Geisel School of Medicine at Dartmouth
Dartmouth-Hitchcock Medical Center
CURRICULUM VITAE

NAME: Joshua Levy PhD
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Google Scholar: https://scholar.google.com/citations?user=vR39CWkAAAAJ
MyNCBI: https://www.ncbi.nlm.nih.gov/myncbi/1fgQvdpod0SEEc/bibliography/public/

I. EDUCATION:

2017 BS in Physics
University of California, Berkeley, CA
College of Letters & Sciences: Highest Distinction graduation (top 1%)

2021 PhD in Quantitative Biomedical Sciences (Data Science)
Dartmouth College, Geisel School of Medicine, Hanover, NH
Co-mentors: Brock C. Christensen PhD (Department of Epidemiology)
Louis J. Vaickus MD, PhD (Department of Pathology and Laboratory Medicine)

Technical and Research skills:

Python • R • Shell • Supercomputer • Machine Learning • Dataviz • PyTorch • NLP
Sklearn • Plotly • Aircraft Pilot • Dask • Matlab • Javascript • C++ • SQL
Deep Learning • Docker • AWS • LaTEX • Nextflow • CWL Pipelines • Stan
Comp. Vision • Sensibly Constructing Statistical Golems • Graph Neural Networks

Relevant coursework:

Hierarchical, Bayesian Modeling, Social Network Analysis, Epidemiology, Biostatistics, Bioinformatics, Linear Algebra, Diff. Eq., Multivar. Calc., C++, Python, Statistics, Machine Learning, Health Promotion, Policy, Management, Quantum Computing and Stat Mechanics

II. POSTDOCTORAL TRAINING: N/A

III. ACADEMIC APPOINTMENTS:

2021-present Assistant Professor, Geisel School of Medicine at Dartmouth,
Departments of Pathology and Laboratory Medicine, and Dermatology

2021-present Adjunct Professor, Geisel School of Medicine at Dartmouth,
Department of Epidemiology

2021-present Faculty, Geisel School of Medicine at Dartmouth,
Quantitative Biomedical Sciences

2022-present Faculty, Dartmouth Hitchcock Medical Center,
Department of Medicine, Section of Radiation Oncology

IV. INSTITUTIONAL LEADERSHIP ROLES:

2018-present EDIT (Emerging Diagnostic and Investigative Technologies) Research Program
Editor, Department of Pathology and Laboratory Medicine, DHMC.
Co-director of EDIT Machine Learning and Whole Genome Sequencing arms.

V. LICENSURE AND CERTIFICATION: N/A
VI. HOSPITAL OR HEALTH SYSTEM APPOINTMENTS: N/A
VII. OTHER PROFESSIONAL POSITIONS (NON-DARTMOUTH):

April 2015-Jun 2016 — CiBER lab, Berkeley, CA — Biomechanics Research Assistant
• Agama Lizard Turns: Matlab and ProAnalyst analysis of lizard turning tendencies

Jun 2016-May 2020 — Lawrence Berkeley National Lab, JGI Affiliate, Berkeley, CA — Software Developer
• Novel computational methods elucidate quality biofuels: pangenome phylogenetics, genomics workflows, metagenomics binning, machine learning via large-scale, automated, supercomputer pipelines (Python/Nextflow)

Jun - Dec 2017 — San Francisco Department of Public Health: Tuberculosis Control, San Francisco, CA — Public Service Aide
• Evaluated patient data integrity and transition to electronic health records.

May-Aug 2018 — Zymergen, Emeryville, CA — Software Engineer Intern
• Constructed many different HPC AWS bioinformatics pipelines using CWL Docker, and Seven Bridges, storing results in SQL databases.
• Used Convolutional Neural Networks and hyperbolic embeddings to explore relationships between gene and function for discovery of biomaterials.

