

# BRIAN MARK ANDERSON, PhD

Phone: (828)446-1899  
B5anderson@health.ucsd.edu

8840 Costa Verde Blvd Apt 3457  
San Diego, CA 92122

## EDUCATION

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Residency – The University of California, San Diego (07/21-07/23)  
Ph.D., Medical Physics - The University of Texas Health and Science Center, MD Anderson (9/17-05/21)  
S.M.S, Medical Physics - The University of Texas Health and Science Center, MD Anderson (9/15-8/17)  
B.S, Nuclear Engineering - The Georgia Institute of Technology (8/10-5/15) Highest Honors

## GRANTS AND FELLOWSHIPS

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Dr. John J. Kopchick Fellowship: \$15,000 for one year, ‘...for students who demonstrate exceptional character, extracurricular leadership, research excellence and scholarly merit.’ (01/2021)  
Dr. John J. Kopchick Fellowship: \$15,000 for one year, ‘...for students who demonstrate exceptional character, extracurricular leadership, research excellence and scholarly merit.’ (01/2020)  
Society of Interventional Radiology (SIR) Allied Scientist Grant: \$40,000 total for two years, work titled “*Improving Treatments of Local Liver Disease with Biomechanical Modeling and Deep Learning*” (05/2019)  
American Association of Physicists in Medicine (AAPM) Summer Undergraduate Fellowship Program: 10 week program designed to gain experience in medical physics; work spent commissioning new Elekta linear accelerator in Eureka, CA (2014)

## SOFTWARE FAMILIARITY

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Aria/Eclipse – Fully competent in all clinical tasks: EBRT treatment planning, fusion, brachytherapy, care path, etc. Experience with creation of programs to enhance workflow and facilitate research.  
MIM – Experience with contouring, 4DCT binning, PET and image fusion  
Raystation – Fully competent with three years of intense coding experience, created several programs and technologies to improve clinical and research endeavors.

## EDITORIAL AND REVIEW ACTIVITIES

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### **Editor/Service on Editorial Board(s)**

Ad hoc Associate Editor, The International Journal of Medical Physics Research and Practice (2020-present)

### **Journal Reviewer**

Manuscript Reviewer, The International Journal of Medical Physics Research and Practice (2019-present)

## CLINICAL PROJECTS AND RESPONSIBILITIES

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**Chief Resident:** Responsible for the scheduling of resident clinical responsibilities, coordinating with faculty for resident education, and participate in ongoing Quality and Safety meetings  
**VMAT Breast Rapid Plan:** Creation of a knowledge-based rapid plan model for VMAT breast.  
**Brachytherapy sterilization kit program:** Graphical user interface for tracking the usage of sterilization kits in the brachytherapy suite, and notifying when new kits will need to be ordered.  
**DICOM transfer server:** DICOM server created to seamlessly transfer between the Ethos TPS and AlignRT.  
**MR DICOM tool:** Inherent frames of reference are needed to be broken prior to registration of MR and CT images in the UCSD clinic. This tool automatically breaks the inherent registration among the MR images in an efficient manner.

## HONORS AND AWARDS

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AAPM Jack Krohmer Early Career Investigator Competition Winner – EPIDEEP: Predicting In-Vivo EPID Transit Images – a Deep Learning Approach (2022)

Alfred G. Knudson Jr. Outstanding Dissertation Award 2021: \$5,000 Award established by MD Anderson Cancer Center to honor the late Dr. Knudson in recognition of the top selected PhD dissertation. (2022)

AAPM Practical Big Data Workshop, 2021 Early Career Investigator – Impact Award

Association of Science Communication (ASC) 2019 Oral Competition: 1<sup>st</sup> place, on topic ‘Why is scientific communication important?’

