

# Antonio R. Porras

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## CURRENT POSITION

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### Department of Biostatistics and Informatics

2020-Present

Colorado School of Public Health, University of Colorado Anschutz Medical Campus  
Assistant Professor on the Tenure Track

#### Affiliations

- Department of Pediatric Plastic and Reconstructive Surgery (Director of Research)  
Children's Hospital Colorado
- Computational Bioscience Program (core Faculty)  
School of Medicine, University of Colorado Anschutz Medical Campus
- Biomedical Sciences Program (training Faculty)  
School of Medicine, University of Colorado Anschutz Medical Campus
- Department of Pediatric Neurosurgery (secondary Faculty)  
Children's Hospital Colorado
- Department of Pediatrics (secondary Faculty)  
School of Medicine, University of Colorado Anschutz Medical Campus
- Department of Surgery (secondary Faculty)  
School of Medicine, University of Colorado Anschutz Medical Campus
- Department of Biomedical Informatics (secondary Faculty)  
School of Medicine, University of Colorado Anschutz Medical Campus

#### Contact Information

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## EDUCATION

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### **B.Sc. Technical Engineering in Computer Systems**

2003-2006

University of Cordoba, Spain

Thesis title: Data mining tool to discover sequential rules in the "AHA!" system

Supervisor: Dr. Cristobal Romero

### **B.Sc./M.Sc. Computer Engineering**

2006-2008

University of Cordoba, Spain

Thesis title: Collaborative filtering system for digital art recommendations

Supervisor: Dr. Enrique Garcia

### **M.Sc. Biomedical Engineering**

2008-2010

University of Barcelona and Polytechnic University of Catalonia, Spain

Thesis project at Chalmers University of Technology, Gothenburg, Sweden

Thesis title: Accurate segmentation of brain MR images

Supervisor: Dr. Hoi-Shun Lui

<p><b>Ph.D.</b> – Department of Information and Communication Technologies  Pompeu Fabra University, Barcelona, Spain  Research Internship at Catholic University of Leuven, Belgium  <u>Thesis title:</u> Multi-cue image integration for cardiac tissue characterization  <u>Supervisors:</u> Dr. Alejandro Frangi and Dr. Gemma Piella  <u>Awards:</u> <i>Summa cum laude</i> and International Quality Award – Spanish Government</p>	2011-2015
<p><b>Postdoctoral training</b>  Foundation for Advanced Education in the Sciences, National Institutes of Health,  Bethesda, MD.</p> <ul style="list-style-type: none"> <li>• GENE 500 – Introduction to Medical Genetics (Dr. Susan Hart)</li> <li>• GENE 505 – Embryology, Developmental Biology and Human Malformations (Dr. Leslie Biesecker)</li> </ul> <p>Children’s National Hospital, Washington, DC</p> <ul style="list-style-type: none"> <li>• Clinical management of pediatric neurosurgery patients (Dr. Robert Keating).</li> </ul>	2019-2020

## PRIOR ACADEMIC AND RESEARCH POSITIONS

<p><b>Biomedical Engineer</b>  Department of Physics, University of Barcelona, Spain</p> <p><u>Responsibilities:</u> Development of controllers and graphic software interface to manage a new robotic atomic forces microscope station built for research</p>	2009-2010
<p><b>Research Assistant</b>  Department of Electrical Engineering, Chalmers University of Technology, and  Sahlgrenska Hospital, Gothenburg, Sweden.</p> <p><u>Responsibilities:</u> Development and evaluation of a software tool to segment brain structures from magnetic resonance images</p>	2010
<p><b>Researcher in training</b>  Center for Imaging and Simulation Technologies in Biomedicine (CISTIB)  Department of Information and Communication Technologies, Pompeu Fabra University,  Barcelona, Spain</p> <p><u>Responsibilities:</u> Development of methods and graphic interface to reconstruct patient-specific cardiac motion using interventional electro-anatomical mapping data</p>	2010-2011
<p><b>Instructor and research assistant</b>  Department of Information and Communication Technologies, Pompeu Fabra University,  Barcelona, Spain</p> <p><u>Teaching:</u> Computational Techniques in Biomedicine (1 year), Fundamental of Programming (1 year), and Biomedical Image Analysis courses (2 years)  <u>Research:</u> Development of image integration methods for cardiac tissue characterization</p>	2011-2015

**Postdoctoral research fellow** (2015-2016) and **Staff Scientist** (2016-2020) 2015-2020  
Sheikh Zayed Institute for Pediatric Surgical Innovation, Children's National Hospital,  
Washington DC

Responsibilities: Development of quantitative image analysis and machine learning methods for:

- Quantitative evaluation of diuresis renography to assess surgical treatment needs
- Facial screening for genetic syndromes in diverse pediatric populations
- Interventional planning and surgical treatment evaluation of craniosynostosis using imaging data, statistical models and machine learning
- Predictive modeling of cranial bone development using cross-sectional datasets

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## HONORS AND AWARDS

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### PERSONAL

**Global Honors Award** 2003-2004  
Spanish Ministry of Education. All fees waived during the first year of college in a Spanish university.

**General State Scholarship** 2004-2008  
Spanish Ministry of Education. All costs waived for university studies and funds for materials and transportation.

**General State Scholarship for Master Studies** 2008-2010  
Spanish Ministry of Education. All costs waived for master studies and funds for material, transportation and living expenses.

**Erasmus Scholarship for Master Studies** 2010  
European Commission, Spanish and Catalan Governments. Funds to finish master studies at Chalmers University of Technology, Gothenburg, Sweden.

**Student Travel and Registration Award** 2013  
Based on paper review scores – International Conference of Medical Image Computing and Computer Assisted Interventions, Nagoya, Japan.  
Article: Myocardial motion estimation combining tissue Doppler and B-mode echocardiographic images

**Best Paper Award** 2016  
Workshop on Clinical Image-based Procedures – International Conference of Medical Image Computing and Computer Assisted Interventions, Athens, Greece,  
Article: Personalized optimal planning for the surgical correction of metopic craniosynostosis

**Best Research Abstract Award** 2016  
Annual Joseph E. Roberts Jr. Academic Day – Children's National Hospital, Washington, DC.  
Title: Early detection of ureteropelvic junction obstruction from diuretic renograms

**Invited demonstration** 2016  
Arab Health, Dubai, United Arab Emirates  
Project: mGene – Early and Mobile Detection of Genetic Syndromes

**Invited participation and finalist** 2016  
World Government Summit – Edge of Government competition. Dubai, United Arab Emirates  
Project: mGene – Early and Mobile Detection of Genetic Syndromes

