Timeseries Clustering using Contrastive Learning

Halil Beglerovic & Jörg Simon, June 30th 2020

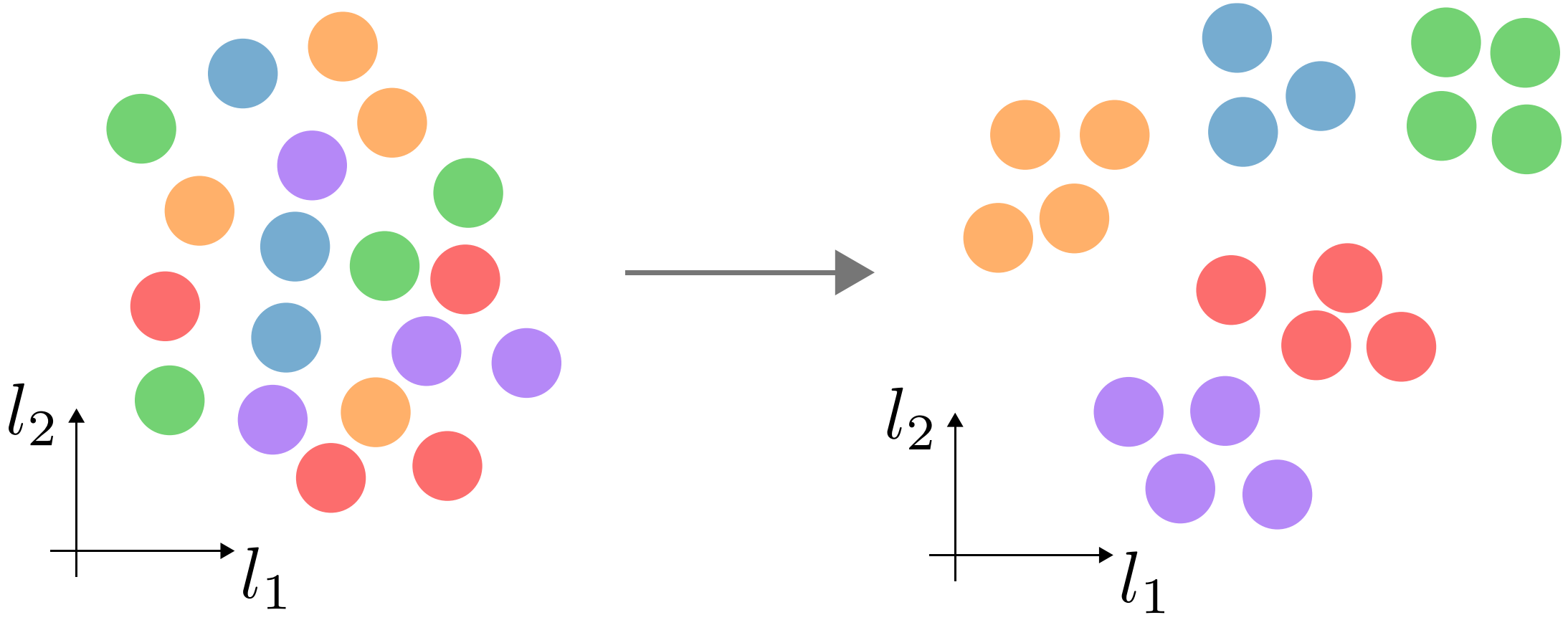
About me

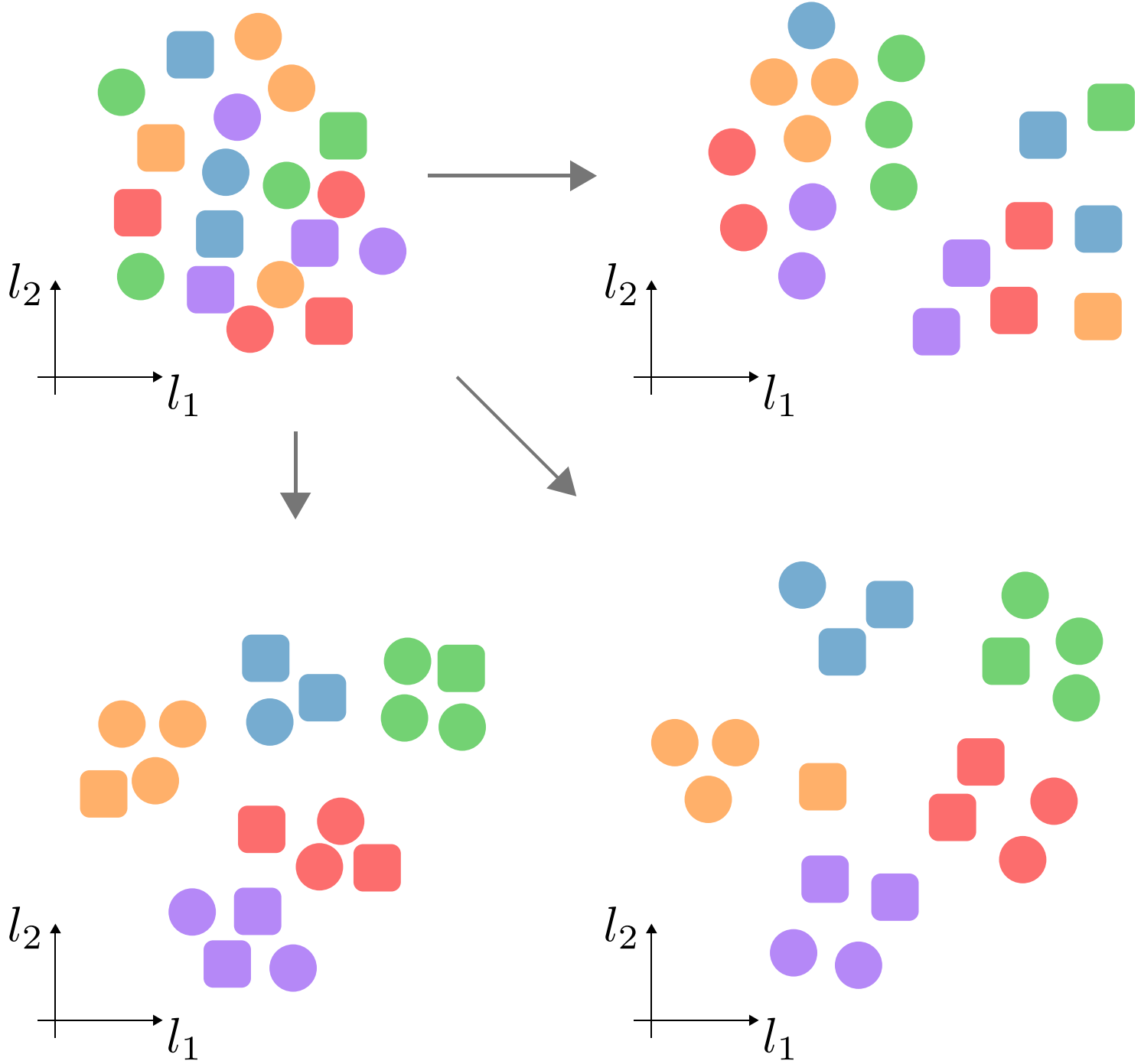
- Research Engineer and Marie Curie Alumni
- Finishing my PhD at TU Graz on “Methodologies for Testing and Validation of Automated Driving Functions”
- Interests: Deep Learning, Computer Vision, Programming, Open-source software

