Objective: create a dynamic visualisation showing crowd analytics data overlaid on an image - like a heat map on a floor plan (see example video in drive folder) and build a process to allow the visualisation to be updated easily.

Deliverable 1: A visualisation (video, ppt or similar) showing crowd analytics

Deliverable 2: Code plus installation/usage instructions

Smart Stadium project

* <https://channel9.msdn.com/Blogs/DX-Ireland/Croke-Park-IOT-Smart-Stadium-Dublin>
* see slides in drive folder

Technology suggestions (other options are fine)

* OpenCV - <https://opencv.org/> (available through [Python](https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_tutorials.html))
* ffmpeg - <https://ffmpeg.org/>
* ImageMagick - <https://imagemagick.org/index.php> (maybe?)
* PIL/Pillow in Python - <https://pillow.readthedocs.io/en/stable/>

Publications (these give background on how the crowd analytics is performed)

* Marsden, Mark, McGuinness, Kevin , Little, Suzanne , Keogh, Ciara E. and O'Connor, Noel E. (2018) People, penguins and Petri dishes: adapting object counting models to new visual domains and object types without forgetting. In: Computer Vision and Pattern Recognition 2018, 18-22 Jun 2018, Salt Lake City, USA. - <http://doras.dcu.ie/22264/>
* Ballas, Camille, Marsden, Mark, Zhang, Dian, O'Connor, Noel E. and Little, Suzanne (2018) Performance of video processing at the edge for crowd-monitoring applications. In: 4th IEEE World Forum on Internet of Things (WF-IoT 2018), 5-8 Feb 2018, Singapore - <http://doras.dcu.ie/22324/>
* Marsden, Mark, Little, Suzanne , McGuinness, Kevin and O'Connor, Noel E. (2017) Fully convolutional crowd counting on highly congested scenes. In: 12th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications (VISAPP), 27 Feb - 1 Mar 2017, Porto, Portugal - <http://doras.dcu.ie/21498/>
* Marsden, Mark, McGuinness, Kevin , Little, Suzanne and O'Connor, Noel E. (2017) ResnetCrowd: a residual deep learning architecture for crowd counting, violent behaviour detection and crowd density level classification. In: 2017 IEEE International Conference on Advanced Video and Signal-based Surveillance, 29 Aug-1 Sep 2017, Lecce, Italy. - <http://doras.dcu.ie/21879/>

“A survey of video datasets for crowd density estimation”, <https://ieeexplore.ieee.org/document/7955333>