<p><b>Junior Researcher Travel and Registration Award</b>  Based on paper review scores – International Conference of Medical Image Computing and Computer Assisted Interventions, Quebec City, Canada  <u>Article:</u> Locally affine diffeomorphic surface registration for planning of metopic craniosynostosis surgery</p>	2017
<p><b>Finalist to Young Investigator Award</b>  International Conference of Medical Image Computing and Computer Assisted Interventions, Quebec City, Canada.  <u>Article:</u> Locally affine diffeomorphic surface registration for planning of metopic craniosynostosis surgery</p>	2017
<p><b>Cover of Scientific Journal</b>  American Journal of Medical Genetics – Part A  <u>Article:</u> 22q11.2 deletion syndrome in diverse populations</p>	2017
<p><b>Cover of Scientific Journal</b>  American Journal of Medical Genetics – Part A  <u>Article:</u> Noonan syndrome in diverse populations</p>	2017
<p><b>Runner-up</b>  STAT Madness – STAT News, Boston Globe.  <u>Project:</u> Facial analysis technology for the early identification of genetic syndromes</p>	2018
<p><b>Cover of Scientific Journal</b>  American Journal of Medical Genetics – Part A  <u>Article:</u> Williams-Beuren syndrome in diverse populations</p>	2018
<p><b>Second Best Paper Award</b>  Annual Joseph E. Roberts Jr. Academic Day – Children’s National Hospital. Washington, DC.  <u>Title:</u> Deep learning for screening of genetic syndromes</p>	2018
<p><b>Top Cited Article in 2018-2019</b>  American Journal of Medical Genetics Part A  <u>Article:</u> 22q11.2 deletion syndrome in diverse populations</p>	2019
<p><b>Best Scientific Poster</b>  Annual Research and Education Week at Children’s National Hospital. Washington, DC.  <u>Title:</u> Quantification of head shape from three-dimensional photography for pre- and post-surgical evaluation of craniosynostosis</p>	2019
<p><b>Featured paper in scientific journal</b>  IEEE Transactions on Biomedical Engineering  <u>Article:</u> Predictive statistical model of early cranial development</p>	2021
<p><b>Inducted</b>  Delta Omega National Honors Society for Public Health, Alpha Upsilon Chapter.</p>	2022
<p><b>Top Cited Article during 2021-2022</b>  Molecular Genetics and Genomic Medicine  <u>Article:</u> Objective differential diagnosis of Noonan and Williams-Beuren syndromes in diverse populations using quantitative facial phenotyping</p>	2023
<p><b><u>AS MENTOR</u></b></p>	
<p><b>Second Best Research Work</b>  Student Innovators Program, Children’s National Hospital. Washington, DC.  <u>Mentee:</u> James Jared</p>	2017

<b>Third Best Research Work</b>	2018
Student Innovators Program, Children’s National Hospital. Washington, DC. <u>Mentee:</u> Phillip Taylor	
<b>Student Travel and Registration Award</b>	2022
Based on paper review scores – International Conference of Medical Image Computing and Computer Assisted Interventions, Singapore. <u>Article:</u> Learning with context encoding for single-stage cranial bone labeling and landmark localization <u>Mentee:</u> Jiawei Liu	
<b>Nomination to Junior Investigator Award</b>	2024
Annual Meeting of the American Cleft Palate and Craniofacial Conference (ACPA), Denver, CO, USA <u>Title:</u> Identifying increased intracranial pressure in non-syndromic sagittal craniosynostosis using machine learning analysis of CT images <u>Mentee:</u> Jasmine Chaij	
<b>Nomination to Junior Investigator Award</b>	2024
Annual Meeting of the American Cleft Palate and Craniofacial Conference (ACPA), Denver, CO, USA <u>Title:</u> Leveraging AI’s Potential: Real-time Prediction of Longitudinal Patient Development Using Imaging Data <u>Mentee:</u> Connor Elkhill	
<b>Strother Walker Award</b> – Outstanding PhD student	2024
Colorado School of Public Health, University of Colorado Anschutz Medical Campus, Aurora, CO, USA <u>Mentee:</u> Jiawei Liu	
<b>MICCAI-NIH Society Registration and Travel Grant</b>	2024
International Conference of Medical Image Computing and Computer Assisted Interventions, Singapore. <u>Mentee:</u> Ines Alejandro Cruz Guerrero	

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## PROFESSIONAL AFFILIATIONS

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• Medical Image Computing and Computer Assisted Intervention (MICCAI) Society	2017-2024
• Institute of Electrical and Electronics Engineers (IEEE), Denver section	2022-2024
• IEEE Engineering in Medicine and Biology Society (EMBS)	2022-2024
• Society for Advancing Chicanos/Hispanics and Native American in Science (SACNAS)	2022-2024
• International Association for Dental Research (IADR)	2023-2024

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## PROFESSIONAL LEADERSHIP AND SERVICE

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<b>Department / School</b>	
• Biostatistics and Informatics Seminar Series (chair)	2020-2022
<u>Duties:</u> coordination of weekly seminar series including strategy on speaker invitation and seminar logistics.	

- Biostatistics and Informatics Computing Resources Committee (member) 2020-2022  
Duties: understanding the computing needs from our faculty and creating a list of computational resources that could improve their teaching and research productivity.
- Student recruitment for graduate programs in Biostatistics 2020-2022  
Duties: preparation of research presentation and speaking to different groups of prospective students in break-out sessions.
- Computational and Data Science Curriculum Committee (lead) 2021-2022  
Duties: coordinate a group of faculty to create a feasible plan to improve our teaching curriculum in data science.
- Colorado School of Public Health's Research Committee (department representative) 2023-2024  
Duties: represent the interest of the department in the school's research committee – a faculty senate organism with the goal of optimizing our research productivity and visibility.
- Biostatistics and Informatics Finance Committee (member) 2024-Present  
Duties: periodic revision of our department finances and suggestion of budget planning strategies.

### University

- Chair for Diversity, Equity and Inclusion – Computational Biosciences Program 2021-Present  
Duties: creation of the first integrated diversity, equity and inclusion strategy in the program, and coordination with related activities associated with admissions, program promotion, curriculum and local resource availability.
- Graduate Diversity, Equity and Inclusion Task Force working group 2021-2023  
Duties: participation on the coordination of diversity, equity and inclusion activities between the different training programs on campus.
- Student recruitment for Computational Bioscience Program (interviews and research presentations) 2021-2023  
Duties: Full day student interviews and evaluations, and research presentation to attract graduate student candidates.
- Co-created the first local pediatric craniofacial research biobank between Children's Hospital Colorado and CU Anschutz. 2021-2023  
Role: pitched the concept to secure internal funding, supervision of IRB protocol development, supervision of collected data, coordination of research strategy.
- Graduate student recruitment at the National Diversity STEM Conference (NDiSTEM), the conference of the Society for Advancing Chicanos/Hispanics and Native American in Science (SACNAS) 2022-2023  
Duties: promotion of our Computational Bioscience PhD program during SACNAS for student recruitment.
- Reviewer and judge for Center for Children's Surgery Symposium 2022-2023  
Duties: Review abstract submission and score presentations.
- Director of Research – Pediatric Plastic and Reconstructive Surgery, Children's Hospital Colorado 2022-Present  
Duties: creation, coordination and supervision of the research program and projects of the department.

- Chair and organizer of the first CU Anschutz Symposium on Biomedical Imaging 2023  
Role: event organization including advertisement, guideline development, program generation, speaker invitation, logistics coordination and budgeting.  
Details: Full day research event with morning and afternoon oral research presentations and a moderated poster session in between. Speakers: 18.
- Member of the Pediatric Craniofacial Biobank Committee 2024-Present  
Duties: review applications from investigators to use the collected biological samples in the biobank.
- Mentor within the BIPOC (black, indigenous and people of color) Opportunities for Networking and Development (BOND) program. 2024-Present  
Duties: mentoring underrepresented investigators as they grow their career.

