

## Mobile Detection of Head Pose

- Mobile detection of head pose can be a useful tool for determining where someone is looking at on their phone, when coupled with an approximate gaze separately determined from the eye (not a part of this project). A variety of Neurological conditions which manifest in abnormalities in the vestibular system can be detected by examining the head pose with reference to the eye gaze and saccadic movements.
- Students will work with the Kata group in the department of Neurology to develop a mobile application that will ultimately provide vestibular ocular therapies for patients in outpatient and inpatient rehab clinic. Students will be responsible for developing a rudimentary geometric surface model of a human face with marked feature points, read video from the camera, segment the human face and identify feature points, 3D-2D register the geometric surface model to the 2D image to determine an approximate Head Pose. Note: we are after a good approximate pose that could be superimposed back onto the camera image, for example. It is not necessary that the registration produce millimeter by pixel accuracy etc. Good entry points for iOS software and framework for software will be provided.
- **Deliverables:**
  - **A. minimum: rudimentary 3D model of human face based upon feature locations, C++ class that can read camera (video feed) from iOS, segment and detect face and feature points, 3D-2D register feature points to determine approximate pose.**
  - **B. medium A + 3D model of human face to include surface model around feature points (tessellated geometry). Some sensible deformable registration with good boundary conditions to not yield improbable shapes.**
  - **C. maximum: B + full statistical shape atlas for face with deformable registration by varying modes of variation.**
- **Size group:** (no more than 3)
- **Skills:** (C, C++, image processing, computer vision, some iOS but we will provide software framework to get started and easy access points)
- **Mentors:** Omar Ahmad (director Kata, Neurology), Promit Roy (Chief of Software, Kata). [omar.ahmad@maxandhaley.com](mailto:omar.ahmad@maxandhaley.com), [promit.roy@gmail.com](mailto:promit.roy@gmail.com)