Agenda

- Clustering using Deep Learning
- Contrastive Learning
- Timeseries Clustering using Contrastive Learning

Clustering using Deep Learning

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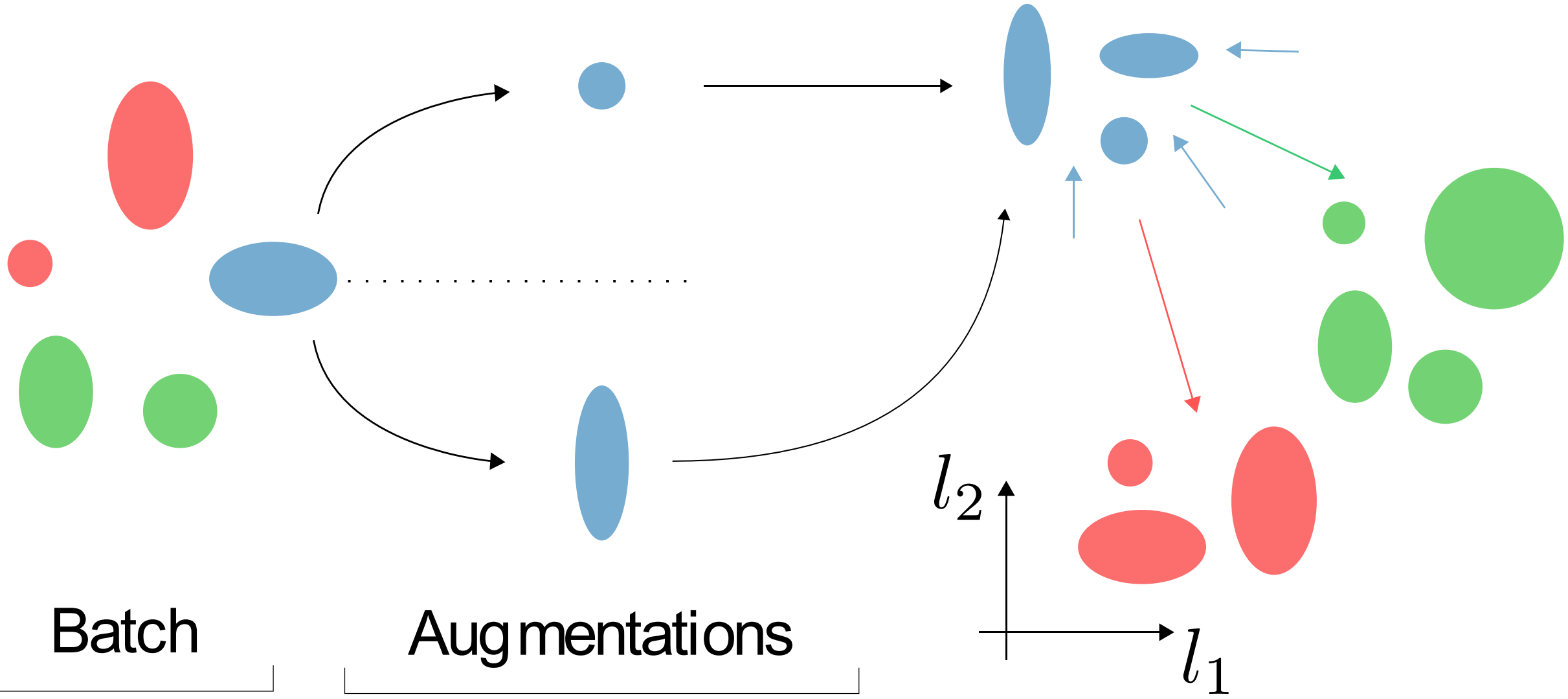
Contrastive Learning