Jan 2020-present — ArcticAI, Hanover, NH — Chief Technical Officer
• Developing core technology, IP, and vision for intraoperative medical device

May 2022-present — ViewsML, Hanover, NH — Scientific Advisor
• Consulting and informatics for virtual staining technologies

Oct 2020-present — Veterans Affairs Healthcare System, White River Junction, VT — Statistical Consultant
• Consulting on machine learning-based natural language processing software for suicide risk prediction

Oct 2022-present — DCC Trace Element Analysis Core, Lebanon, NH — Statistical Consultant
• Consulting on machine learning-based and statistical methods for assessing high resolution elemental imaging maps

VIII. PROFESSIONAL DEVELOPMENT ACTIVITIES:

2018-present	CITI Program, Biomedical Responsible Conduct of Research (RCR) course completion
2018-present	CITI Program, Biomedical Data or Specimens Research Basic course, completion
2018-present	CITI Program, Good Clinical Practice (US, FDA focus) clinical trials with investigational drugs and medical devices (GCP) course completion
2019	Supervised Teaching Workshop, Mentor Skills Development
2019	NIH Grant Workshop
2017	Coaching Corps Leadership Development Program
2016	Crisis Support Counselor Training Program

IX. TEACHING ACTIVITIES:

A. UNDERGRADUATE (COLLEGE) EDUCATION: N/A

B. GRADUATE EDUCATION:

Courses:

Professional Level / Online:

TBD	Applied Machine Learning (QBS)	150 hr/yr

Graduate Level:

2022	Participation in Scientific Research (QBS 195)	150 hr/yr
2021-2022	Independent Study (QBS 195) (x6 students)	150 hr/yr
2022	Master's Capstone Experience (QBS 185)	150 hr/yr
2021	Faculty Seminar Student Projects (QBS 110.5)	150 hr/yr
2023	QBS Journal Club– Machine Learning	20 hr/yr
2023	QBS Journal Club– AI and Placental Histology	20 hr/yr

Lectures:

2020	Introduction to Python (QBS 146)	2 hr/yr
2021	Introduction to Neural Networks (QBS 177)	2 hr/yr
2021	Application of Hierarchical Bayesian Methods to Machine Learning (QBS 122)	3 hr/yr
2021-2022	Machine Learning in Pathology (QBS 110)	3 hr/yr
2021	R Software Packaging (QBS 181)	3 hr/yr
2022	Introduction to Neural Networks (QBS 177)	2 hr/yr
2022	Artificial Intelligence @ Dartmouth Health (ENGS 56)	2 hr/yr

Supervised Teaching:

Graduate Level:

2019	Foundations of Biostatistics (QBS 120)	150 hr/yr
2020-2021	Statistical Learning for Big Data (QBS 177)	150 hr/yr
2021	Hierarchical Bayesian Modeling (QBS 122)	150 hr/yr

Graduate Workshop:

2020	Fundamentals of Bioinformatics and High-Performance Computing	3 hr/yr

C. UNDERGRADUATE MEDICAL EDUCATION:

Medical Student Enrichment Elective:

