

# TANISHQ MATHEW ABRAHAM

Ph.D. candidate  
Biomedical Engineering  
University of California, Davis

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## SUMMARY

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I am an 18-year-old 4<sup>th</sup>-year Ph.D. candidate currently pursuing research in Biomedical Engineering at University of California, Davis. For the past two years, I have been under the supervision of Dr. Richard Levenson at UC Davis Pathology and Laboratory Medicine. I am researching the application of deep learning (especially generative networks) to novel microscopy techniques for digital pathology. I have presented my work at several conferences, published a book chapter, established various collaborations with labs around the world, and more.

I have also been recognized as a child genius and a prodigy. I graduated high school at 10 years old with a 4.0 GPA. At 11 years old, I obtained 3 Associate Degrees also with a 4.0 GPA. At 14 years old, I graduated from UC Davis *summa cum laude* with a Bachelor's degree in Biomedical Engineering. For these reasons, I have been recognized on many international and national TV, radio and print news, TV and radio talk shows, reality TV shows and documentary shows, and have been a role model for young and old students around the world.

## EDUCATION

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<b>University of California, Davis</b> <i>Ph.D. degree in Biomedical Engineering</i> <i>Advisor: Dr. Richard Levenson</i>	Davis, CA, USA <i>Sept. 2018 - present</i> <i>GPA 3.84</i>
<b>University of California, Davis</b> <i>B.S. degree in Biomedical Engineering</i> <i>summa cum laude</i>	Davis, CA, USA <i>Sept. 2016 - Jun. 2018</i> <i>GPA 3.94</i>
<b>American River College</b> <i>A.S. degrees in General Science, Mathematics &amp; Physical Sciences, and Language Studies</i> <i>Highest Honors</i>	Sacramento, CA, USA <i>Jan. 2011 - May 2015</i> <i>GPA 4.0</i>

## ACADEMIC HONORS AND AWARDS

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- [1] Top 50 Varkey Foundation/Chegg.org Global Student Prize Finalist, Sept. 2021
- [2] Absolute Winner Award from Premio Internazionale Giuseppe Sciacca Foundation, Nov. 2018
- [3] UC Davis University Honors Program Scholar. Sept. 2016-June 2018.
- [4] UC Davis Biomedical Engineering Distinguished Innovation Award for "CardioVision: Non-Contact Heart Monitoring of Burn Patients" June 2018.
- [5] 18th UC Systemwide Bioengineering Symposium Diversity Travel Award, June 2017
- [6] UC Davis Undergraduate Travel Award, April 2017
- [7] Honorable Mention Award for "Whole-Body Mathematical Models of Synthetic Biosensing Liposomes" at West Coast Biological Sciences Undergraduate Research Conference, April 2017.
- [8] UC Davis College of Engineering Dean's List Winter 2017 - Spring 2018 (5 quarters)
- [9] UC Davis College of Agriculture and Environmental Sciences Dean's List Fall 2016 (1 quarter)
- [10] UC Santa Cruz Regent Scholar Awardee (turned down to attend UC Davis), April 2016
- [11] 2015 Phi Theta Kappa All-California Academic Team Award by Community College League

## SCHOLARSHIPS

- [1] 2018 UC Davis College of Engineering Dean's Distinguished Graduate Fellowship (2-year fellowship modeled after the NSF Graduate Research Fellowship Program)
- [2] Robot Appreciation Society Scholarship (1-year scholarship awarded for both 2016 and 2017)
- [3] Thomas E. Bruzzone Scholarship (UC Davis Undergraduate Scholarship 2017-2018)
- [4] Richard C. and Joy Dorf Award (UC Davis Undergraduate Scholarship 2017-2018)
- [5] Gail E. and Ruth M. Oliver Scholarship (UC Davis Undergraduate Scholarship 2016-2017)
- [6] 2016 California Aggie Alumni Association Leadership Scholarship

## JOURNAL PUBLICATIONS

- [1] Tess Engel, **Tanishq Abraham**, Arshia Rangchi, Maxwell Fung, Maija Kiuru, Farzad Fereidouni, Richard Levenson, "Fluorescence Imitating Brightfield Imaging (FIBI): A Novel Application of Rapid, Non-destructive and Slide-free Skin Tissue Imaging," *Manuscript in preparation*.
- [2] **Tanishq Abraham**, Michelle Mao, Cheemeng Tan, "Engineering approaches of smart, bio-inspired vesicles for biomedical applications," *Physical biology* 15.6 (2018): 061001.

## EXTENDED ABSTRACTS

- [1] **Tanishq Abraham**, Andrew Shaw, Daniel O'Connor, Austin Todd, Richard Levenson, "Slide-free MUSE Microscopy to H&E Histology Modality Conversion via Unpaired Image-to-Image Translation GAN Models," Computational Biology Workshop at International Conference on Machine Learning, July 2020. (peer-reviewed) [Presentation](#), [arXiv 2008.08579 \[eess.IV\]](#).