Science Council Session AAPM 2019 for work titled “Deep Learning for Rapid Deformable Image Registration of Liver CT Scans”

People’s Choice Award for Medical Physics Slam AAPM annual meeting (2018): Monetary award for winning the people’s choice in presentation of research to a lay audience of non-medical physicists

1<sup>st</sup> Place Medical Physics Slam for South West AAPM annual meeting (2018): Challenge where students have 3 minutes to present their research to community members outside of the medical physics profession, received travel award to compete in the Medical Physics Slam in the annual meeting

1<sup>st</sup> Place Young Investigator Award for South West AAPM annual meeting (2018): Monetary award from SWAAPM chapter for best work presented at SWAAPM

Early Career Medical Physicist Scholar: Travel and monetary award for the Winter Institute of Medical Physics conference (2018)

Summer Student Research Retreat, 2<sup>nd</sup> Place: Students are invited to present their research for a monetary prize (2017)

Graduation with Highest Honors (2015)

Presidents Undergraduate Research Award (PURA) (2014)

## **RESEARCH EXPERIENCE**

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PhD Thesis: “Improving Treatment of Local Liver Ablation Therapy with Deep Learning and Biomechanical Modeling” [https://digitalcommons.library.tmc.edu/utgsbs\\_dissertations/1099/](https://digitalcommons.library.tmc.edu/utgsbs_dissertations/1099/)

This work was largely focused on providing tools to improve needle guidance during local liver ablation therapy, and improving ablation assessment in a manner conducive to immediate additional ablation during the surgical procedure. Python, for both the creation of deep learning networks and work within Raystation, was a skill I am now confident in using from this project. This skill led to the creation of a clinically implemented deep learning network for liver, tumor, and ablation segmentation, built into the Raystation workflow at MD Anderson. I furthermore developed a GUI based workflow within Raystation for the process of ROI creation of the liver, tumor, and ablation volumes, and deformable image registration for needle guidance, and ablation assessment. This work directly led to the creation and success of a Phase 2 Clinical Trial (NCT04083378).

Master’s Thesis: Computer-Aided Detection of Pathologically Enlarged Lymph Nodes on Non-Contrast CT in Cervical Cancer Patients for Low-Resource Settings (2015-2017)

PURA: Research studying radioresistivity of CHO cell lines, dependent on cell cycle phase (2014)

## PUBLICATIONS

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### Technical Notes

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**Anderson B.M**, Wahid K., Brock K. *Simple Python Module for Dicom and RT: Conversions to Images and Masks, and Predictions to Dicom-RT Structures* Practical Radiation Oncology 02/2021

### Papers

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Woodland M, Wood J, **Anderson B.M**, Kundu S, Lin E, Koay E, Odisio B, Chung C, Kang H.C, Venkatesan A.M, Yedururi S, De B, Lin Y-M, Patel A.B, Brock K.K *Evaluating the Performance of StyleGAN2-ADA on Medical Images* Simulation and Synthesis in Medical Imaging. SASHIMI 2022. Lecture Notes in Computer Science, vol 13570. Springer, Cham 09/22

He Y, **Anderson B.M**, Cazoulat G, Rigaud B, Almodovar-Abreu L, Pollard-Larkin J, Balter P, Liao Z, Mohan R, Odisio B, Svensson S, Brock KK. *Optimization of mesh generation for geometric accuracy, robustness, and efficiency of biomechanical-model-based deformable image registration* Medical Physics 08/22

Lin Y-M, **Anderson B.M**, et al. *Study Protocol COVER-ALL: Clinical impact of a volumetric image method for confirming tumour coverage with ablation on patients with malignant liver lesions* CardioVascular and Interventional Radiology 09/22

**Anderson B.M**, B. Rigaud, Y Lin, K Jones, H Kang, B Odisio, K Brock *Automated Segmentation of Colorectal Liver Metastasis and Liver Ablation on Contrast-Enhanced CT Images* Frontiers in Radiation Oncology 08/22

Cazoulat G, **Anderson B.M**, McCulloch MM, Rigaud B, Koay EJ, Brock KK *Detection of vessel bifurcations in CT scans for automatic objective assessment of deformable image registration accuracy* The International Journal of Medical Physics Research and Practice 08/2021

**Anderson B.M**, Lin YM, Lin EY, Cazoulat G, Gupta S, Kyle Jones A, Odisio BC, Brock KK *A novel use of biomechanical model based deformable image registration (DIR) for assessing colorectal liver metastases ablation outcomes* The International Journal of Medical Physics Research and Practice Accepted 07/2021

