(4) Number of principal modes of variation is about 50 for each digit.

The 50th largest eigen value is a 100 times less than the λ for that digit and we can neglect the rest without any significant ~~error~~ difference in assumption/result

Hence 50 is much less than 28^2. The number of eigen values with order of magnitude = 10^5 (largest eigen values) is also less than 50.

All pixels are not covered in writing a digit and moreover everyone writes the same digit in a different way. The unmarked pixels have nearly 0 variance and covariance.

Also true for some marked pixels.

Hence only some eigen values have a significant contribution.

The mean image is the a little bit more hazy is less (sharp) crisp from other 2 for every digit Since mean image takes equal contributions from all writing styles.

Other 2 take into account principal mode of variation v_i & hence less hazy and ~~more~~ sharper.

→ To certain digits like 0 and 1, λ_1 is large and other eigen values drop quickly unlike some like 3 and 8, since they are most uniformly written (also may be cover less number of pixels)

Others have many ways of writing them.