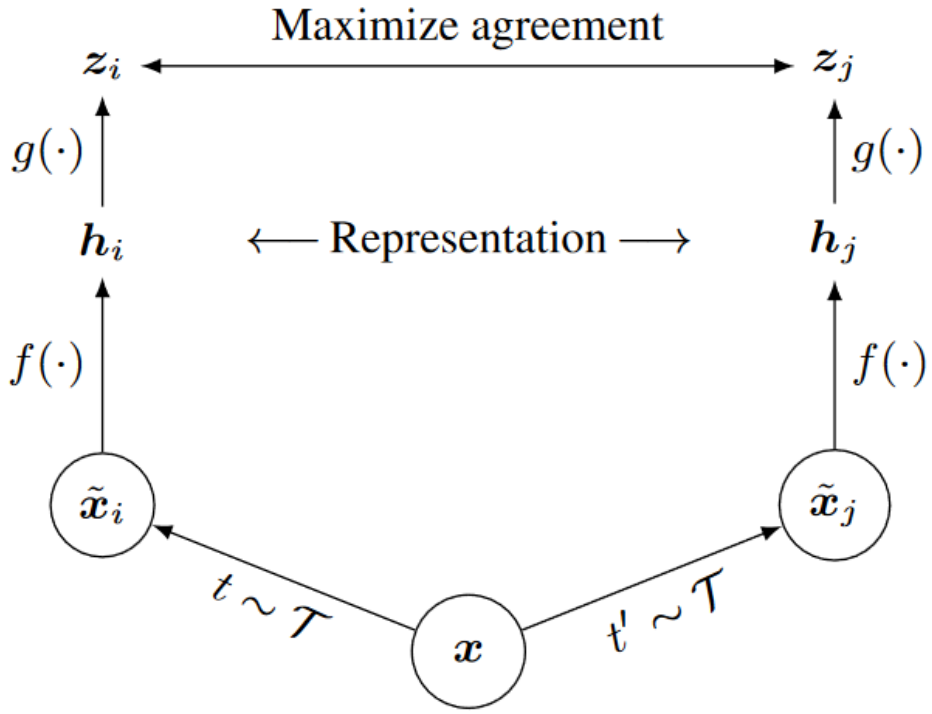


Contrastive Learning

NT-Xent - The normalized temperature-scaled cross entropy loss

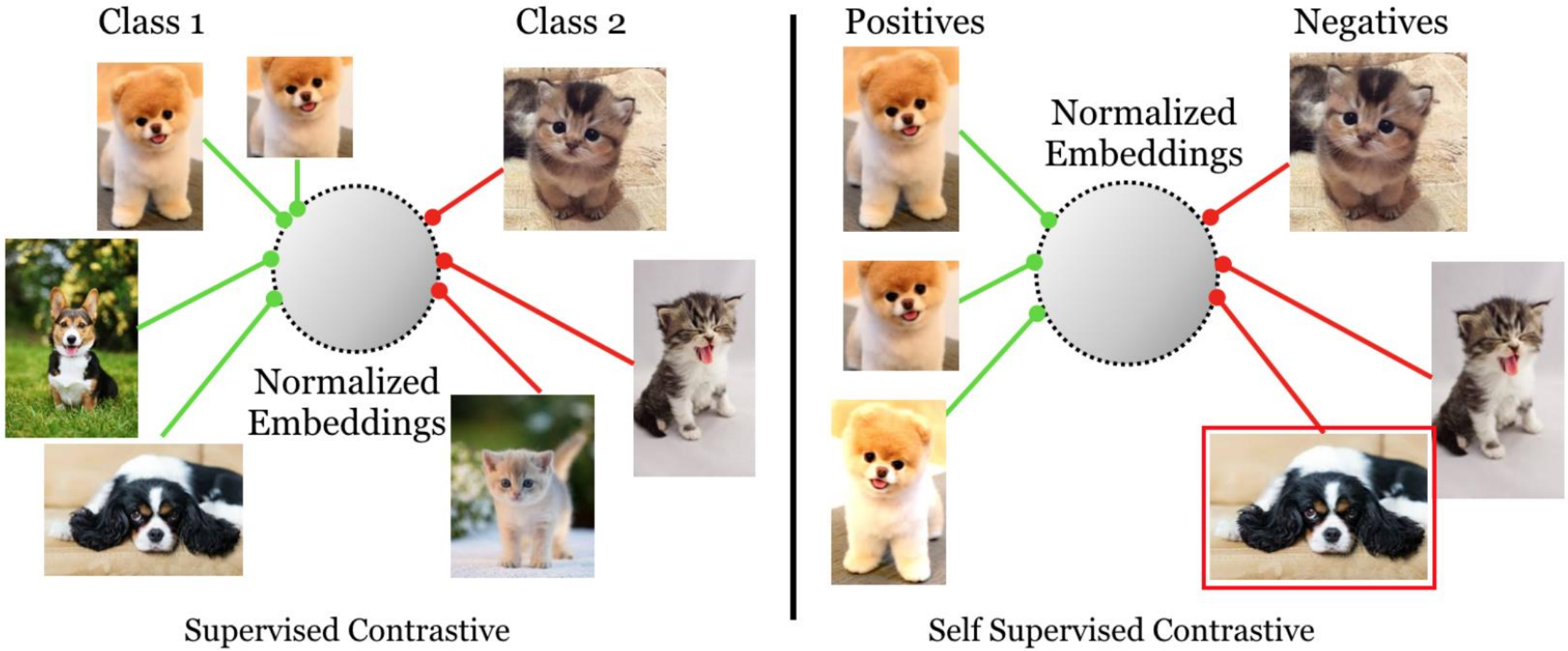
$$\mathcal{L}_i = -log \frac{exp(sim(z_i, z_j)/\tau)}{\sum_{k=1,k\neq i}^{2N} exp(sim(z_i, z_k)/\tau)}$$

$$\mathcal{L} = \sum_{i=1}^{2N} \mathcal{L}_i$$



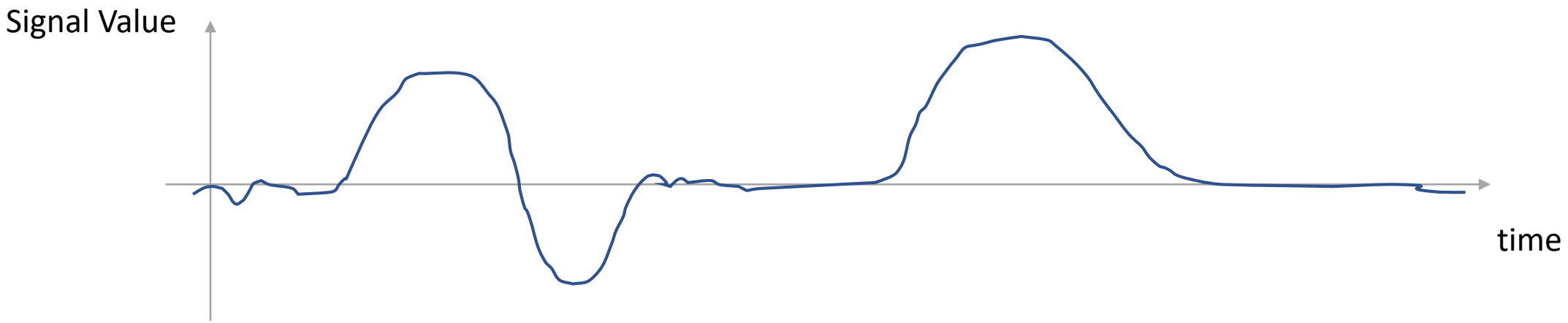
[1] A Simple Framework for Contrastive Learning of Visual Representations - arxiv.org/pdf/2002.05709.pdf

