**Project Title:** **Video Compression using Variational Auto-encoders**

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This project aims to improve compression performance using Variational Auto-Encoders. Recently, use of machine learning approaches to image compression has led to considerable performance improvements over classical image compression techniques [1 - 3]. However, learning based video compression has started to be explored very recently. This area is in nascent stages of development and has a wide scope of improvement. According to Cisco [4], more than 82% of the internet traffic is estimated to be videos by 2022. Therefore, improved video compression would definitely have great economic impact. The project requires the study of variational auto-encoders, image and video processing and knowledge of the classical and learning based compression approaches.

## Learning Objectives:

1. Study and analysis:
    a. Variational Auto-encoders including variational inference
    b. Image and video processing (esp. Image and video compression)
    c. Entropy coding and probabilistic modeling
2. Implementation:
    a. Image and video compression using Auto-Encoders.
    b. Entropy coding to achieve end-to-end compression.
    c. Optimization to increase compression and reduce computations.

## Technology and Tools:

- Python, C/C++
- Deep Learning Frameworks (Pytorch/Keras/Tensorflow)

## Project Illustration:

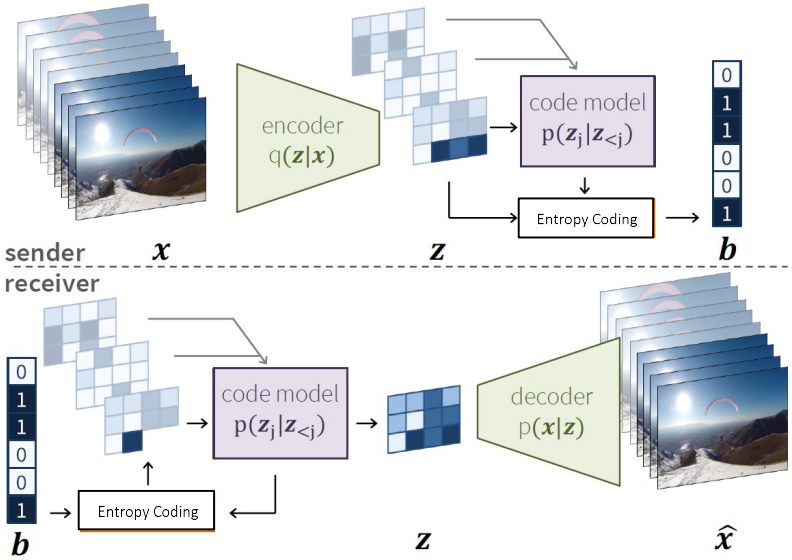


Image Source: [5]

## References:


[1] J. Ballé, D. Minnen, S. Singh, S.-J. Hwang, N. Johnston, “Variational image compression with a scale hyperprior,” arXiv preprint arXiv:1802.01436, Feb. 2018.

[2] J. Ballé, V. Laparra, E. Simoncelli, “End-to-end optimized image compression,” arXiv preprint arXiv:1611.01704, Nov. 2016.

[3] O. Rippel, L. Bourdev, “Real-time adaptive image compression,” Proc. 34th Intl. Conf. Machine Learning, vol. 70, pp. 2922-2930, Aug. 2017.

[4] White paper, Cisco Visual Networking Index: Forecast and Trends, 2017–2022, Cisco Public Information, Feb. 2019.

[5] A. Habibian, T. Rozendaal, J. Tomczak, T. Cohen, “Video compression with rate-distortion autoencoders,” Proc. IEEE Intl. Conf. Computer Vision, pp. 7033-7042, July 2019.