Wahid K, He R, McDonald B, **Anderson B.M**, Salzillo T, Mulder S., Wang J., Sharafi C., McCoy L, Naser M., Ahmed S., Sanders K., Mohamed A., Ding Y, Wang J, Hutcheson K., Lai S., Fuller C., Van Dijk L. *MRI Intensity Standardization Evaluation Design for Head and Neck Cancer Quantitative Analysis Applications* Physics and Imaging in Radiation Oncology 10/2021

He Y, Cazoulat G, Wu C, Peterson C, McCulloch M, **Anderson B.M**, Pollard-Larkin J, Balter P, Liao Z, Mohan R, Brock K *Geometric and Dosimetric Accuracy of Deformable Image Registration between Average-Intensity Images for 4DCT-Based Adaptive Radiotherapy for Non-Small Cell Lung Cancer* Journal of Applied Clinical Medical Physics 06/2021

Rigaud B, **Anderson B.M**, Yu ZH, Gobeli M, Cazoulat G, Söderberg J, Samuelsson E, Lidberg D, Ward C, Taku N, Cardenas C, Rhee DJ, Venkatesan AM, Peterson CB, Court L, Svensson S, Löfman F, Klopp AH, Brock KK *Automatic segmentation using deep learning for online dose optimization during adaptive radiotherapy of cervical cancer* International Journal of Radiation Oncology, Biology, Physics 10/2020

**Anderson B.M**, Lin EY, Cardenas CE, Gress DA, Erwin WD, Odisio BC, Koay EJ, Brock KK *Automated Contouring of Contrast and Non-Contrast CT Liver Images with Fully Convolutional Networks (FCNs)* Advances in Radiation Oncology 05/2020

Cazoulat G, Elganainy D, **Anderson B.M**, Zaid M, Park PC, Koay EJ, Brock KK *Vasculature-Driven Biomechanical Deformable Image Registration of Longitudinal Liver Cholangiocarcinoma Computed Tomographic Scans*. Advances in Radiation Oncology 03/2020

Jin Y, Randall J., Elhalawani H., Feghali K., Elliot A., **Anderson B.M**, Lacerda L., Tran B., Mohamed A., Brock KK, Fuller C., Chung C. *“Detection of Glioblastoma Subclinical Recurrence Using Serial Diffusion Tensor Imaging”* Cancers 02/2020

McCulloch M., **Anderson B.M**, Cazoulat G, Peterson CB, Mohamed ASR, Volpe S, Elhalawani H, Bahig H, Rigaud B, King JB, Ford AC, Fuller CD, Brock KK *Biomechanical modeling of neck flexion for deformable alignment of the salivary glands in head and neck cancer images* Physics in Medicine and Biology 07/2019

Kisling KD, Ger RB, Netherton TJ, Cardenas CE, Owens CA, **Anderson B.M**, Lee J, Rhee DJ, Edward SS, Gay SS, He Y, David SD, Yang J, Nitsch PL, Balter PA, Urbauer DL, Peterson CB, Court LE, Dube S “*A snapshot of medical physics practice patterns,*” J. Appl. Clin. Med. Phys., vol. 19, no. 6, pp. 306–315, (11/2018)

Cardenas, E.C, **Anderson B.M**, Aristophanous M, Yang J, Rhee DJ, McCarroll RE, Mohamed ASR, Kamal M, Elgohari BA, Elhalawani HM, Fuller CD, Rao A, Garden AS, Court LE *Auto-delineation of Oropharyngeal Clinical Target Volumes Using Three-Dimensional Convolutional Neural Networks* Physics in Medicine and Biology 10/2018

**Anderson B.M**, Lin E., Cazoulat G., Gupta S., Odisio B., Brock KK. *Improvement of liver ablation treatment for colorectal liver metastases.* Medical Imaging 2018: Image-Guided Procedures, Robotic Interventions, and Modeling, 2018, p. 74.