Contrastive Learning

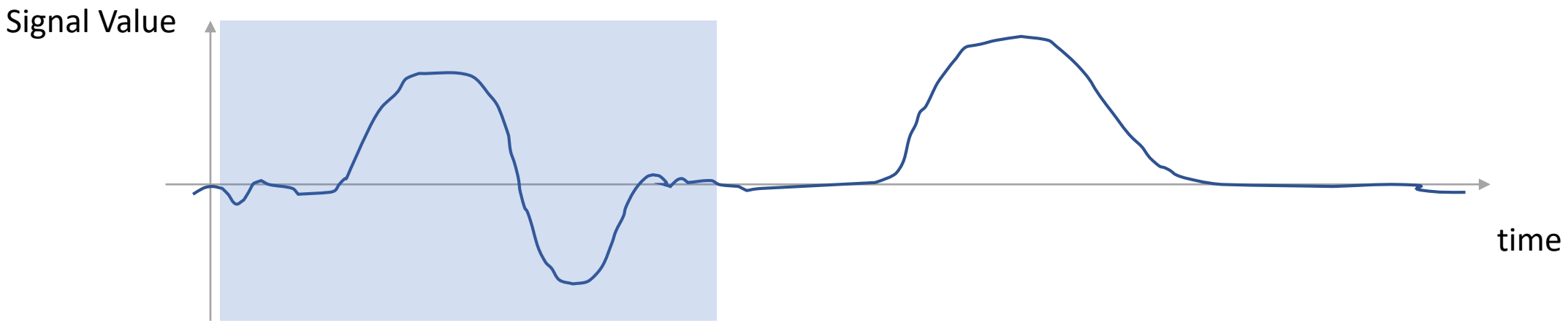


[2] Supervised Contrastive Learning - arxiv.org/pdf/2004.11362.pdf

Timeseries Clustering



Timeseries Clustering



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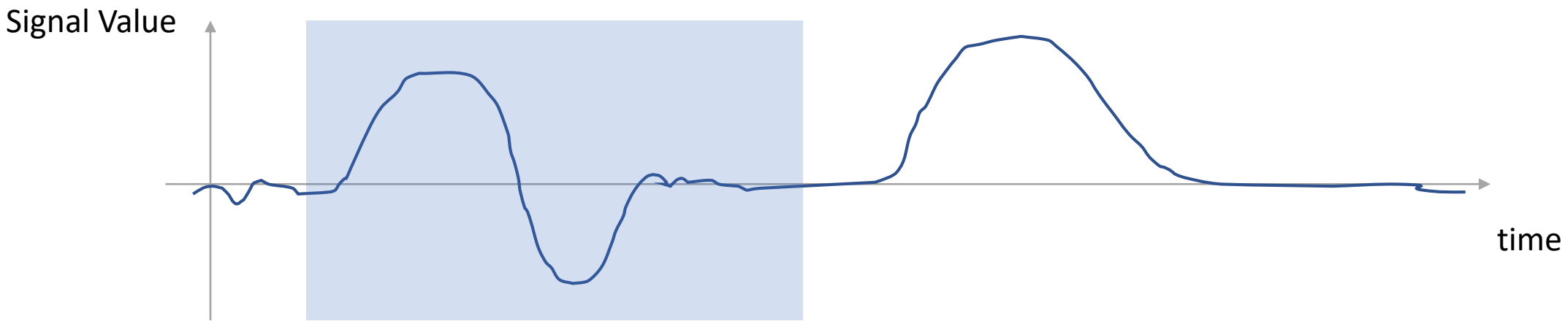

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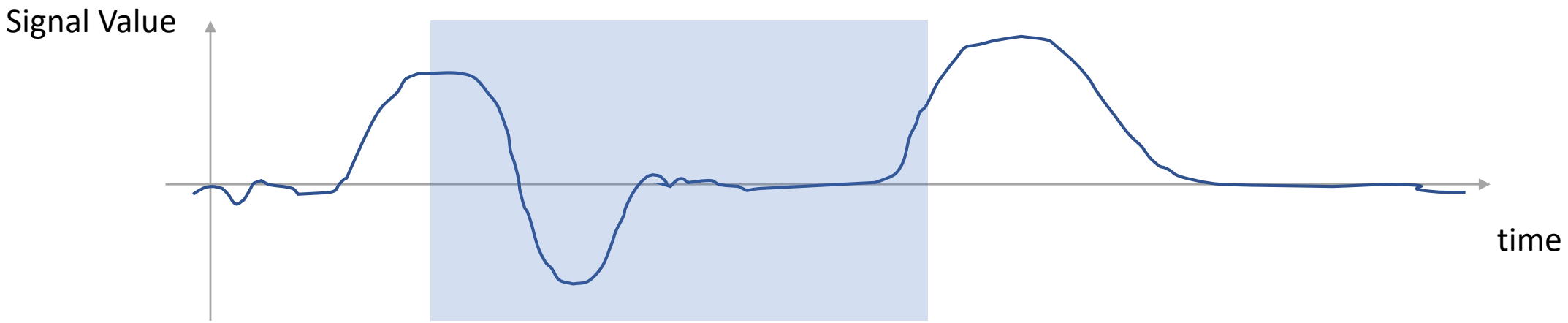

