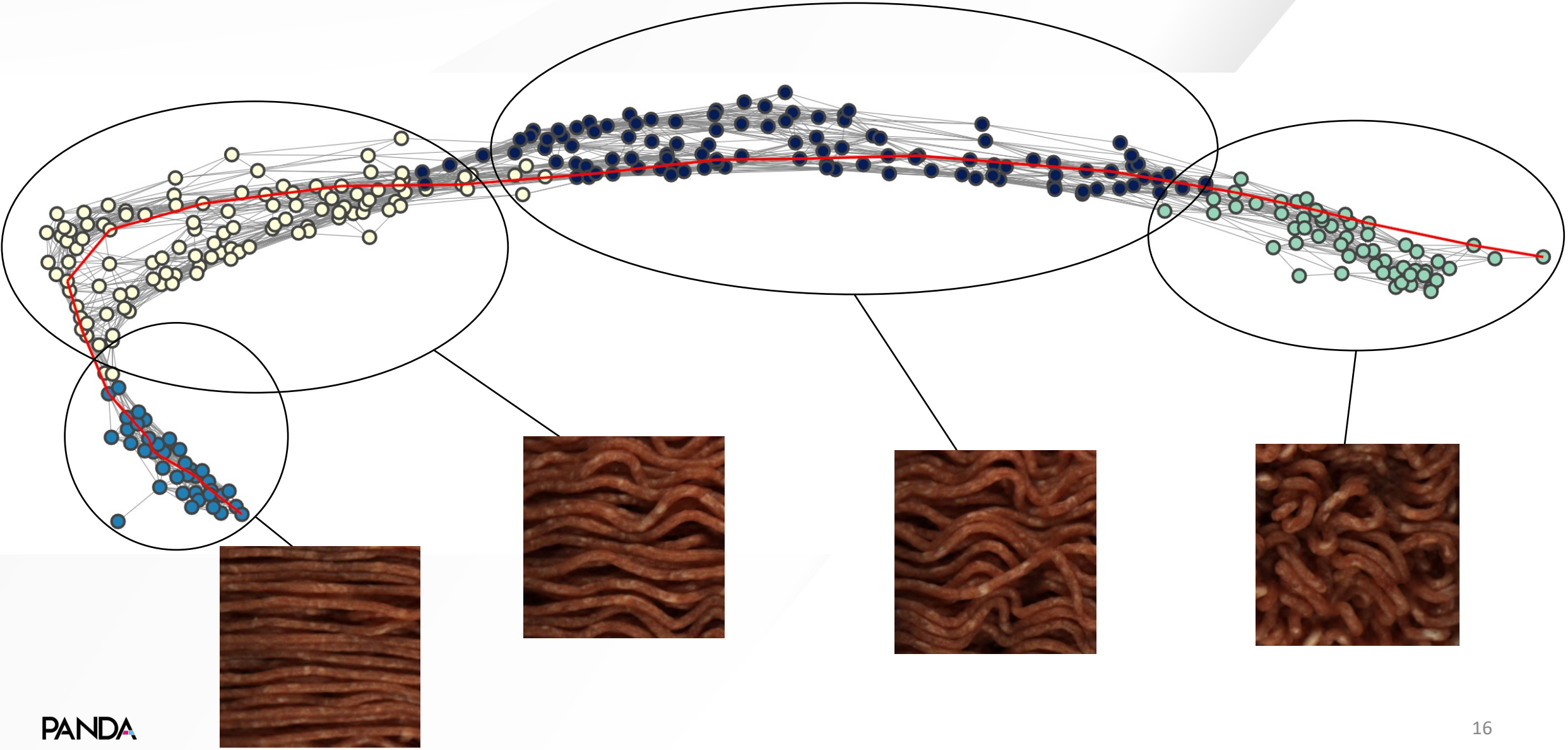
Cluster Example



PANDA INDUSTRIAL AI

Panda GmbH
Zeughausmarkt 33
20459 Hamburg

040 524 760 25
www.panda.technology

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