McCulloch M.M, **Anderson B.M**, Mohamed A., Volpe S., Elhalawani H., Cazoulat G., Bahig H., Fuller C., Brock KK *Deformable Image Registration for Modeling Neck Flexion in Head and Neck Cancer Patients.* Physics in Medicine and Biology 09/2019

Ger R.B, Cardenas E.C, **Anderson B.M**, Yang J, Mackin DS, Zhang L, Court LE *Guidelines and Experience Using Imaging Biomarker Explorer (IBEX) for Radiomics.* Journal of Visualized Experiments 01/2018

Court, L. E., Kisling, K., McCarroll, R., Zhang, L., Yang, J., Simonds, H., du Toit, M., Trauernicht, C., Burger, H., Parkes, J., Mejia, M., Bojador, M., Balter, P., Branco, D., Steinmann, A., Baltz, G., Gay, S., **Anderson, B.M**, Cardenas, C., Jhingran, A., Shaitelman, S., Bogler, O., Schmeller, K., Followill, D., Howell, R., Nelson, C., Peterson, C., Beadle, B *Radiation Planning Assistant – A streamlined, fully automated radiotherapy treatment planning system.* Journal of Visualized Experiments. 12/2017

Rubinstein, A. E., Ingram, S. W., **Anderson, B.M**, Gay SS, Fave XJ, Ger RB, McCarroll RE, Owens CA, Netherton TJ, Kisling KD, Court LE, Yang J, Li Y, Lee J, Mackin DS, Cardenas CE *Cost-effective immobilization for whole brain radiation therapy.* Journal of Applied Clinical Medical Physics. 04/2017

### **Oral Presentations (Presenting Author)**

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**Anderson B.M**, Moore K., Bojecho C. *EPIDEEP: Predicting In-Vivo EPID Transit Images – a Deep Learning Approach* AAPM Annual Conference 07/2022

**Anderson, B.M.**, Rigaud B., Lin YM, Cazoulat G., Koay E., Jones AK., Odisio B, Brock KK *Deep Learning for Near Real-Time Image-Guided Focal Ablation* AAPM Annual Conference. Virtual. 07/2021.

**Anderson, B.M.**, McCulloch M., Kirimli E., Lin YM., Rigaud B., Lin E., TranCao H., Qayyum, Koay E., Odisio B., Brock KK *Closing the Variability Gaps on Liver Surgery: Deep Segmentation of Disease and Lobes* AAPM Annual Conference. (Virtual) Vancouver, Canada. 07/2020.

**Anderson, B.M.**, Cazoulat G., Lin E., Odisio O., Brock KK. *Deep Learning for Rapid Deformable Image Registration of Liver CT Scans* AAPM Annual Conference. San Antonio, TX. 07/2019.

**Anderson B.M**, Lin E., Koay E., Brock KK, Odisio O. *Improving Colorectal Liver Metastasis Treatments with Biomechanical Modeling and Deep Learning* SIR Annual Conference. Austin, TX. 03/2019.

**Anderson B.M**, Lin E., Cardenas C., Koay E., Odisio O., Brock KK. *Automated Contouring of Contrast and Non-Contrast CT Liver Images with Fully Convolutional Neural Networks* ASTRO Annual Conference. San Antonio, TX. 10/2018

Cardenas C, **Anderson, B.M**, Zhang L., Jhingran A., Simonds H., Yang J., Brock Kk., Klopp A., Beadle B., Court L., Kisling K. *A Comparison of Two Deep Learning Architectures to Automatically Define Patient-Specific Beam Apertures.* AAPM Annual Conference. Nashville, TN. 07/2018

**Anderson, B.M.**, Cardenas C, Elgohari B., Volpe S., Pei Y., Mohamed A., Elhalawani H., Chung C., Fuller C., Brock KK. *Deep Learning for Head and Neck Segmentation in MR: A Tool for the MR-Guided Radiotherapy*. AAPM Annual Conference. Nashville, TN. 07/2018