2023	Introduction to Data Science and Applications	50 hr/yr

D. GRADUATE MEDICAL EDUCATION:

Pathology Residents

2022	Medical Informatics & AI	20 hr/yr

E. MULTIDISCIPLINARY / INTERDEPARTMENTAL:

2021	Mentorship Ethics Discussion Panelist	3 hr/yr

X. RESEARCH ADVISING/MENTORING:

Program Director, EDIT (Emerging Diagnostic and Investigative Technologies)
DPLM's newly established EDIT Lab sponsors highly qualified high school students to participate in a 10-week remote internship exploring research topic in digital pathology, machine learning and statistics. Through a series of lectures, guided projects and IRB supported basic research, students develop algorithms to explore various diagnostic spaces in pathology from cancer detection, to gigapixel image manipulation to text prediction. Undergraduate, Master's and medical students have participated in the ongoing year-round internship program. Joshua Levy and Louis Vaickus manage and organize the internship as Co-PI's. At the end of the 10-week program, internship culminates with a presentation to the DPLM faculty, residents and technical staff. Twenty interns have manuscripts in pre-print and submitted to journals; five have been published. The 2020 internship was so popular that we were able to recruit over 25 new interns for 2021 with many alumni returning to give selected lectures and mentor incoming students. We have run pilot programs for the past 3 years, and last summer, 2022, we had 36 high school students (many from rural NH/VT), who presented at national conferences, participated in science fairs, co-authored academic papers, matriculated to college, and successfully applied for scholarships. Students in the EDIT AI program work as members of existing labs to develop and apply AI technologies across a range of diagnostic methods and medical specialties, from cancer detection and gigapixel image manipulation to text prediction and spatial omics. Students are mentored by biomedical researchers and clinicians and discuss their work with clinical collaborators in a weekly seminar series. They learn to design and pitch projects, to use and develop open-source, reproducible biomedical informatics software, and to work in a team culture that promotes broad collaboration. At the end of the summer, students present in a center-wide poster and presentation session. Mentors meet with students prior to these presentations and students are encouraged to consider how their work would impact "big picture" clinical practices rather than only focusing on computational aspects. Students are challenged to think critically about the successful design of clinically impactful technologies. Our goal is that students' experiences in EDIT AI will continue to shape how they engage project stakeholders both during and after their time at Dartmouth. The EDIT AI program is currently under review at the NIH for a R25 Science Educational Partnership grant (PAR-20-153). Last year's end-of-summer presentation day featuring select student groups can be found here: https://www.youtube.com/watch?v=RCHfBC6jEQk and our virtual conference page is https://editai.conference.levylab.host.dartmouth.edu/ (password: edit2022).

HIGH SCHOOL STUDENTS:

2020 Summer Cohort

2020	Ajay Prabhakar	EDIT Summer Intern	Morphology Hierarchy
2020	Kaien Yang	EDIT Summer Intern	Secure Data Encryption
2020	Richard Zhan	EDIT Summer Intern	Virtual Staining
2020-Present	Sumanth Ratna	EDIT Summer Intern	Segmentation
2020-2021	Harsha Harish	EDIT Summer Intern	Cell/Tissue Clustering
2020-2021	Nishitha Vattikonda	EDIT Summer Intern	Natural Language Processing

2021 Summer Cohort

2021-Present	Sachin Kumar	EDIT Summer Intern	3D Tissue Modeling
2021-Present	Ramya Reddy	EDIT Summer Intern	Morphological-Molecular Alteration
2021-Present	Ram Reddy	EDIT Summer Intern	Morphological-Molecular Alteration
2021-Present	Akshat Alok	EDIT Summer Intern	Omics Deep Staging Models
2021-Present	Zarif Azher	EDIT Summer Intern	Multimodal Integration
2021-Present	Andrew Wang	EDIT Summer Intern	Cellular Hierarchy
2021-Present	Akash Pamal	EDIT Summer Intern	Surgical Cell Modeling
2021-Present	Irfan Nafi	EDIT Summer Intern	Surgical Cell Modeling

2021-Present	Tarushii Goel	EDIT Summer Intern	Surgical Cell Modeling
2021-Present	Abhinav Angirekula	EDIT Summer Intern	Surgical Cell Modeling
2021-Present	Cristian Clewis	EDIT Summer Intern	Tissue Staging Models
2021-Present	Abena Kyereme-Tuah	EDIT Summer Intern	Tissue Staging Models
2021-Present	Sameeksha Garg	EDIT Summer Intern	Tissue Staging Models
2021-Present	Sagar Gupta	EDIT Summer Intern	Omics Deep Staging Models
2021	John Kim	EDIT Summer Intern	3D Tissue Modeling
2021	Aryan Kumawat	EDIT Summer Intern	3D Tissue Modeling
2021	Adnan Murtaza	EDIT Summer Intern	3D Tissue Modeling
2021-Present	Edward Zhang	EDIT Summer Intern	Ink Imputation Histology
2021-Present	Taein Kim	EDIT Summer Intern	Ink Imputation Histology
2021-Present	Nikhil Kalidasu	EDIT Summer Intern	Cell Detection
2021	Mohan Liu	EDIT Summer Intern	Stain Preference
2021-Present	Michael Cheng	EDIT Summer Intern	Cytology Translation

