What is the problem?

The challenge lies in enhancing the quality of low-resolution, blurry text images, which are common in images captured by mobile cameras or low-end digitization devices. These images often suffer from motion blur, out-of-focus issues, and low resolution, making tasks like optical character recognition (OCR) and text analysis difficult. The primary problem the authors focus on is the simultaneous super-resolution and deblurring of text images without prior knowledge of the blur kernel.

What has been done earlier?

Earlier research has tackled the problems of super-resolution and deblurring separately:

- Super-Resolution Methods:These fall into two main categories:
  - Exemplar-based methods
  - Regression-based methods
- Deblurring Techniques:These have traditionally employed:
  - Bayesian-based methods
  - CNN networks Some recent methods have aimed at solving these two tasks simultaneously using deep learning techniques, such as deep encoder-decoder networks and Generative Adversarial Networks (GANs). However, most of these approaches have been applied to natural images rather than focusing on text images.

Pratik Ranjan Sau, B421034

Remaining Challenges

The remaining challenges include:

- Jointly performing super-resolution and deblurring in a unified process for text images.
- Effectively enhancing text images without prior knowledge of the blur kernel.
- Achieving fast, high-quality image reconstruction, particularly for documents requiring OCR and text analysis.

Novel Solution Proposed

a method called SDT-DCSCN (Simultaneous Deblurring and Super-Resolution based on DCSCN architecture). This novel approach involves:

- Using a deep neural network based on DCSCN (Deep CNN Skip Connection and Network in Network), which has been successful in natural image super-resolution.
- Modifying DCSCN to handle both super-resolution and deblurring of blurry text images.
- Utilizing blurred images and bicubic upsampled sharp images as input to train the network, which enables the system to generate high-resolution, sharp images from blurred, low-resolution text images.
- The solution outperforms previous state-of-the-art methods, both in terms of quantitative measures (PSNR, SSIM) and visual results, while also being computationally efficient by using 1x1 CNNs for faster processing.