### International

- Program Committee for the Workshop on Clinical Image-based Procedures. 2016-2017  
International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI), Athens, Greece, and Quebec City, Canada  
Role: contribution to the workshop program and review of submitted work.
- Associate to General Chair, International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI), Granada, Spain 2018  
Role: coordination and follow-up of conference organization activities and coordination between all the chairs and committees.
- Co-chair and co-founder of MICCAI Mentorship Program 2018-2022  
Role: Creation of the first MICCAI mentorship program to match experienced mentor scientist with students and junior investigators.
- Co-chair for Young Investigators and Early Career Development Program, 2020-2023  
International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI): Peru, Lima (2020); Strasbourg, France (2021); Singapore (2022); and Vancouver, Canada (2023)  
Role: Implementation and coordination of the MICCAI mentorship program and securing funding to subsidize attendance of early career investigators and students.
- Mentor and judge at the National Diversity in STEM (NDiSTEM) Conference of the 2022-2023  
Society for Advancing Chicanos/Hispanics and Native American in Science (SACNAS). San Juan, Puerto Rico.  
Role: student presentation review and providing advice for improvement.
- Member of the Computer Aided Diagnosis (CAD) Committee of the International 2022-Present  
Society of Optics and Photonics (SPIE).  
Role: SPIE meeting program contribution and abstract review.
- Member of the MICCAI Society Continuous Mentorship Program working group. 2022-Present  
Role: coordination of the transition of the yearly MICCAI mentorship program that I co-created in 2018 to a continuous program supported by the MICCAI Society.
- Co-organizer of the first MICCAI / AFRICAI (African Network for Artificial 2023  
Intelligence in Biomedical Imaging) Summer school, Marrakesh, Morocco.  
Role: participation in the initial organization bid and strategy.
- Chair for Career Development and Student Affairs, International Conference on 2023-2024  
Medical Image Computing and Computer Assisted Interventions (MICCAI) 2024. Marrakesh, Morocco.  
Role: coordination between the conference, the career development activities and the student-led activities. Coordination of MICCAI mentorship program with the conference, and lead to funding to subsidize attendance to MICCAI for US-based underrepresented students and early career investigators.

- Co-organizer and advisor for the 1<sup>st</sup> MICCAI Student Board (MSB) Workshop – EMERGE: Empowering medical information computing research through early-career expertise (MICCAI 2024). 2024  
Role: supervision of initial workshop proposal, advise on strategy, and contribution with feedback during student presentations.
  - Chair, Moderator and Judge – International Symposium on Medical Information Processing and Analysis (SIPAIM) 2024, Antigua, Guatemala. 2024  
Role: Chaired, moderated and judged scientific presentations in the Brain Imaging sessions of the SIPAIM conference.
- Additional continuous education activities**
- Researcher Management and Leadership Training by Anne Libby, University of Colorado Anschutz Medical Campus, Coursera 2020
  - Multicultural Mentoring Series, Center for Faculty Development & Advancement, University of Colorado Anschutz Medical Campus 2022
  - Bioethics Conference, Colorado Center for Bioethics, University of Colorado Anschutz Medical Campus 2022
  - Work in Progress (WIP) working group on Grant Writing led by Dr. Elizabeth Juarez-Colunga, Department of Biostatistics and Informatics, Colorado School of Public Health, University of Colorado Anschutz Medical Campus. 2022-2024
  - CU Anschutz Office of Research Education: Upstander / Bystander training. University of Colorado Anschutz Medical Campus. 2024
  - CU Anschutz Office of Diversity, Equity, Inclusion and Community Engagement: Training for participation in the BOND Mentoring Program. 2024

## Intellectual Property

- Software copyright: SR 1-8317833951 – Quantitative evaluation of facial dysmorphology of genetic origin. Licensed to mGeneRX (NC) in 2020. (Currently member of the mGeneRx Advisory Board) 2020

## Review, Referee and Editorial Activities

### Journal reviews

- Computers in Biology and Medicine
- Frontiers in Radiology
- Frontiers in Surgery
- IEEE Transactions on Medical Imaging
- IEEE Journal of Biomedical and Health Informatics
- Journal of Medical Imaging
- Journal of Magnetic Resonance Imaging
- Journal of Urology
- Nature Scientific Reports
- Personalized Medicine

## Conference reviews

- International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI)
- MICCAI Workshop on Clinical Image-based Procedures (CLIP)
- MICCAI Workshop on Statistical Atlases and Computational Models of the Heart (STACOM),
- Computer Aided Diagnosis (CAD) Conference of the International Society of Optics and Photonics (SPIE)
- Annual Symposium of the Center for Children's Surgery (CCS), Children's Hospital Colorado
- CU Anschutz Symposium on Biomedical Imaging, University of Colorado Anschutz Medical Campus

## Funding proposal reviews

- Colorado Center for Translational Sciences Institute (CCTSI) Pilot Grant Program and CCTSI Translational Methods Grant Program  
Years: 2021-2023. Type: Ad-hoc.
- Clinical Translational Imaging Science (CTIS) Study Section, National Institutes of Health.  
Year: 2023 (June). Type: Ad-hoc.
- Image Guided Interventions and Surgery (IGIS) Study Section, National Institutes of Health.  
Year: 2023 (October). Type: Ad-hoc.  
*\*\* Note: Nominated for standing membership starting in Summer 2025.*
- Emerging Imaging Technologies and Applications (EITA) Study Section, National Institutes of Health.  
Year: 2024 (June and October). Type: Ad-hoc.

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## Invited Lectures, Presentations and Workshops

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### Invited seminars

#### Local

- Title: Quantitative imaging for the diagnosis, treatment, and surgical outcome assessment of patients with craniosynostosis. 2018  
Venue: Children's Craniofacial Fellowship program. Children's National Hospital. Washington, DC.
- Title: Personalized and quantitative evaluation of cranial malformations in patients with craniosynostosis. 2019  
Venue: Innovation Rounds, Sheikh Zayed Institute for Pediatric Surgical Innovation. Children's National Hospital. Washington, DC.
- Title: Predictive statistical model of cranial development 2020  
Venue: Department of Bioengineering, Sheikh Zayed Institute for Pediatric Surgical Innovation. Children's National Hospital. Washington, DC.
- Title: Quantitative medical image analysis for a personalized optimal clinical management of craniosynostosis. 2020  
Venue: Department of Biostatistics and Informatics, University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Quantitative medical image analysis for a personalized optimal clinical management of craniosynostosis. 2020  
Venue: Bioengineering Initiative – Children's National Hospital. Washington, DC.

- Title: Predictive statistical model of cranial development 2020  
Venue: Precision Medical Imaging lab – Children’s National Hospital. Washington, DC.
- Title: Quantitative characterization of the cranium. 2020  
Venue: Department of Pediatric Plastic and Reconstructive Surgery. Children’s Hospital Colorado. Aurora, CO.
- Title: Image-based computational craniofacial phenotyping. 2020  
Venue: Computational Bioscience Program. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Medical Image Computing and Computer Assisted Interventions. 2020  
Venue: Medical Imaging Working Group. Department of Biostatistics and Informatics. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Medical image computing and computational phenotyping. 2020  
Venue: Biostatistics and Informatics Seminar Series. Department of Biostatistics and Informatics. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Image-based computational craniofacial phenotyping. 2021  
Venue: Human Medical Genetics and Genomics Program (HMGGP). University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Image-based computational craniofacial phenotyping. 2021  
Venue: Center for Personalized Medicine. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Medical imaging and big data 2021  
Venue: Big Data Seminar Series. Center for Innovation Design and Analysis (CIDA). University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Quantitative medical image analysis for a personalized optimal clinical management of craniosynostosis. 2021  
Venue: Department of Bioengineering. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Image-based computational craniofacial phenotyping. 2021  
Venue: Genetics and Metabolism Grand Rounds. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Using pediatric craniofacial imaging to screen for genetic and developmental anomalies. 2022  
Venue: Real World Ethics for Artificial Intelligence Research: Managing the Issues. 12th Annual Research Ethics Conference. Colorado Clinical and Translational Sciences Institute (CCTSI). Aurora, CO.
- Title: Medical Image Phenotyping. 2022  
Venue: Computational Bioscience Program – Recruitment flash talks. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Medical Image Phenotyping. 2023  
Venue: CU Anschutz Symposium on Biomedical Imaging. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: My path to directing a machine learning and biomedical engineering research program. 2023  
Venue: Aurora Science and Tech Middle School. Aurora, CO.
- Title: A data-driven approach to the clinical management of patients with craniosynostosis. 2023  
Venue: Department of Biostatistics and Informatics Seminar Series. University of Colorado Anschutz Medical Campus. Aurora, CO.

