During registration, it is usually done by other methods. We can use some anchor points that will be based on deep learning; but the registration itself - whether it is rigid body, affine transform, or other transform - will be done with technology based on the physics of the problem. Segmentation can be done with other technology also when we have less data. We can obtain a very good segmentation without training for thousands of images.

Whenever we need to do complete authentication with 100% accurate biometrics identification, we will need to use technologies that are 100% correct and not only statistically working. In this case, we should not use deep learning. Of course, when we perform navigation during surgery, we will prefer to use solid computer vision technology.

The diagram below shows on the left side all the machine learning, classification, segmentation, and detection technology. The leading technology will use deep learning, but of course Support Vector Machine and other technology are very efficient as well.

On the right side, advanced computer vision technology will use graph cut, active contours, mean shift, Dijkstra and Bellman-Ford. All of these are based on solid graph series coming from mathematics. Of course, that also includes 3D reconstruction, optimization methods, compression and color science. Many more examples can be found in any computer vision textbook.

We want to end with a reminder that the best practice is to use both methods because with only one method, you can skip and do very partial work. We find that, especially for the pre-processing and post-processing, you need other tools. As we say, **even the biggest hammer cannot replace a screwdriver**…

Management

Even the biggest hammer cannot replace a screwdriver

RSIP VISION

Deep Learning

- Classification
- Segmentation
- Diagnostics - lesion detection
- Many more, every day
- Computational cost
- Data set requirements
- Slow FDA acceptance

- When you have to detect / recognize complicated objects

N³ CV

- Exact Measurements
- 3D reconstruction
- Model based reconstruction
- Registration
- Segmentation with less data
- Bio metrics and authentication
- Navigation in medical surgery

- When Mathematics, Physics or Physiology are involved