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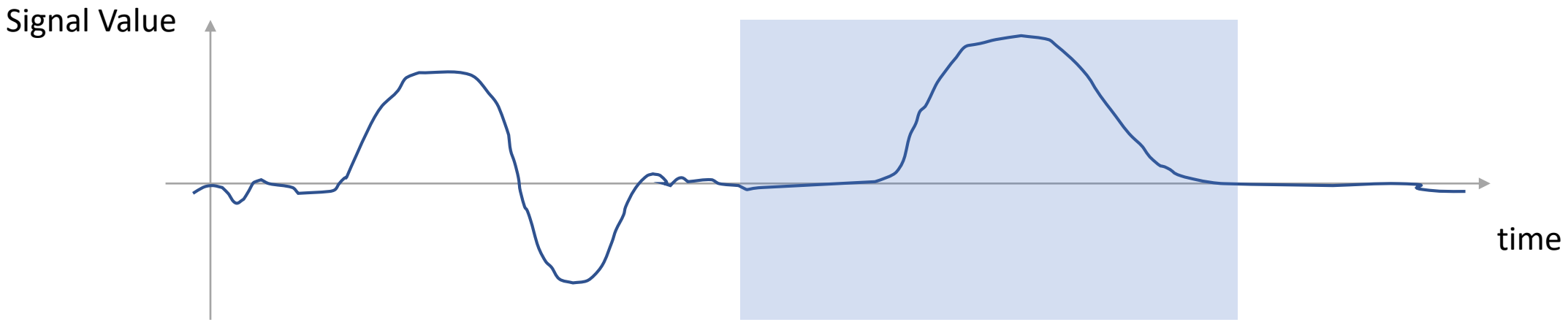

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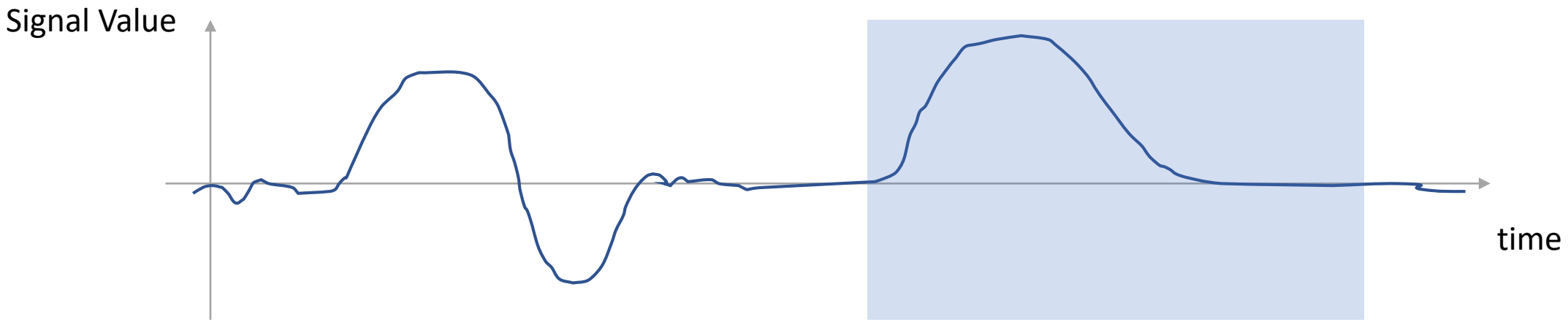

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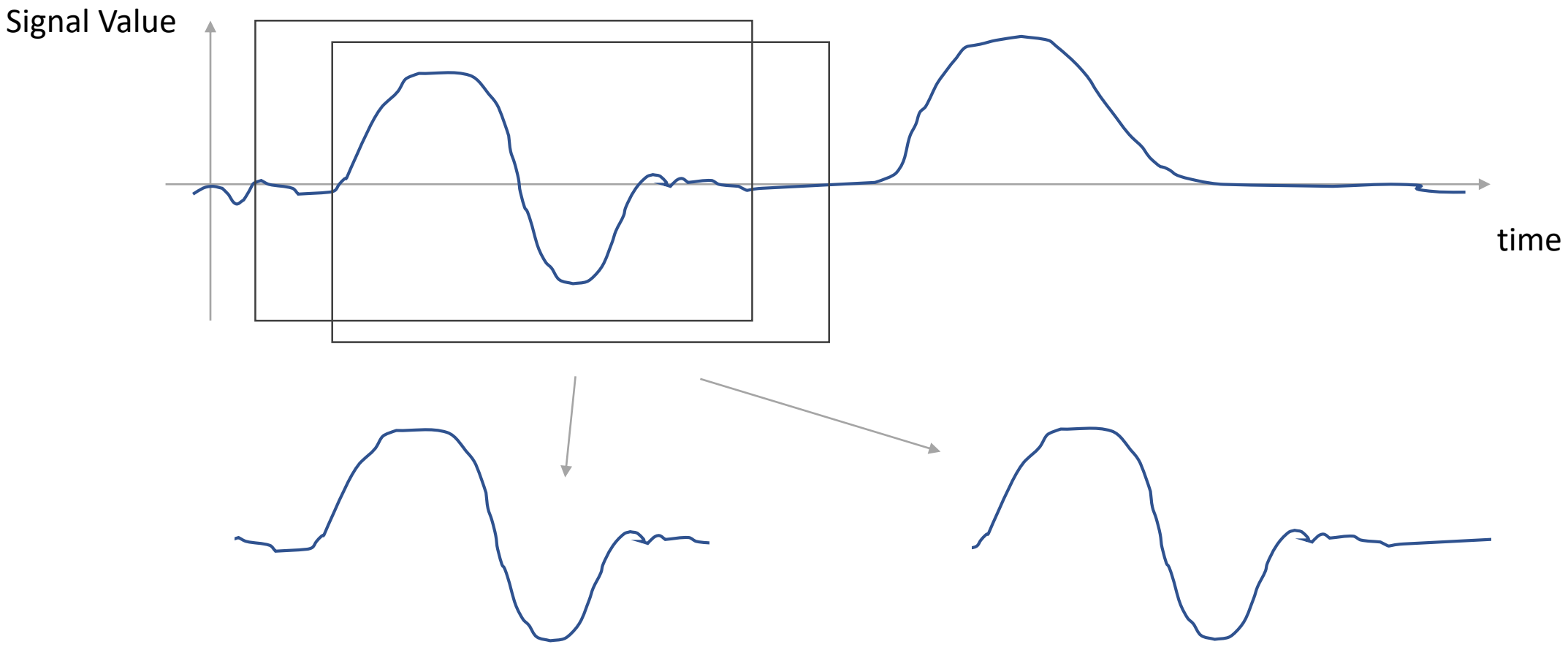