- Title: A data-driven approach to the clinical management of craniosynostosis. 2023  
Venue: Department of Biomedical Informatics. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Imaging and Machine Learning Technologies to Quantify Pediatric Development. 2023  
Venue: Annual Research Exchange – Technology Panel. Colorado School of Public Health. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Research Program on Medical Image Computing and Machine Learnings. 2024  
Venue: Department of Radiology – Children’s Hospital Colorado, Aurora, CO.
- Title: Using AI to personalize and optimize the treatment of craniosynostosis 2024  
Venue: University of Colorado – Colorado State University Summit: Research Innovations in Health AI. University of Colorado Anschutz Medical Campus. Aurora, CO.
- Title: Accounting for Diversity in Medical Imaging and Artificial Intelligence Research 2024  
Venue: Annual Retreat of the Department of Biomedical Informatics, School of Medicine, University of Colorado Anschutz Medical Campus. Aurora, CO.

#### National

- Title: Quantification of craniofacial malformations using quantitative imaging technologies. 2018  
Venue: Medical Genetics Branch, National Human Genome Research Institute (NHGRI). National Institutes of Health, Bethesda, MD. Washington, DC.
- Title: Personalized quantitative evaluation, treatment and follow-up of patients with craniosynostosis. 2018  
Venue: Clinical Case Conference. National Institute of Dental and Craniofacial Research (NIDCR). National Institutes of Health, Bethesda, MD.
- Title: Personalized quantitative evaluation, treatment and follow-up of patients with craniosynostosis. 2019  
Venue: Craniofacial Anomalies and Regeneration Section. National Institute of Dental and Craniofacial Research (NIDCR). National Institutes of Health, Bethesda, MD.
- Title: Quantitative medical image analysis for a personalized optimal clinical management of craniosynostosis. 2020  
Venue: Department of Biomedical Engineering – Columbia University. New York City, NY.
- Title: Quantitative medical image analysis for a personalized optimal clinical management of craniosynostosis. 2020  
Venue: Department of Bioengineering – University of Maryland College Park, MD.
- Title: Quantitative medical image analysis for a personalized optimal clinical management of craniosynostosis. 2020  
Venue: Department of Radiology – Washington University. St. Louis, MO.
- Title: Medical Image Phenotyping 2023  
Venue: Sheikh Zayed Institute for Pediatric Surgical Innovation, Children’s National Hospital. Washington, DC.
- Title: A data-driven approach for the clinical management of craniosynostosis 2023  
Venue: Surgery Grand Rounds – School of Medicine, University of Arizona, Tucson, AZ.
- Title: A data-driven approach for the clinical management of craniosynostosis 2024  
Venue: Facebook Community Forum, Annual Conference – National Institutes of Health. Bethesda, MD.

- Panel: Bridging Foundational, Translational, Clinical and Public Health Research – Lessons Learned and Future Perspectives 2024  
Venue: Facebook Community Forum, Annual Conference – National Institutes of Health. Bethesda, MD.
- Title: A data-driven approach to the clinical management of craniosynostosis. 2024  
Venue: Department of Biomedical Data Science, Dartmouth College, Hanover, NH.

#### Keynote/invited presentations in international venues

- Title: Computational facial phenotyping of genetic syndromes. 2019  
Venue: Digital Health and Artificial Intelligence Seminar – World Orphan Drug Conference. Washington, DC.
- Title: Quantitative phenotyping and predictive modeling of cranial bone development. 2021  
Venue: New Trends in Perinatal and Pediatric Imaging. Annual Conference of the IEEE Engineering in Medicine and Biology Society (EMBC). Virtual.
- Title: Clinical Workflow 4: Abdominal and Pelvic Imaging (with Dr. Emmanuel Salinas Miranda and Dr. Vinay Duddalwar). 2023  
Venue: IEEE International Symposium on Biomedical Imaging. Cartagena, Colombia.
- Title: Accounting for diversity in medical imaging and artificial intelligence research 2023  
Venue: Annual Meeting of the Radiological Society of North America (RSNA) – Health Equity Series.

#### **Scientific conference presentations**

- Title: Cardiac Deformation from Electro-Anatomical Mapping Data: Application to Scar Characterization 2011  
Conference: Functional Imaging and Modeling of the Heart (FIMH)  
Format: Poster presentation
- Title: Endocardial motion estimation from electro-anatomical data 2012  
Conference: IEEE International Symposium on Biomedical Imaging (ISBI)  
Format:
- Title: Temporal Diffeomorphic Free Form Deformation to Quantify Changes Induced by Left and Right Bundle Branch Block and Pacing 2013  
Conference: Workshop on Statistical Atlases and Computational Models of the Heart, International Conference of Medical Image Computing and Computer Assisted Interventions  
Format: Oral presentation
- Title: Myocardial Motion Estimation Combining Tissue Doppler and B-mode Echocardiographic Images 2013  
Conference: International Conference of Medical Image Computing and Computer Assisted Interventions  
Format: Poster presentation
- Title: Personalized Optimal Planning for the Surgical Correction of Metopic Craniosynostosis 2016  
Conference: Workshop on Clinical Image-Based Procedures. International Conference of Medical Image Computing and Computer Assisted Interventions  
Format: Oral presentation
- Title: Locally Affine Diffeomorphic Surface Registration for Planning of Metopic Craniosynostosis Surgery 2017  
Conference: International Conference of Medical Image Computing and Computer Assisted Interventions  
Format: Oral presentation

- Title: Quantification of oxygen changes in the placenta from BOLD MR image sequences 2017  
Conference: SPIE Computer Aided Diagnosis Conference  
Format: Oral presentation
- Title: Early Detection of Ureteropelvic Obstruction from Diuretic Renograms 2017  
Conference: American Urological Association (AUA) Annual Meeting  
Format: Oral presentation
- Title: Personalized Optimal Planning of Fronto-Orbital Advancement Surgery for the Correction of Metopic Craniosynostosis from CT 2017  
Conference: Annual Meeting of the American Cleft Palate & craniofacial Association (ACPA)  
Format: Oral presentation
- Title: Progress in Automated Intracranial Volume Quantification from 3D Photography 2017  
Conference: Biennial Congress of the International Society of Craniofacial Surgery (ISCFS)  
Format: Poster presentation
- Title: Automatic Planning of Cranial Vault Reconstruction for Metopic Craniosynostosis Treatment 2017  
Conference: Biennial Congress of the International Society of Craniofacial Surgery (ISCFS)  
Format: Oral presentation
- Title: Machine Learning Facilitates Early Detection of Ureteropelvic Junction Obstruction 2018  
Conference: American Society for Artificial Internal Organs (ASAIO) Annual Meeting  
Format: Oral presentation
- Title: Automatic Measurement of Intracranial Volume from Three-Dimensional Photography 2019  
Conference: Biennial Congress of the International Society of Craniofacial Surgery (ISCFS)  
Format: Poster presentation
- Title: Quantification of Head Shape from 3D Photography for Automatic Detection of Craniosynostosis 2019  
Conference: Biennial Congress of the International Society of Craniofacial Surgery (ISCFS)  
Format: Oral presentation
- Title: Quantitative Evaluation of Treatment for Craniosynostosis from 3D Photography 2019  
Conference: Biennial Congress of the International Society of Craniofacial Surgery (ISCFS)  
Format: Poster presentation
- Title: Normative temporal model of cranial bone development, mineral density changes and suture fusion 2021  
Conference: Biennial Congress of the International Society of Craniofacial Surgery (ISCFS)  
Format: Oral presentation (presented by PhD student: Jiawei Liu)
- Title: Age-dependent machine learning model improves head shape characterization and enables longitudinal evaluation of patients with craniosynostosis 2021  
Conference: Rocky Bioinformatics Conference  
Format: Poster presentation (presented by PhD student: Connor Elkhill)

