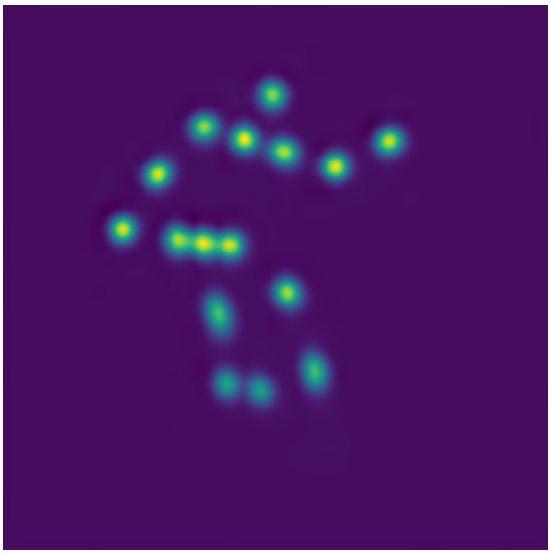
Privacy compliant Human Pose Estimation

In a previous project Human Pose Estimation (Figure 1) has been successfully implemented on an edge FPGA (Blog post). AMD-Xilinx Vitis AI was used to compute the deep neural network. Accordingly, the basic work has already been done and an advanced, complete system could be developed. The far vision is to have product which guarantees a privacy safe output. For example a camera with an output which only delivers an image with the human poses and no actual people.

(a) The human pose overlaid over the input image



(b) The confidence map the direct output of the neural network

Figure 1

- Porting from the `Python`-API to the `C++`-API
- Adding multiperson HPE with Part Affinity Fields as presented in [1]
  - Implementation in `C++` and `HLS`
- Removing the person in the image and only display the human pose
  - Simple approaches like, paint a human avatar over the person or use a prerecorded background and display the pose on that
  - Classical computer vision Image inpainting approaches like [2]
    - `HLS`
  - With modern deep learning [3]
    - Vitis AI
- Adding 3D capability with e.g. a stereo vision or time of flight camera
  - Showing a room in 3D with humans displayed as avatars or stick figure
  - Coordinate transformation done in `HLS`

Bibliography

[1] Z. Cao, T. Simon, S.-E. Wei, and Y. Sheikh, "Realtime multi-person 2d pose estimation using part affinity fields," *2017 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2017.

[2] A. Criminisi, P. Perez, and K. Toyama, "Region filling and object removal by exemplar-based image inpainting," *IEEE Transactions on Image Processing*, vol. 13, no. 9, p. 1200–1212, 2004.

[3] K. Nazeri, E. Ng, T. Joseph, F. Z. Qureshi, and M. Ebrahimi, "Edgeconnect: Generative image inpainting with adversarial edge learning," Jan 2019.