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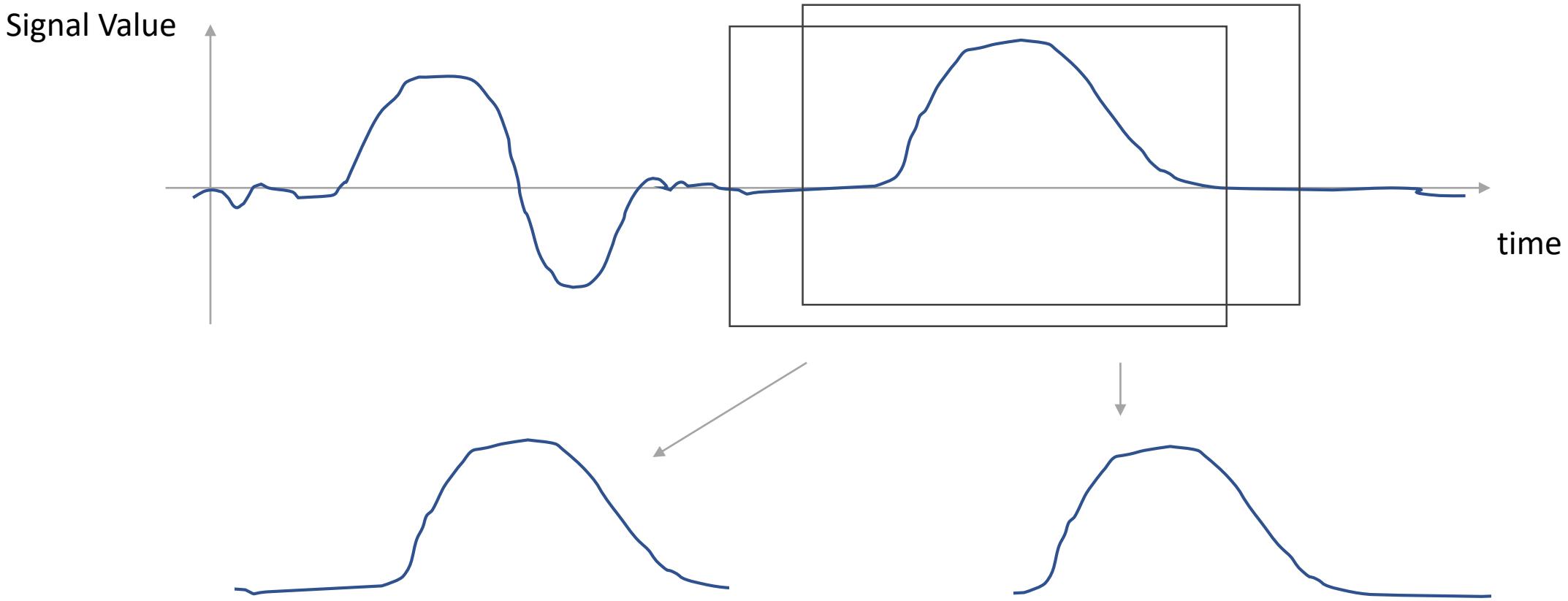