- Title: Age-dependent machine learning model improves head shape characterization and enables longitudinal evaluation of patients with craniosynostosis 2022  
Conference: Annual Meeting of the American Cleft Palate & craniofacial Association (ACPA)  
Format: Oral presentation
- Title: Age-dependent machine learning model improves head shape characterization and enables longitudinal evaluation of patients with craniosynostosis 2022  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado.  
Format: Oral presentation (presented by PhD student: Connor Elkhill)
- Title: Graph convolutional network with probabilistic spatial regression: application to craniofacial landmark detection from 3D photogrammetry 2022  
Conference: International Conference on Medical Image Computing and Computer Assisted Interventions  
Format: Poster presentation (presented by PhD student: Connor Elkhill)
- Title: Learning with context encoding for single-stage cranial bone labeling and landmark localization 2022  
Conference: International Conference on Medical Image Computing and Computer Assisted Interventions  
Format: Poster presentation (presented by PhD student: Jiawei Liu)
- Title: Normative temporal model of cranial bone development, mineral density changes and suture fusion 2022  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado  
Format: Oral presentation (presented by PhD student: Jiawei Liu)
- Title: Geometric deep learning for automated pediatric craniofacial landmarking 2022  
Conference: National Library of Medicine T15 Conference  
Format: Oral presentation (presented by PhD student: Connor Elkhill)
- Title: Using artificial intelligence to predict personalized development from imaging data in real time for longitudinal patient evaluation 2023  
Conference: International Symposium on Craniofacial Surgery  
Format: Oral presentation (by PhD student: Connor Elkhill)
- Title: AI-driven real-time evaluation of 3D photogrammetry to quantify surgical outcomes of patients with non-syndromic craniosynostosis in a clinical setting. 2023  
Conference: International Symposium on Craniofacial Surgery  
Format: Oral presentation
- Title: Automated quantification of uncertainty for emphysema evaluation from CT images using hybrid Bayesian deep learning 2023  
Conference: Annual Meeting of the Radiological Society of North America (RSNA)  
Format: Poster presentation
- Title: Normative model of cranial bone development unveils abnormal local bone density in pediatric CT associated with intra-cranial hypertension and non-syndromic sagittal craniosynostosis 2023  
Conference: Annual Meeting of the Radiological Society of North America (RSNA)  
Format: Oral presentation
- Title: Cranial bone thickness and density anomalies quantified from CT images identify chronic increased intracranial pressure 2024  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado  
Format: Oral presentation (by PhD student: Jiawei Liu)

- Title: Identifying Increased Intracranial Pressure in Complex and Syndromic Craniosynostosis Using Machine Learning 2024  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado  
Format: Poster presentation (by clinical fellow: Jasmine Chaij)
- Title: Quantifying the risk of increased intracranial pressure in non-syndromic craniosynostosis using machine learning 2024  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado  
Format: Poster presentation (by clinical fellow: Jasmine Chaij)
- Title: Quantifying Aesthetic Outcomes of Patients with Unoperated Craniosynostosis 2024  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado  
Format: Poster presentation (by clinical fellow: Jasmine Chaij)
- Title: Objective Evaluation of Aesthetic Outcomes in Surgical Intervention for Metopic Craniosynostosis 2024  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado  
Format: Poster presentation (by clinical fellow: Jasmine Chaij)
- Title: Quantifying surgical outcomes in patients undergoing endoscopic vs open repair of unicoronal craniosynostosis 2024  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado  
Format: Poster presentation (by clinical fellow: Jasmine Chaij)
- Title: Implementing AI to automate craniofacial 3D photogrammetry analysis at the clinic 2024  
Conference: Children's Center for Surgery Research Symposium, Children's Hospital Colorado  
Format: Poster presentation (by PhD student: Connor Elkhill)
- Title: Identifying increased intracranial pressure in non-syndromic sagittal craniosynostosis using machine learning analysis of CT images 2024  
Conference: Annual Meeting of the American Cleft Palate & craniofacial Association (ACPA)  
Format: Oral presentation (by clinical fellow: Jasmine Chaij)
- Title: Quantification of bone anomalies indicative of increased intracranial pressure in patients with craniosynostosis 2024  
Conference: Annual Meeting of the American Cleft Palate & craniofacial Association (ACPA)  
Format: Oral presentation (by clinical fellow: Jasmine Chaij)
- Title: A quantitative study of aesthetic changes in patients with unoperated craniosynostosis 2024  
Conference: Annual Meeting of the American Cleft Palate & craniofacial Association (ACPA)  
Format: Poster presentation (by clinical fellow: Jasmine Chaij)
- Title: Leveraging AI's Potential: Real-time Prediction of Longitudinal Patient Development Using Imaging Data 2024  
Conference: Annual Meeting of the American Cleft Palate & craniofacial Association (ACPA)  
Format: Oral presentation (by PhD student: Connor Elkhill)

- Title: Quantifying surgical outcomes in patients with non-syndromic craniosynostosis: AI-driven real-time evaluation of 3D photogrammetry 2024  
Conference: Annual Meeting of the American Cleft Palate & craniofacial Association (ACPA)  
Format: Oral presentation (by PhD student: Connor Elkhill)
- Title: Mesh registration via geometric feature homogenization and offset cross-attention: application to 3D photogrammetry 2024  
Conference: Workshop on GRaphs in biomedical Image analysis (GRAIL) – International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)  
Format: Oral presentation (by Postdoctoral fellow: Ines A. Cruz-Guerrero)
- Title: Personalized phenotype encoding and prediction of pathological development from cross-sectional images 2024  
Conference: International Symposium on Medical Information Processing and Analysis (SIPAIM)  
Format: Oral presentation

## Teaching Record

### Courses

Pompeu Fabra University (Barcelona, Spain)

**22109 – Computational Techniques in Biomedicine** (20 students) 2011-2012

Role: Single instructor in 22 seminars (2h/seminar, 33% of the course).

Program: BSc Biomedical Engineering, Department of Information and Communication Technologies

Description: This course provides students with fundamental concepts of: (1) algorithms, data structures and programming; and (2) mathematical modeling and finite element method (FEM) to solve biomedical linear differential equation problems.

**21595 – Fundamentals of Programming** (20 students) 2012-2013

Role: Single instructor in 20 seminars (2h/seminar, 50% of the course).

Program: BSc Computer Engineering, BSc Telecommunications Network Engineering and BSc Audiovisual Systems Engineering, Department of Information and Communication Technologies

Description: This course teaches the basic concepts of algorithms, programming in C language and data structures.

**22130 – Biomedical Image Analysis** (20 students) 2013-2015

Role: Single instructor in 18 seminars/year (2 years, 2h/seminar, 50% of the course)

Program: BSc Biomedical Engineering, Department of Information and Communication Technologies

Description: The course presents a theoretical and practical introduction to the fundamentals of image processing and analysis with special emphasis on biomedical applications.

University of Colorado Anschutz Medical Campus (Aurora, CO)

**BIOS 7718 – Introduction to Biomedical Image Analysis** (13 students). 2021-2022

Role: Single instructor (3 credits), Department of Biostatistics and Informatics.  
*Most of the contents and materials of this course were redesigned by the instructor.*

Program: PhD Biostatistics. Colorado School of Public Health.

Description: This course provides students with the theoretical and computational skills to tackle a biomedical image analysis problem, covering important topics such as image segmentation, feature quantification, object recognition, etc.