**Anderson B.M., Lin E.**, et al. *Deep Learning and Biomechanical Models for Improving Treatment of Colorectal Liver Metastases*. SWAAPM Annual Conference. Houston, TX 04/2018

**Anderson, B.M.**, Lin E. Cazoulat G., Gupta S., Koay EJ., Odisio B., Brock KK. *Improvement of liver ablation for Colorectal Liver Metastases* MDA Cancer Imaging and Intervention Conference. Houston, TX 04/2018

**Anderson, B. M.**, Cardenas, C. E, Klopp A., Kry S., Johnson J., Ho J., Rao A., Yang J., Cressman E., Court L. *Computer-Aided Detection of Pathologically Enlarged Lymph Nodes of Non-Contrast CT in Cervical Cancer Patients for Low-Resource Settings* AAPM Annual Conference. Denver, CO. 07/2017.

### **Poster Presentations (Presenting Author)**

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**Anderson B.M.**, *Quick Guide to Setting Up GitHub and Jupiter Notebook*. AAPM Practical Big Data Workshop. Virtual. 09/2021

**Anderson B.M.**, *Setting up the pipeline of data to TensorFlow .tfrecords*. AAPM Practical Big Data Workshop. Virtual. 09/2021

**Anderson B.M.**, Ethan Lin, Cazoulat G., Gupta S., Odisio B., Brock KK. *Improving Colorectal Metastases Treatment: Neural Networks and Biomechanical Models*. AAPM Annual Conference. Nashville, TN. 07/2018

**Anderson B.M.**, Lin E., et al. *Improvement of liver ablation treatment for Colorectal Liver Metastases (CLM)* SPIE Annual Conference. Houston, TX. 02/2017

### **Abstracts**

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Woodland M, Wood J, **Anderson B.M.**, Kundu S., Lin E., Koay E., Odisio O., Chung C., Kang H., Venkateson A., Yedururi S., De B., Lin Y., Patel A., Brock KK. *Comparing Transfer Learning, Data Augmentation, and Data Expansion in the Improvement of Medical Image Generation* AAPM Annual Conference 07/2022

Rigaud, B., Kirimli E., Yedururi S., Cazoulat G., **Anderson B.M.**, Zaid M., Elganainy D., Koay E., Brock KK. *Evaluation of Deep Learning-Based Automatic Segmentation of the Pancreas* AAPM Annual Conference. Virtual, 07/2021

McCulloch, M., Cazoulat G., Rigaud B., **Anderson B.M.**, Kirimli E., Gryshkevych S., Svensson S., Ohrt A., Chopra A., Mathew R., Zaid M., Elganainy D., Balter P., Koay E., Brock KK. *Use of Deep Learning Segmentation and Biomechanical Models to Improve Dose Accumulation Accuracy in GI Structures* AAPM Annual Conference. Virtual, 07/2021

Reber, B., **Anderson, B.M.**, Mohamed A., Van Dijk L., Rigaud B., McCulloch M., He Y., Woodland M., Fuller C., Lai S., Brock KK *Predicting Osteoradionecrosis From Head and Neck Radiotherapy Using a Residual convolutional Neural Network* AAPM Annual Conference. Virtual, 07/2021

Brock, K., **Anderson, B.M.**, et al *Anatomical Modeling to Improve the Precision of Image Guided Liver Ablation* Image-Guided Therapy Workshop Rockville, MD. 04/2020

Owens, C., Gupta, A., Shrestha, S., **Anderson, B.M.**, et al *Development of a colon model for colon dosimetry in late effect studies* International Society of Radiation Epidemiology and Dosimetry, Sitges, Spain. 05/2020

Elhalawani, H., Jin Y., Randall J.W., Mahajan A., Mohamed A., Elliot A., **Anderson B.M.**, Landry L., Zhu H., Fuller C., Chung C. *Longitudinal and Dose Dependent Analysis on White Matter Injury in Glioblastoma Radiation Therapy* ASTRO Annual Conference, Chicago, IL. 09/2018

McCulloch M., Elhalawani H., **Anderson B.M.**, et. al *Biomechanical model-based Deformable Image Registration for OARs in Glioma Patients* RSNA Annual Conference, Chicago, IL. 11/2018