2022 Summer Cohort

2022-Present	Utkarsh Goyal	EDIT Summer Intern	DNAm
2022-Present	Sanjay Jacob	EDIT Summer Intern	CRISPR
2022-Present	Anish Suvarna	EDIT Summer Intern	Mohs
2022-Present	Eric Feng	EDIT Summer Intern	Spatial Omics
2022-Present	Michael Fatemi	EDIT Summer Intern	Spatial Omics
2022-Present	Ananya Gottumukkala	EDIT Summer Intern	Microbiome
2022-Present	Aryaman Khanna	EDIT Summer Intern	Mohs
2022-Present	Ram Vempati	EDIT Summer Intern	Mohs
2022-Present	Nikhil Pesala	EDIT Summer Intern	Mohs
2022-Present	Sameer Gabbita	EDIT Summer Intern	DNAm
2022-Present	Neha Reddy	EDIT Summer Intern	CRISPR
2022-Present	Audhav Durai	EDIT Summer Intern	Mohs
2022-Present	Christal Wang	EDIT Summer Intern	Satellites
2022-Present	UnCheng Leong	EDIT Summer Intern	Virtual Staining
2022-Present	Hyunjae Chung	EDIT Summer Intern	DNAm
2022-Present	Sayan Bhattacharya	EDIT Summer Intern	Satellites
2022-Present	Will Crampton	EDIT Summer Intern	Disease Staging
2022-Present	Amruta Rajeev	EDIT Summer Intern	CRISPR
2022-Present	An Le	EDIT Summer Intern	Satellites
2022-Present	Nancy Hernandez	EDIT Summer Intern	Radiation Oncology
2022-Present	Ananya Pamal	EDIT Summer Intern	Satellites
2022-Present	Rushank Goyal	EDIT Summer Intern	Omics
2022-Present	Charlie Spivak	EDIT Summer Intern	Merkel Cell
2022-Present	Adam Gilbert-Diamond	EDIT Summer Intern	Merkel Cell
2022-Present	Cyril Sharma	EDIT Summer Intern	Spatial Omics
2022-Present	Christopher Perriello	EDIT Summer Intern	Virtual Staining
2022-Present	Sophie Chen	EDIT Summer Intern	Mohs

A. <u>UNDERGRADUATE</u>

Dartmouth College, Hanover NH

2019-Present	Jason Zavras - Presidential Scholar	
		Computational Stain Normalization
		Intra-institutional digital stain preference
2020-Present	Jason McFadden	Evaluation AI Technologies
2021	Osezele Okoruwa	Stain Preference
2021-2022	Jean Yuan	Medical Informatics

2021-2022	Daniel Dong	Medical Informatics
2022-Present	William Chen	Data Evaluation
2022-Present	John Zavras - Presidential Scholar	Spatial Profiling
2022-Present	Sabin Hart	DNA Methylation
2022-Present	Gokul Srinivasan	Dermatology
2022-Present	David Kaufmann	Cancer Immunology
2022-Present	Cinay Dilibal	Medical Informatics
2022-Present	Julia Shen	Placenta

