Good morning,
You are invited to attend our weekly ECE Graduate Seminar.

Old Dominion University
College of Engineering and Technology
Department of Electrical and Computer Engineering

All lectures to be held at 3:00pm on Fridays online at
https://vs.prod.odu.edu/kvs/interface_webex/?cid=202010_ECE7831VS_91606.
For more information, contact Dr. Chung Hao Chen at (757) 683-3475 or email cxchen@odu.edu.

Friday, December 4th Seminar Topic:
IMPROVING SCOLIOSIS CORRECTION PROCEDURES USING PATIENT-SPECIFIC, SOFT-TISSUE INCLUSIVE MODELS by Mr. Austin Tapp, PHD Candidate in the Biomedical Engineering Institute at Old Dominion University

Abstract:

Scoliosis is an abnormal spinal curvature of greater than 10 degrees. Severe scoliotic deformities are usually addressed with a highly invasive procedure: an anterior or posterior spinal fusion approach. The invasiveness is due, in part, to the constraints of current scoliosis surgical planning, which utilizes computed tomography (CT) scans that are unable to discern soft tissue elements. If localization of ligaments and other soft tissues is achieved pre-operatively, corrective procedures can be made safer and more efficient by reducing the number of required ligament releases performed during spinal fusion. Most soft tissue assumptions for surgical planning are accomplished through simplistic, hand-drawn, finite-element models. Compared to these traditional models our use of patient-specific meshes that encompass vertebrae, intervertebral discs, ligaments, and other soft tissue will more accurately guide computer-assisted surgery systems supporting deformity correction. Our anatomically inclusive meshes are produced using a computer-aided design (CAD) mesh that is warped onto a patient CT image through a deformable surface algorithm. Conspicuous structures, such as vertebral bodies, are segmented with deep learning neural networks and the CAD meshes are readily fit onto the CT segmentations. Meanwhile, the soft tissues that surround these structures are locally warped to surmise a contextually appropriate position. Dice coefficients and Hausdorff distance metrics quantitatively demonstrate the accuracy and feasibility of our approach. Preliminary, qualitative outcomes of full spinal columns fit to pre-operative patient images offer a view into the developments nearing finalization. When complete, these anatomically inclusive models will be implemented as the “roadmap” of the “Surgical GPS”.

Bio:
Austin Tapp earned his bachelor's degree in Neuroscience from the College of William and Mary in 2017. Currently, he is a Ph.D. candidate in the Biomedical Engineering Institute at ODU. Austin's research focuses on surgical planning, anatomical modeling, and medical simulation. He was recently recognized as the 2020 Biomedical Engineering Ph.D. Researcher of the Year. Austin was also was awarded Graduate Research Fellowships from the Virginia Space Grant Consortium for the 2020 and 2019 academic years and Excellence in Presentation for the Medical Simulation Track of the Modeling, Simulation, & Visualization Student Capstone Conference in both 2018 and 2017. Austin plans to graduate in 2021.