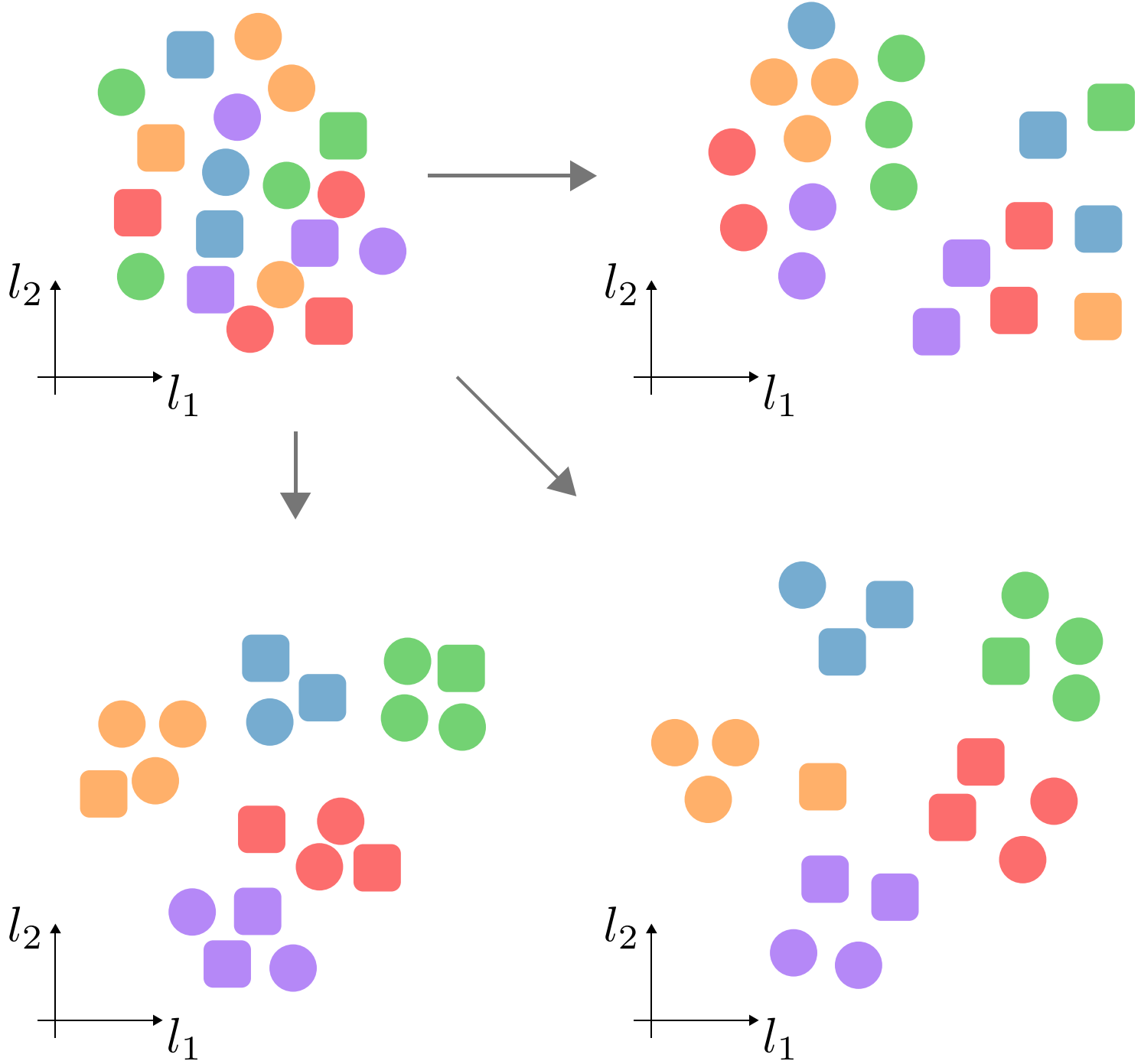
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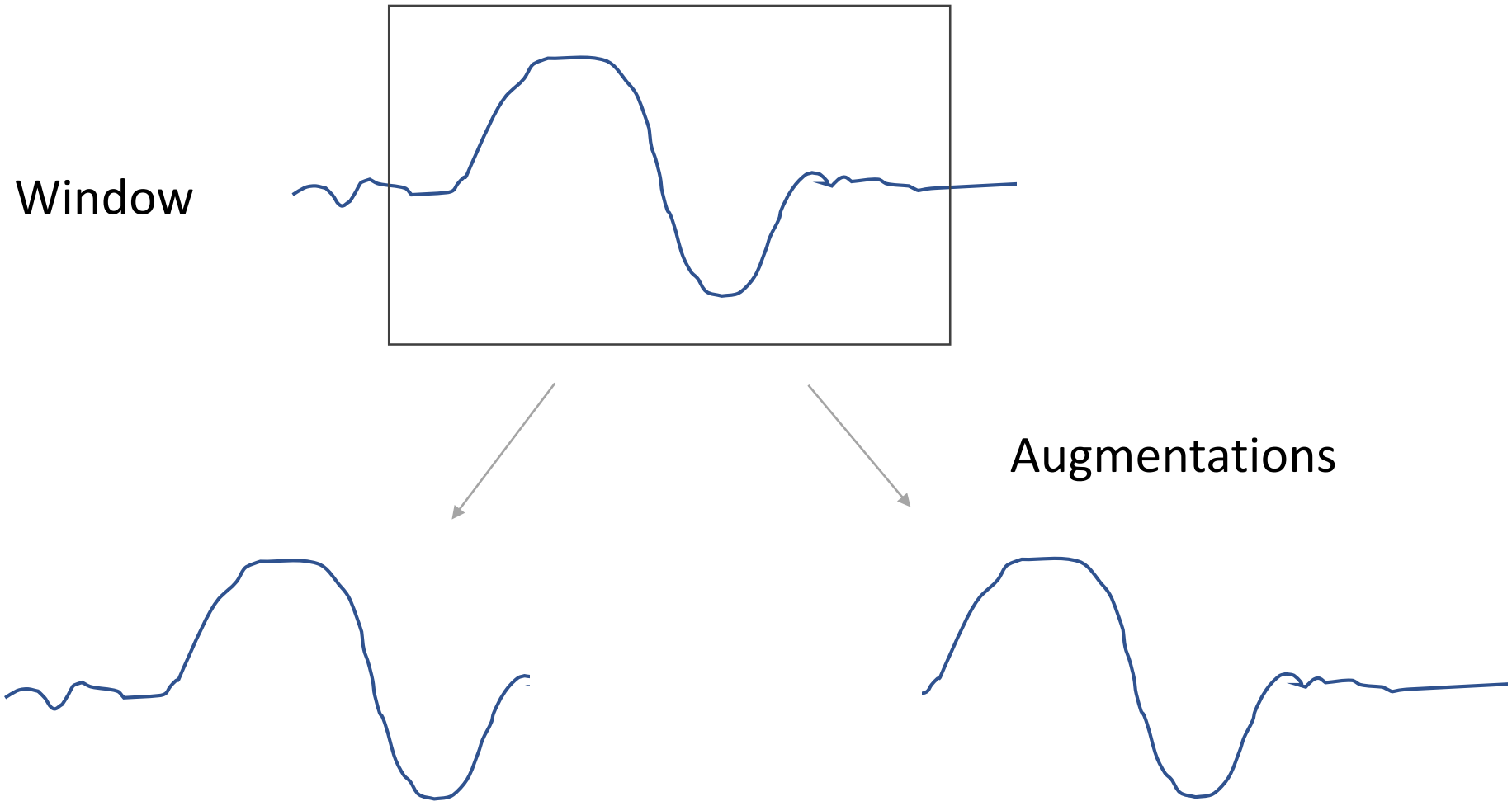
Timeseries Clustering using Contrastive Learning



