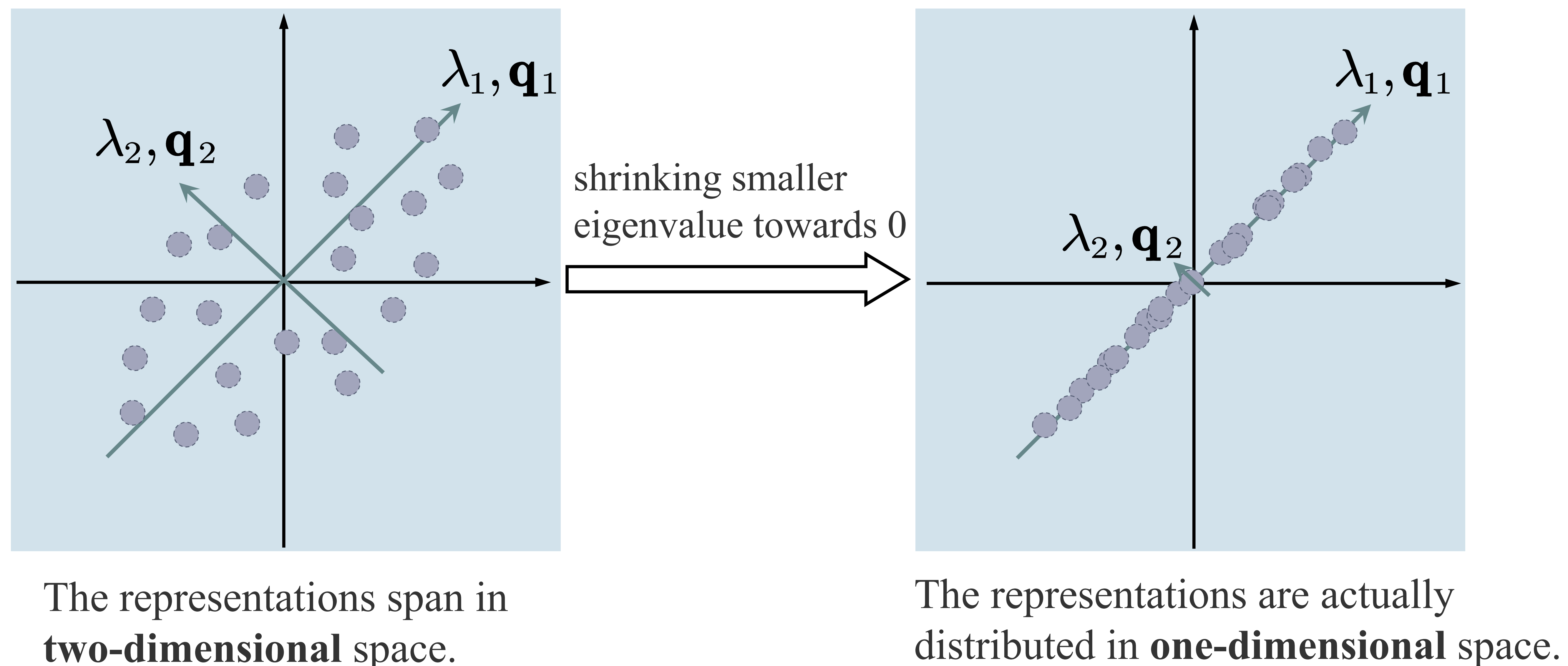


Assuming the output space of the model is two-dimensional:



We can find that

- Shrinking the smaller eigenvalues towards zero potentially acts as a **dimensionality reduction**.
- The output of the model is two-dimensional, but only one dimension is effectively utilized, which **wastes model capacity**. This can equivalently be achieved by **setting the output dimension (a hyperparameter) to 1**, which is more efficient.
- The same scenario can be analogized to high-dimensional space.
- The situation of eigenvalues can reflect the utilization of representation space.
- Self-supervised learning aims to fully leverage the expressive power of the model. Some works utilize the distribution of eigenvalues to **measure the effective utilization of the representation space**, as illustrated in Figure A.3 in [1] and Figure 9 in [2]. They all concur that flatter distributions of eigenvalues are preferable.

[1] Self-supervised learning with an information maximization criterion. NeurIPS, 2022.

[2] Understanding dimensional collapse in contrastive self-supervised learning. ICLR, 2022.