## BOOK CHAPTERS

- [B1] **Tanishq Abraham**, Austin Todd, Daniel A. Orringer, Richard Levenson. "Applications of artificial intelligence for image enhancement in pathology." In *Artificial Intelligence and Deep Learning in Pathology*, pp. 119-148. Elsevier, June 2020.

## POSTER PRESENTATIONS

- [P1] **Tanishq Abraham**, "UPIT: A fastai Package for Unpaired Image-to-Image Translation" April 2021. PyTorch Ecosystem Day.
- [P2] **Tanishq Abraham**, Andrew Shaw, Daniel O'Connor, Austin Todd and Richard Levenson. "Slide-Free MUSE Microscopy to H&E Histology Modality Conversion with Deep Learning" October 2020. Biomedical Engineering Society Annual Meeting.
- [P3] **Tanishq Abraham**, Andrew Shaw, Daniel O'Connor, Austin Todd and Richard Levenson. "Ex-vivo slide-free microscopy with H&E color-mapping via unpaired image-to-image translation" October 2020. 2nd International Symposium on Mathematical and Computational Oncology.
- [P4] **Tanishq Abraham**, Cheemeng Tan. "Whole-Body Computational Design of Biomimetic Cells that Inhibit Circulating Tumor Cells" October 2018. Biomedical Engineering Society Annual Meeting.
- [P5] **Tanishq Abraham**, Cheemeng Tan. "Whole-Body Mathematical Models of Synthetic Biosensing Liposomes" (with Rapid-fire) June 2017. 18th Annual UC Systemwide Bioengineering Symposium.

## ORAL PRESENTATIONS

- [O1] **Tanishq Abraham**, Andrew Shaw, Daniel O'Connor, Austin Todd, Richard Levenson. "Slide-Free MUSE Microscopy to H&E Histology Modality Conversion with Deep Learning" (Rapid-Fire) May 2020. UC Davis Biomedical Engineering Graduate Group Symposium.
- [O2] **Tanishq Abraham**, Connor Dougherty, Michelle Mao, Ben Price, Sagar Shah (in alphabetical order). "CardioVision: Non-Contact Heart Monitoring of Burn Patients" June 2018. 19th UC Systemwide Bioengineering Symposium.
- [O3] **Tanishq Abraham**, Connor Dougherty, Michelle Mao, Ben Price, Sagar Shah (in alphabetical order). "CardioVision: Non-Contact Heart Monitoring of Burn Patients" June 2018. UC Davis Pathology Grand Rounds.

- [O4] **Tanishq Abraham**, Connor Dougherty, Michelle Mao, Ben Price, Sagar Shah (in alphabetical order). "Cardio-Vision: Non-Contact Heart Monitoring of Burn Patients" June 2018. UC Davis Biomedical Engineering Senior Design Symposium.
- [O5] **Tanishq Abraham**, Cheemeng Tan. "Whole-Body Mathematical Models of Synthetic Biosensing Liposomes: An Application for the Prevention of Metastasis" October 2017. Biomedical Engineering Society Annual Meeting.
- [O6] **Tanishq Abraham**, Cheemeng Tan. "Whole-Body Mathematical Models of Synthetic Biosensing Liposomes" April 2017. West Coast Biological Sciences Undergraduate Research Conference.
- [O7] **Tanishq Abraham**, Cheemeng Tan. "Whole-Body Mathematical Models of Synthetic Biosensing Liposomes" April 2017. UC Davis Undergraduate Research Conference.

## TECHNICAL SKILLS

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LABORATORY SKILLS:	PCR, gel electrophoresis, bacterial transformation, cell-free systems, artificial cell synthesis, microscopy, fluorescence microscopy, mathematical modeling of biological systems
COMPUTER SCIENCE SKILLS:	Deep learning (CNNs, GANs, Transformers, GCNs, etc.), machine learning (Decision Trees, Random Forests, XGBoost, SVMs, Regression, etc.), computer vision (Classification, segmentation, etc.)

## PROGRAMMING PROFICIENCY

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LANGUAGES:	Python, MATLAB, C++, $\LaTeX$ , HTML
MODELING AND ANALYSIS SOFTWARE:	Solidworks, ImageJ, GIMP, QuPath
LIBRARIES:	PyTorch, fastai, HuggingFace Transformers, Scikit-learn, OpenCV, NumPy, SciPy, Pandas

## OTHER TRAINING

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COURSES:	Machine Learning by Stanford University   Coursera Practical Deep Learning for Coders   fast.ai
TRAINING:	UC Biomedical Engineering Entrepreneurship Academy   UC Davis

## TEACHING EXPERIENCE

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### 13.1 Teaching Assistantship

#### **BIM 1 - Introduction to Biomedical Engineering**

University of California, Davis

Oct. 2020 - Dec. 2020

Lead two 3 hour-long virtual discussion sections, mentoring and grading about 60 freshman/sophomore students for their design project, gave lectures on the engineering design process and computer-aided design. Significantly contributed to the transition of the learning environment into a virtual setting due to the COVID-19 pandemic.