**BIOS 7747 – Machine Learning for Biomedical Applications** (~15-20 students). 2022-2025

Role: Single instructor (2 credits in 2022/23, 3 credits in 2023/24 and 2024/2025), Department of Biostatistics and Informatics.

*The entirety of this new course was designed and developed by the instructor.*

Program: PhD Biostatistics. Colorado School of Public Health.

Description: Students learn the theoretical background of unsupervised and supervised machine learning methods, and how to develop programs to solve biomedical problems using machine learning techniques.

### Guest lectures

University of Colorado Anschutz Medical Campus (Aurora, CO)

**CPBS 7711 – Methods and Tools in Biomedical Informatics** (3 - 6 students). 2021-2024

Role: Guest 3h lecture on supervised machine learning methods

Program: Computational Bioscience Program. School of Medicine. University of Colorado Anschutz Medical Campus, Aurora, CO.

Description: In this class, students receive an overview of the most popular supervised machine learning methods, and they learn about the different steps to build and evaluate a supervised machine learning model using Python.

**BIOS 6670 – Special Topics: Biostatistics** (20 students). 2023-2024

Role: Instructor of a one-week course on machine learning methods in biomedicine.

Program: Colorado Summer Institute in Biostatistics (CoSIBS). University of Colorado Anschutz Medical Campus, Aurora, CO.

Description: Students received an overview of machine learning methods that are typically used to solve biomedical problems, with focus on supervised learning methods.

**CPBS 7712 – Research Methods in Biomedical Informatics** (5 students). 2023-2024

Role: Guest 2h workshop on the development and training of neural networks using PyTorch.

Program: Computational Bioscience Program. School of Medicine. University of Colorado Anschutz Medical Campus, Aurora, CO.

Description: In this hands-on class, students learn how to create and train a new neural network from scratch using PyTorch.

**BIOS 6642 – Introduction to Python Programming** (15 students).

2023-2024

Role: Guest lecture on the use of Python programming for research.

Program: MS/PhD Biostatistics. Colorado School of Public Health. University of Colorado Anschutz Medical Campus, Aurora, CO.

Description: Seminar about leveraging Python programming skills within a data science research program.

**Mentoring and supervision**

Children's National Hospital, Washington, DC

- Elijah Biggs, Research assistant, University of Maryland College Park, MD. 2015-2017  
Role: Supervisor. Mentee duties: clinical data curation and anonymization, MATLAB software development, support on research experiments for pediatric craniofacial analysis studies.
- Catherine Arnold, Summer intern, Colgate University, NY. 2016  
Role: Supervisor. Mentee duties: clinical data curation and anonymization, MATLAB software development, support on research experiments for pediatric craniofacial analysis studies.
- Mohammed Al-Tenaiji, Summer intern, Khalifa University, Abu Dhabi, UAE. 2016  
Role: Mentor. Project: improvement of automated facial analysis technology for the detection of genetic syndromes.
- Scott Ensel, Research assistant, University of Maryland College Park, MD. 2016-2017  
Role: Supervisor. Mentee duties: data curation and evaluation of quantitative methods for an automated diagnosis and optimal treatment of craniosynostosis.
- James Jared, Summer intern, Princeton University, NJ. 2017  
Role: Mentor. Project: development of mobile phone application using Xamarin for the early detection of genetic syndromes: patient consenting and server-side HIPAA-compliant storage.
- Alec Boyle, Research assistant, University of Maryland College Park, MD. 2017-2018  
Role: Supervisor. Mentee duties: clinical data curation and anonymization, MATLAB software development, support on experiments for evaluation of facial analysis technology for the early detection of genetic syndromes in diverse populations.
- Manuel Mastromanolis, Research assistant, University of Maryland College Park, MD. 2017-2018  
Role: Supervisor. Mentee duties: data curation and evaluation of quantitative methods for an automated diagnosis and optimal treatment of craniosynostosis. Translation of MATLAB software to Python.
- Phillip Taylor, Summer intern, Princeton University, NJ. 2018  
Role: Mentor. Project: implementation of a neural network for the early detection of genetic syndromes using photography data.
- Liyun Tu, Postdoctoral fellow. 2016-2019  
Role: supervisor. Project: quantitative evaluation of craniofacial dysmorphology using two- and three-dimensional photographic data.
- Daniel Perez, Research assistant, University of Maryland College Park, MD. 2017-2018  
Role: Supervisor. Mentee duties: clinical data curation and anonymization, MATLAB software development, support on research experiments for evaluation of deep learning technology to identify genetic syndromes from photographic data.
- Graham Buck, Research assistant, University of Maryland College Park, MD. 2018-2019  
Role: Supervisor. Mentee duties: data curation and evaluation of quantitative methods for automated diagnosis and optimal treatment of craniosynostosis.

- Sacheth Sathyanarayanan, Summer intern, Princeton University, NJ. 2019  
 Role: Mentor. Project: automated pose estimation and three-dimensional representation of facial geometry and texture using iPhone infrared sensors.
  - Sofia Gonzalez, Research assistant, University of Maryland College Park, MD. 2019-2020  
 Role: Supervisor. Mentee duties: clinical data curation and anonymization, MATLAB software development, support on research experiments for facial analysis studies.
  - Tenzin Sonam, Research assistant, University of Maryland College Park, MD. 2019-2020  
 Role: Supervisor. Mentee duties: clinical data curation and anonymization, support on research experiments for facial analysis studies.
- Children's Hospital Colorado, Aurora, CO
- Thomas Lucero, Research assistant (MS Computer Science student). Department of Pediatric Plastic and Reconstructive Surgery. 2020-2021  
 Role: Research supervisor. Project: Creation of a graphic software interface for the clinical translation of image computing and machine learning methods.  
 Status: graduated in Summer 2021.
  - Jasmine Chajj, Clinical Fellow (Medical student). Department of Pediatric Plastic and Reconstructive Surgery. 2023-2024  
 Role: Research mentor. Project: Clinical translation of artificial intelligence methods to improve the management of pediatric craniofacial disorders.  
 Status: fellowship ends in Summer 2024.
  - Skyler Palmer, Clinical Fellow (Medical student). Department of Pediatric Plastic and Reconstructive Surgery. 2024-Present  
 Role: Research mentor. Project: Clinical translation of artificial intelligence methods to improve the management of pediatric craniofacial disorders.  
 Status: fellowship ends in Summer 2024.
  - Diego Gomez, Clinical Fellow (Medical student). Department of Pediatric Plastic and Reconstructive Surgery. 2024-Present  
 Role: Research mentor. Project: Clinical translation of artificial intelligence methods to improve the management of pediatric craniofacial disorders.  
 Status: fellowship ends in Summer 2024.
- University of Colorado Anschutz Medical Campus, Aurora, CO
- Jiawei Liu, Research assistant (PhD student). Department of Biostatistics and Informatics. 2020-2024  
 Role: Mentor and thesis supervisor. Project: Development of image computing and machine learning methods to build models of pediatric cranial bone development.  
 Status: Graduated in 2024.
  - Connor Elkhill, Research assistant (PhD student). Computational Bioscience Program. 2021-Present  
 Role: Mentor and thesis supervisor. Project: Development of geometric deep learning algorithms for craniofacial evaluation from non-invasive 3D photogrammetry data.  
 Status: expected graduation in 2025.
  - Abbas Shaikh, Research intern (high school senior). 2021-2022  
 Role: Mentor. Project: development and testing of convolutional neural network for the automated segmentation of cranial bones in computed tomography images.  
 Status: graduated in 2022.

