# Project Proposal: Option A

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## 1 About the Paper

- **Title**: Toward Understanding the Feature Learning Process of Self-supervised Contrastive Learning

- **Authors**: Zixin Wen, Yuanzhi Li

- **Journal**: Proceedings of the 38 th International Conference on Machine Learning

- **Volume**: PMLR 139

- **Page**: p.11112-11122

- **Year**: 2021

## 2 Brief Summary of the Paper

- *Problem the paper is dealing with*: How and when neural network training with using SGD learns features in constrstive learning.

- This paper theoretically characterize when contrastive learning learns features like the supervised learning in image classification. In particular, they point out both theoretically and empirically that the data augmentation is need for the network to learn sparse(good) feature instead of dense(bad) features.

- The architecture they analyze here is the 2-layer(one-hidden layer) network in which the most theoretical analysis is going on. This contrasts to the classical results about the neural network is based on the neural tangent kernel(NTK) of which pointed out in fail to explain how neural networks learn features.