#### **BIM 1 - Introduction to Biomedical Engineering**

University of California, Davis

Oct. 2019 - Dec. 2019

Lead two 3 hour-long virtual discussion sections, mentoring about 50 freshman/sophomore students for two design projects, gave lectures on the engineering design process and computer-aided design. Mentored 11 teams for the design challenges. Out of the total 35 teams across all six discussion sections, one of the teams that I mentored won the course design challenge.

### 13.2 Undergraduates mentored

#### **Students in the Levenson Lab:**

Erika Moe, undergraduate at University of Oregon, interning from June 2021 to present. She is researching nuclear segmentation for slide-free microscopy images.

Anna Weier, undergraduate at University of California, Davis, interned from Sept. 2020 to April 2021. She helped me run CycleGAN-based slide-free microscopy conversion experiments.

### Senior Design Teams:

UC Davis Computer Science Senior Design Team, Jan. to June 2020 - The project was on creating a full pipeline (from training to inference) for the conversion of MUSE images to H&E images. The students met regularly with me, presented their work to us for evaluation, as well as presented relevant papers during our weekly journal club.

John Hopkins University Biomedical Engineering Senior Design Team, Feb. to April 2020. Their project focused on applying MUSE for surgical margin assessment during Mohs surgery. I helped them with preliminary MUSE-to-H&E translation experiments.

## PROFESSIONAL MEMBERSHIPS

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BIOMEDICAL ENGINEERING SOCIETY	2016-2021
SPIE	2021 - present
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS	2021 - present

## HONOR SOCIETY MEMBERSHIPS

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PHI THETA KAPPA	2012-2015
TAU BETA PI	2018
PHI KAPPA PHI	2018
PHI BETA KAPPA	2018

## SERVICE

### 16.1 Positions

- [1] UC Davis Biomedical Engineering Student Association, Program Advising Chair & Graduate Student Association Representative, June 2021-present
- [2] UC Davis Synthetic Biology Club, Public Relations Officer, 2016-2017
- [3] Phi Theta Kappa American River College chapter, Vice President of Communications, 2014-2015
- [4] American River College Physics and Astronomy Club, Co-founder and Vice President, 2012-2014

### 16.2 Peer Review: Journals

- [1] Journal of Pathology Informatics, 2020

### 16.3 Peer Review: Books

- [1] Approaching (Almost) Any Machine Learning Problem by Abhishek Thakur, July 2020

## OPEN-SOURCE CONTRIBUTIONS

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<a href="#">DALL·E mini</a> (replication efforts of OpenAI's text-to-image generation models)	July 2021
<a href="#">UPIT</a> (developed & maintained by me, unpaired image translation algorithms)	Aug. 2020 - present
<a href="#">fastai</a> (A training framework built on top of PyTorch)	June 2019 - present

## INVITED TALKS

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- [1] "What are CycleGANs? (a novel deep learning tool in pathology)", Abhishek Thakur's YouTube channel. Aug. 2020. [Link](#). (8.4k views)
  - [2] Invited speaker, Deepalaya High School Special Event, Mumbai India, Dec. 2019
  - [3] Invited speaker, Guest Lecture Series, VJTI Technovanza 2019, Mumbai, India, Dec. 2019
  - [4] "Reaching the impossible - A child's perspective", TEDxYouth@Folsom, Sacramento, CA, Aug. 2016
  - [5] Invited speaker, Sharjah International Children's Book Festival, Sharjah, UAE, April 2016
  - [6] Invited speaker, "Youth Think Tank", 7 Days of Genius, 92Y, New York City, CA, March 2014

- [7] “College life begins at 7”, TEDxSacramento, Sacramento CA, June 2013
- [8] Panelist for SXSW 2013 Interactive Conference, Austin, TX, March 2013

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## SOCIAL MEDIA AND OTHER COMMUNITIES

I am active on Twitter, mainly participating in discussions and sharing resources related to machine learning and STEM. I have amassed over 18k followers on Twitter (including leaders in the field of machine learning like Jeremy Howard, Andrej Karpathy, Michael Bronstein, Jack Clark, and more), with many people finding my content useful. Check out my account [here](#). Additionally, I have started a blog this year relating to machine learning topics. Check it out over [here](#).

I am also active in several online machine learning communities. I participate on the [fast.ai forums](#) and one of the top 10 members of the community. Additionally, I am a moderator of the “The Machine Learning Community” Discord server with over three thousand members.

Finally, I am active on [Kaggle](#), where I have received 2 silver medals and 2 bronze medals in machine learning competitions, as well as achieving Notebooks Master and Discussions Master rank. Some of the content and resources I shared have been widely used throughout the machine learning community. One dataset I released on Kaggle has been used in several papers, even a Nature Machine Intelligence paper.

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## EXTRACURRICULAR ACTIVITIES

- [1] UC Davis University Chorus - Winter 2019
- [2] TV appearances: The Doctors Show, The Queen Latifah Show, Conan, CNN, MSNBC, Huffington Post Live, Child Genius, etc. - 2012-present
- [3] San Francisco Boy Chorus (performed at 8 concerts, National Anthem for San Francisco Giants and Oakland As) - Sept. 2011 - June 2014