Lin E.Y., **Anderson B.M.**, et al. *Application of a biomechanical deformable registration image method for assessing ablation margins in colorectal liver metastases*. CIRSE Annual Conference. Barcelona, Spain (09/2018)

Kisling K., Ger R., Cardenas C., Rubinstein A., Netherton T., Ingram W., Fave X., Owens C., **Anderson B.M.**, Lee J., Gay S., Yang J., McCarroll R., Machin D., Li Y., Rhee D., Edward S., He Y., David S., Nitsch P, Balter P., Court L *Broadening the Graduate School Experience: Paper-In-A-Day* AAPM Annual Conference. Nashville, TN. 07/2018

Sen A, **Anderson B.M.**, Cazoulat G., Zaid M., Chaudhury B., Elganainy D., Koay E., Brock KK. *A Comparison of Deformable Registration Techniques for Pre and Post-Treatment Cholangiocarcinoma CT Images*. AAPM Annual Conference. Nashville, TN. 07/2018

Cazoulat G, Chaudhury B, **Anderson B.M.**, Zaid M., Elganainy D., Koay E., Brock KK *Use of Vasculature Information in Biomechanical Model-Based Registration of Longitudinal Liver Cancer CT Scans*. AAPM Annual Conference. Nashville, TN. 07/2018

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## INVITED TALKS

Invited Speaker, Image Guided Cancer Therapy Workshop, MD Anderson Cancer Center “Getting Started with Artificial Intelligence”, Workshop and presentation (11/2021)

Invited Speaker, Winter Institute of Medical Physics annual meeting, “Getting Started with Deep Learning: Dicom to Predictions” Workshop and presentation (02/2020)

Invited Speaker, Image Guided Cancer Therapy Research Program, MD Anderson Cancer Center “How to Get Started in AI”, Workshop and presentation (01/2020)

Invited Keynote Lecturer, North Central Chapter AAPM Annual Meeting: “Introduction to Deep Learning: Everything I wish I’d known sooner” (11/2019)

Guest Lecturer, Rice University ELEC/ COMP 576: “Introduction to Deep Learning” (09/2019)

Teaching Assistant, AAPM Summer School: Assisted in creation, distribution, and implementation of workbooks for the annual conference (06/2019)

Invited Speaker, Nuclear Medicine Practical Seminar: “Deep Learning in the Liver and our field” (05/2019)

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## WORKSHOPS ATTENDED

European Society of Interventional Radiology: Reliability in Percutaneous Tumour Ablation. (12/2019)

Rigor and Reproducibility: Gulf Coast Consortia workshop, instructing researchers on the importance of robust research with unbiased analysis and reporting of results. (10/2019)

BigData4Imaging: Conference and workshop for training in machine and deep learning (12/2018)

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## PROFESSIONAL AFFILIATIONS

AAPM, MPWB, SPIE, American Nuclear Society (ANS)

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## OTHER

Ordained Minister: Received ordination in order to minister for the wedding of friends (2022)

WizKids: A STEM outreach program where we volunteer to educate local students on medical physics and other STEM opportunities, volunteered at the AAPM annual conference (2018-2019)

International Students Association: Founding member of the organization as domestic liaison with the Graduate School of Biomedical Sciences. Goal being to best help international students with any problems they might have in the transition to the US (opening bank account, etc.) (2019)

Science Night: An outreach program to educate children of all ages on opportunities and research in STEM occurring in UTH. Involves creating fun interactive stages to educate the students. (2017-2019)

St. Vincent de Paul Food Fair: Volunteering in organization and distribution of food to families in need with St. Vincent de Paul (2018)

Volunteer at Friends for Life Animal Shelter: +20 hours spent volunteering in an animal shelter (2017-2019)

Hurricane Harvey Relief: Assisted in the removal of drywall, floor paneling, and ruined furniture of a local home affected by Hurricane Harvey (2017)

UT House Medics: Community outreach assisting elderly citizens with home renovation and reconstruction (2016, 2018)

Eagle Scout (2008)