- Joseph Froelicher, Research assistant (MS student). Department of Biostatistics and Informatics. 2021-2022  
Role: Mentor and thesis supervisor. Project: Data-driven diffeomorphic cranial suture growth model.  
Status: graduated in 2022.
- David Baraghoshi, Research assistant (PhD student of Biostatistics and Informatics until 2024 graduation) and faculty (National Jewish Hospital after 2024 graduation). 2022-Present  
Role: Mentor and thesis supervisor. Project: Bayesian deep learning method for uncertainty quantification in the evaluation of patients with chronic obstructive pulmonary disease from computed tomography images.  
Status: graduated in 2024 (as student), currently mentored investigator (as faculty)
- Marcel Roux, Research assistant (MS student). Department of Applied Mathematics. 2023-Present  
Role: Mentor and thesis supervisor. Project: Deep geometric surface-matching framework for anatomical standardization in 3D photogrammetry data.  
Status: expected graduation in Fall 2024.
- Ines Alejandro Cruz Guerrero, Postdoctoral fellow (PhD). Department of Biostatistics and Informatics. 2023-Present  
Role: Mentor and supervisor. Project: Development of deep learning methods for surface data representation and analysis.
- Isabelle Meredith, Research Assistant (MS Student). Department of Biostatistics and Informatics. 2024-Present  
Role: Mentor and thesis supervisor.  
Status: expected graduation in Spring 2026.
- Madelynn Schina, Research Assistant (MS/PhD Student). Department of Biostatistics and Informatics. 2024-Present  
Role: Mentor and thesis supervisor.  
Status: expected MS graduation in Spring 2026, PhD target 2028.
- Joseph Nagel, Research Assistant (MS/PhD Student). Department of Biostatistics and Informatics. 2024-Present  
Role: Mentor and thesis supervisor.  
Status: expected MS graduation in Spring 2026, PhD target 2028.
- Thomas Stoughton, Professional Research Assistant. Department of Biostatistics and Informatics. 2024-Present  
Role: Mentor.

#### Thesis Committee Member at University of Colorado Anschutz Medical Campus, Aurora, CO

- Benjamin Steinhart (MS student). Department of Biostatistics and Informatics. 2021-2022  
Project: A Video Analysis Pipeline for Detecting Differences in Pupil Dilation across Marijuana User Groups.  
Primary advisor: Dr. Julia Wrobel. Status: graduated.
- Jared Rieck (MS student). Department of Biostatistics and Informatics. 2022-2023  
Project: fMRI data analysis for emotional response prediction.  
Primary advisor: Dr. Julia Wrobel. Status: graduated.
- Xinyi Yang (PhD student). Department of Biostatistics and Informatics. 2023-Present  
Project: Domain adaptation and domain generalization methods for hepatic lesion detection on PET images.  
Primary advisor: Dr. Fuyong Xing. Status: expected graduation Spring 2025.

- Kewalin Samart (PhD student). Computational Bioscience Program. 2023-Present  
Project: Development and application of machine learning tools to identify disease-specific signatures and novel host-directed therapeutics for infectious diseases.  
Primary advisor: Dr. Janani Ravi. Status: expected graduation Summer 2026.
- Keenan Manpearl (PhD student). Computational Bioscience Program. 2023-Present  
Project: Improving gene function, phenotype, and disease prediction by building richer representations of genes and concepts.  
Primary advisor: Dr. Arjun Krishnan. Status: expected graduation Summer 2026.

#### Mentoring within the MICCAI Mentorship Program

- Luke Shepherd, MS student at University College London (UCL), United Kingdom. 2020-2021
- Charles Lu, PhD student at Massachusetts Institute of Technology (MIT), USA. 2022

#### Mentoring within the CU Anschutz BOND Mentorship Program

- David Cantu, MD at Denver Health, Denver, CO, USA. 2024-Present

#### **Other teaching activities**

- Weekly Python working group to help students improve their computational and programming skill (instructor) 2021
- Working group on Neural Networks (Department of Biostatistics and Informatics, and Computational Bioscience Program) 2023
- Working group on Machine Learning (Medical Imaging and Machine Intelligence Initiative, Department of Biostatistics and Informatics) 2024

#### **Training grants**

##### ACTIVE

#### **International Conference on Medical Image Computing and Computer Assisted Intervention** 2024-2027

Funding agency: National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health

Award identifier: R13EB035922

Total award: \$30,000 (\$10,000/year).

Summary: This award aims to enhance the diversity of the attendees to the International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI) in 2024, 2025 and 2026 by funding travel awards to students and early career investigators from underrepresented groups in science including women, racial/ethnic minorities, students with disabilities, and people from disadvantaged backgrounds

Role: Principal investigator

**Colorado Biomedical Informatics Training Program**

2020-2024

Funding agency: National Library of Medicine, National Institutes of Health

Award identifier: T15LM009451

Total award: \$445,363 (FY 2020); \$613,049 (FY 2021); \$465,973 (FY 2022); \$257,402 (FY 2023).

Summary: Our program is designed to provide graduate students and post-doctoral fellows training in both computational methods and molecular biology, an intimate familiarity with the science and technology that synthesizes the two, and the skills necessary to pioneer novel computational approaches to significant biomedical questions.

Role: Core faculty, mentor

Principal investigator: Dr. Katerina Kechris

**Development of deep learning methods to optimize personalized treatment for craniosynostosis**

2024-2026

Funding agency: National Institute of Dental and Craniofacial Research, National Institutes of Health

Award identifier: F31DE033614

Total award: \$75,442

Summary: This mentored training award aims to develop methods to optimize the selection of surgical treatments and the evaluation of their outcomes using non-invasive 3D photogrammetry.

Role: Primary mentor

Trainee: Connor Elkhill

COMPLETED

**International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI) 2020**

2019-2020

Funding agency: National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health

Award identifier: R13EB030422

Total award: \$10,000

Summary: This award aims to enhance the diversity of the attendees to the International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI) in 2020 by funding travel awards to students and early career investigators from underrepresented groups in science including women, racial/ethnic minorities, students with disabilities, and people from disadvantaged backgrounds.

Role: Co-principal investigator

**International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI) 2021** 2020-2023

Funding agency: National Institute of Biomedical Imaging and Bioengineering, National Institutes of Health

Award identifier: R13EB032243

Total award: \$9,850 (FY 2021); \$10,000 (FY 2022); \$10,000 (FY 2023)

Summary: This award aims to enhance the diversity of the attendees to the International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI) in 2021, 2022 and 2023 by funding travel awards to students and early career investigators from underrepresented groups in science including women, racial/ethnic minorities, students with disabilities, and people from disadvantaged backgrounds.

Role: Co-principal investigator

**Development and clinical translation of machine learning methods to optimize treatment outcomes in craniosynostosis on a patient specific level** 2022-2023

Funding agency: National Center for Advancing Translational Sciences, National Institutes of Health

Award identifier: TL1TR2533

Total award: \$26,352

Summary: This predoctoral award has the goal to partially fund one of the PhD students that I supervise in my lab, Connor Elkhill, who is developing novel geometric learning methods to quantify and optimize treatment outcomes of patients with craniosynostosis in collaboration with the Children's Colorado Craniofacial Clinic.

