1. Our Goal – Video Denoising

![Diagram of video denoising process]

2. Non-local Self Similarity

- Every patch has several twins within the frame and in adjacent ones
- Core idea: process similar patches jointly
- The problem:
  - An annoying local-global gap
  - Not suitable with convolutional architectures

3. Patch-Craft Frames

- For each patch of size $p$ find $n$ nearest neighbors
- Build $np$ patch-craft frames by stitching non-overlapping patches together

![Diagram of patch-craft frames]

4. S-CNN

- Each frame and its corresponding patch-crafted ones are fed together to a fully convolutional network

![Diagram of S-CNN]

5. T-CNN

- Temporal post-filtering
- T-CNN and S-CNN are trained separately

![Diagram of T-CNN]

6. Future directions

- Reduce computational complexity using approximate NN search
- Merge T-CNN and S-CNN to a single network and train it end to end

References

Gaussian denoising results on DAVIS data set

<table>
<thead>
<tr>
<th>Sigma</th>
<th>V-BM4D</th>
<th>VNLB</th>
<th>VNLNet</th>
<th>DVDNet</th>
<th>FastDVDNet</th>
<th>PaCNet (ours)</th>
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Denoising with clipped Gaussian noise

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Number of parameters:

- V-BM4D: 15,617,552
- VNLB: 15,617,552
- VNLNet: 15,617,552
- DVDNet: 15,617,552
- FastDVDNet: 15,617,552
- PaCNet: 15,617,552

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