Contrastive Learning

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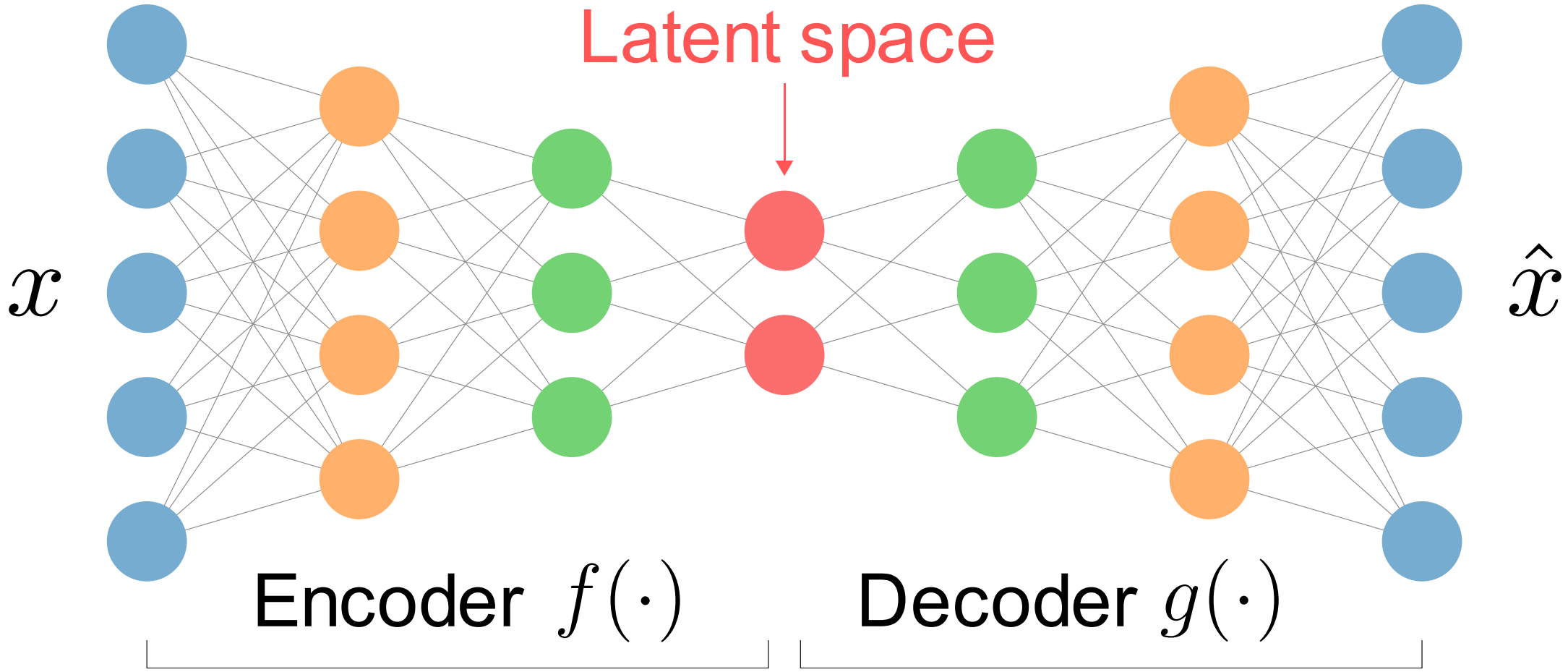
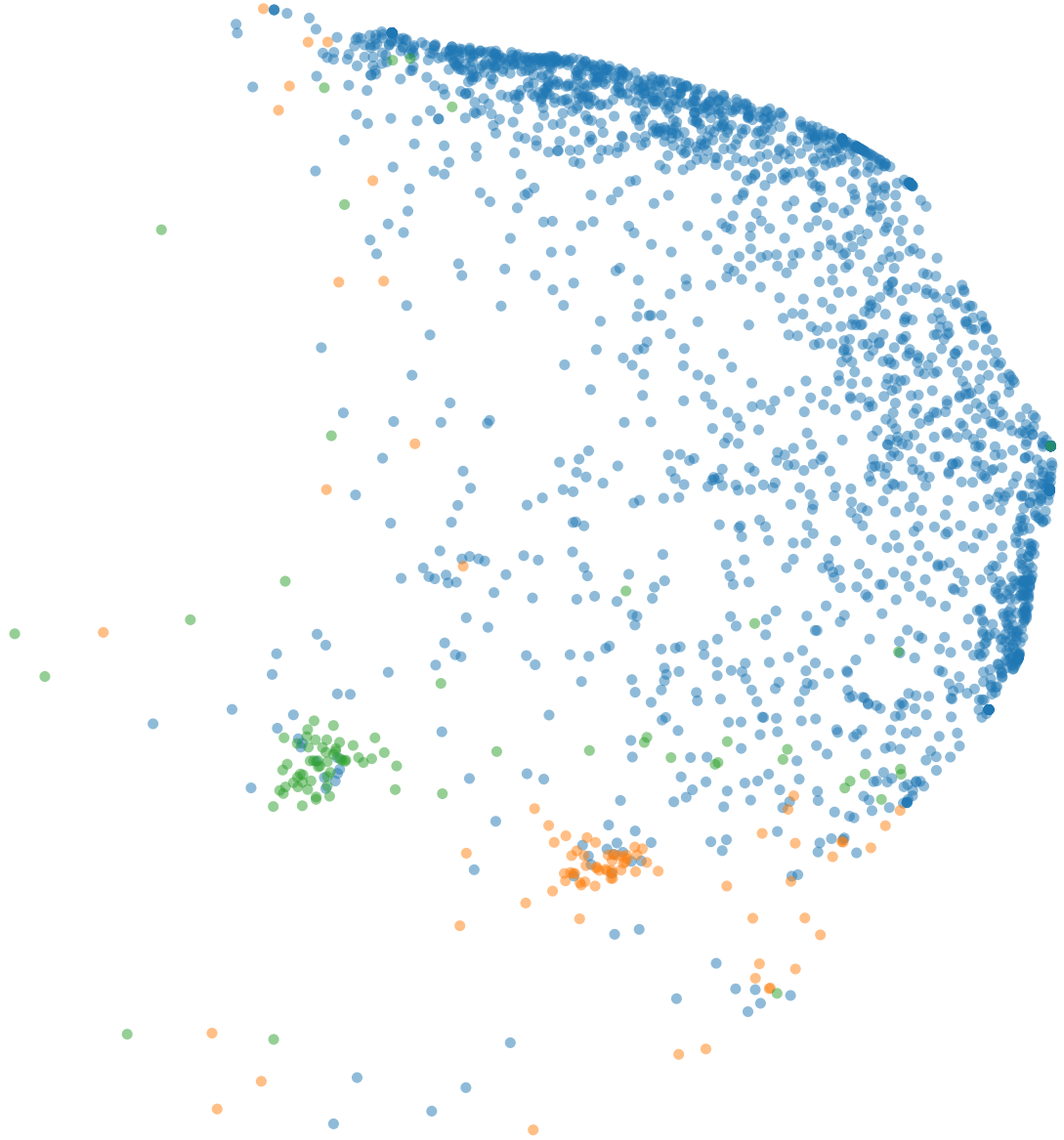
- Not using normalization
- 2D latent space – directly

Timeseries Clustering using Contrastive Learning



Autoencoder + tSNE



Encoder with Contrastive Learning

References

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