Role: Primary mentor

Trainee: Connor Elkhill

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**Research Record**

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ACTIVE

**Quantitative characterization and predictive modeling of cranial bone development in patients with craniosynostosis** 2020-2025

Funding agency: National Institute of Dental and Craniofacial Research (NIDCR), National Institutes of Health (NIH)

Award identifier: R00DE027993

Total award: \$737,906 (+\$115,969.66 transferred from previous K99 award)

Summary: The goal of this project is to develop a normative evidence-based predictive development model of the cranial bones to characterize and predict normal and abnormal growth in children with craniosynostosis

Role: Principal investigator

<b>Early joint cranial and brain development from fetal and pediatric imaging</b>	2021-2026
<u>Funding agency:</u> National Institute of Dental and Craniofacial Research (NIDCR), National Institutes of Health (NIH)	
<u>Award identifier:</u> R01DE030286	
<u>Total award:</u> \$ 2,162,069 (total budget awarded only until May 2024)	
<u>Summary:</u> The main goal of this project is to study the coupled mechanisms of cranial and brain development using perinatal and pediatric imaging data	
<u>Role:</u> Co-investigator	
<u>Principal investigators:</u> Dr. Natasha Lepore, Dr. Marius Linguraru	
<b>Data-driven quantification and prediction of pre-surgical local head volume distributions and post-surgical development in patients with craniosynostosis</b>	2023-2028
<u>Funding agency:</u> National Institute of Dental and Craniofacial Research (NIDCR), National Institutes of Health (NIH)	
<u>Award identifier:</u> R01DE032681	
<u>Total award:</u> \$1,965,270 (estimated)	
<u>Summary:</u> We aim to study, model and predict the compensatory volume mechanisms in the cranium in presence of growth constraints, and how they are modified after surgical treatment.	
<u>Role:</u> Principal investigator	
<b>Development of CT image-based cranial bone markers of intra-cranial hypertension</b>	2023-2025
<u>Funding agency:</u> National Institute of Dental and Craniofacial Research (NIDCR), National Institutes of Health (NIH)	
<u>Award identifier:</u> R21DE031824	
<u>Total award:</u> \$447,497	
<u>Summary:</u> We aim to create image analysis and machine learning methods to identify and quantify for the first time cranial bone development anomalies that are indicative of intra-cranial hypertension. Then, we will investigate the development of elevated pressure in patients with non-syndromic craniosynostosis, and we will study if there are differential patterns across patient subgroups.	
<u>Role:</u> Principal investigator	
<b>AI-driven Tool for the Pre-operative Assessment, Treatment Selection and Surgical Outcome Evaluation of Patients with Craniosynostosis</b>	2024-2026
<u>Funding agency:</u> Center for Children’s Surgery Innovation Award – Children’s Hospital Colorado	
<u>Total award:</u> \$25,000	
<u>Summary:</u> We proposed an AI-driven tool to enable non-invasive quantitative pre-operative assessment, objective treatment selection, and prediction and longitudinal evaluation of surgical outcomes in patients with craniosynostosis. Ours will be the first tool of its kind and a necessary step towards optimizing the management of craniosynostosis.	
<u>Role:</u> Co-investigator	<u>Principal investigator:</u> Dr. Brooke French

COMPLETED

**Convergence of medical technologies for the integral management of cardiovascular remodeling**

2010-2012

Funding agency: Center for Industrial Technology Development (CDTI), Spanish Ministry of Science and Innovation

Award identifier: CEN20091044

Total award: €13.6M

Summary: This multi-institutional national project supported the development of methods, computational models and tools to help evaluate cardiac remodeling in presence of cardiovascular disease, with the overall goal to achieve personalized prevention, diagnosis and treatment strategies through the use of patient-specific quantitative information.

Role: Research assistant      Local principal investigator: Dr. Alejandro Frangi

**Multi-modal data fusion for cardiac tissue characterization in patients with ischemic cardiomyopathy**

2011-2015

Funding agency: FPU - Training program for university professors, Spanish Ministry of Education

Award identifier: AP2010-3684

Total award: €60,000

Summary: This competitive grant funded a PhD research project towards creating new computational and image analysis methods to quantitatively characterize ischemic cardiomyopathy

Role: Principal investigator

**Physiological integration of morphological and functional information for quantification of cardiac motion (PhysIQ)**

2012-2015

Funding agency: National plan for research, development and innovation, Spanish Ministry of Economy and Competitiveness

Award identifier: TIN2012-35874

Total award: €33,520

Summary: The goal of this project was to develop computational techniques to integrate patient-specific information from different sources to quantify accurately cardiac motion.

Role: Co-investigator

Principal investigator: Dr. Gemma Piella

**mGene – Early and Mobile Detection of Genetic Syndromes**

2015-2018

Funding agency: Pediatric Innovation Fund, Children's Hospital Foundation, Children's National Hospital

Total award: \$100,000

Summary: These funds were awarded to develop and validate a mobile technology for facial analysis for the early and non-invasive screening of genetic syndromes with dysmorphology.

Role: Co-investigator.

Principal investigators: Dr. Marius Linguraru, Dr. Marshall Summar

**Early detection of ureteropelvic junction obstruction using signal analysis and machine learning** 2016-2018

Funding agency: Joseph E. Roberts, Jr. Award, Children's National Hospital

Total award: \$25,000

Summary: The goal of this projects was to improve the interpretation of dynamic information embedded in the renal drainage curves trough developing signal processing and machine learning methods to assess disease severity.

Role: Co-investigator

Principal investigators: Dr. Marius Linguraru, Dr. Hans Pohl

**Image-guided planning system for skull correction in children with craniosynostosis** 2016-2019

Funding agency: Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD), National Institutes of Health (NIH)

Award identifier: R42HD081712

Total award: \$1,445,476

Summary: The goal of this project was to develop a personalized pre-operative planning framework for cranial remodeling of infants with craniosynostosis using image computing and statistical shape analysis methods to decrease operative time and morbidity.

Role: Co-investigator

Principal investigators: Dr. Marius Linguraru, Dr. Andinet Enquobahrie

**Quantitative characterization and predictive modeling of cranial bone development in patients with craniosynostosis** 2019-2020

Funding agency: National Institute of Dental and Craniofacial Research (NIDCR), National Institutes of Health (NIH)

Award identifier: K99DE027993

Total award: \$251,529

Summary: This award supported training in medical genetics, embryology, developmental biology and craniofacial surgery. In addition it funded research to develop a normative evidence-based predictive development model of the cranial bones to characterize and predict normal and abnormal cranial bone growth in children with craniosynostosis.

Role: Principal investigator

Mentors: Dr. Marius Linguraru (Children's National Hospital), Dr. Robert Keating (Children's National Hospital), Dr. Maximilian Muenke (National Human Genome Research Institute), Dr. Janice Lee (National Institute of Dental and Craniofacial Research).

## Identification of intracranial hypertension in pediatric patients using CT images and machine learning

2023-2024

Funding agency: Colorado Clinical and Translational Sciences Institute (CCTSI), and NIH National Center for Advancing Translational Sciences (NCATS)

Award identifier: CO-J-23-99 / UM1 TR004933

Total award: \$40,000.

Summary: We aim to quantify local bone thickness, density and volume anomalies in patients with ICH, and study elevated pressure in patients with syndromic and non-syndromic craniosynostosis.

Role: Principal investigator.

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## Bibliography

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*Note: (\*) indicates publication by mentee/trainee; (+) indicates equal contribution of two first authors.*

### Peer-reviewed journal articles [J]

1. **Porras, AR**; Piella, G; Berruezo, A; Hoogendoorn, C; Andreu, D; Fernandez-Armenta, J; Sitges, M; Frangi, AF: *Interventional endocardial motion estimation from electroanatomical mapping data: application to scar characterization*. IEEE Transactions on Biomedical Engineering 60(5), 1217-1224, **2012**. <https://doi.org/10.1109/TBME.2012.2230327>
2. De Craene, M; Marchesseau, S; Heyde, B; Gao, H; Alessandrini, M; Bernard, O; Piella, G; **Porras, AR**; Tautz, L; Hennemuth, A: *3D strain assessment in ultrasound (straus): A synthetic comparison of five tracking methodologies*. IEEE Transactions on Medical Imaging 32(9), 1632-1646, **2013**. <https://doi.org/10.1109/TMI.2013.2261823>
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#### Public Data and Tools [T]

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