George Mason University

2022-Present	Suchita Hadimani	Image analysis

Middlebury College

2021-Present	Jack Greenburg	Natural Language Processing for CPT Code Billing

University of Michigan

2021-Present	Carly Miles	Medical Informatics

UC Santa Cruz

2022-Present	Bailey Thompson	Medical Informatics

University of New Hampshire

2022-Present	Tess Cronin	Machine Learning Review

Other Institutions

2022	Deepanshu Mody	DNAm Aging
2022	Serin Han	TBD

B. <u>GRADUATE:</u>

2020-Present	Brody McNutt	Master's Student (QBS)	Secure Data Encryption
2020-2022	Julian Gullett	Master's Student (QBS)	Evaluation AI Technologies
2021-Present	Yunrui Lu	Master's Student (QBS)	Natural Language Processing
2021-Present	Uhuru Kamau	Master's Student (QBS)	Natural Language Processing
2021-Present	Shuyang Lu	Master's Student (QBS)	Natural Language Processing
2021-Present	Taylor Hudson	Master's Student (QBS)	CRISPR
2021-Present	Sean McOsker	Master's Student (QBS)	Model Explainability
2022-Present	Natt Chan	Master's Student (QBS)	Pathology
2022-Present	Ojas Ramwala	UWashington/NYU CS PhD	Digital Pathology
2021-Present	Elizabeth Anderson	PhD Student (QBS)	Placenta Histology
2021-2022	Jeff Joseph	PhD Rotation (QBS) & Qual	Spatial Correlations
2022	Peiying Hua	PhD Rotation (QBS)	NLP
2022-Present	Alos Diallo	PhD Rotation (QBS)	Spatial Transcriptomics
2021-Present	Sean Pietrowicz	Master's Student (QBS)	Mental Health
2022-Present	Chenhao Zhao	Master's Student (QBS)	Bayesian Statistics
2022-Present	Matthew Chan	Master's Student (QBS)	Medical Informatics
2022-Present	Bofan Chen	Master's Student (QBS)	Imaging
2022-Present	Digvijay Yadav	Master's Student (QBS)	Surgical Technologies
2022-Present	Ayush Chakraborty	Master's Student (QBS)	NLP
2022-Present	Sunishka Jain	Master's Student (CS)	NLP
2021-Present	Marietta Montivero	Geisel MD PhD Student	Surgical Excision/Dermatology

C. MEDICAL STUDENTS:

2020-2021	Eren Veziroglu	Medical Student	Digital Spatial Profiling
2020-2021	Mustafa Nasir Moin	Medical Student	Digital Spatial Profiling
2022-Present	Raven Bennett	Geisel MD Student	Microbiome
2022-Present	Shahin Shahsavari	Geisel MD Student	Skin Aging
2022-Present	Faraz Farhadi	Geisel MD Student	Orthopedics
2022-Present	Harun Sugito	Geisel MD Student	Orthopedics
2022	Alex Lindqwister	Geisel MD Student	Med AI Education
2022-Present	Angel Moore	Geisel MD Student	Med AI Dermatology
2022-Present	Elizabeth Krogman	Geisel MD Student	Med AI Dermatology
2022-Present	Soo Hwan Park	Geisel MD Student	NLP
2022-Present	Travis Byrum	Geisel MD Student	NLP
2022-Present	Liam Locke	Geisel MD Student	NLP
2022-Present	Nicholas An	Geisel MD Student	Skin Photoaging
2023-Present	Meave Otieno	Geisel MD Student	Cancer Informatics
2018-2021	Christian Haudenschild	Medical Student Minnesota	Federated Data Networks

D. RESIDENTS/FELLOWS:

2019-2021	Robert Hamilton	Pathology Resident/Fellow	Auto-Machine Learning
2019-2021	Chris Jackson	Pathology Resident/Fellow	Virtual Immunofluorescence
2020-2021	Ryan Glass	Pathology Resident/Fellow	Bayesian Cytology Prediction
2022-Present	Abdol Aziz	Prospective Resident	Graph Neural Networks

E. RESEARCH ASSOCIATES:

2018-2021	Jorge Lima	Data Scientist	Pressure Injury Prediction
2020-Present	Max Levis	Assistant Professor	NLP Suicide Risk
2021-Present	Brady Hunt	Data Scientist	Radiation Oncology
2019-Present	Carly Bobak	Data Scientist	Graphs & Networks

F. FACULTY:

2022-Present	Marthony Robins	Medical Physicist	Radiation Oncology

XI. ADVISING / MENTORING:

A. UNDERGRADUATE STUDENTS: N/A

B. GRADUATE STUDENTS:

2020 QBS Student Mentor

2020-2022	Julian Gullett	Master's Student (QBS)	Career Mentoring
2021-Present	Sean Pietrowicz	Master's Student (QBS)	Career Mentoring

2022 QBS Faculty Mentor

2022	Alos Diallo	QBS PhD Student	Career Mentoring
2022	Kevin Rouse	Master's Student (QBS)	Career Mentoring
2022	Anton Hung	Master's Student (QBS)	Career Mentoring
2022	Sukriti Ghosh	Master's Student (QBS)	Career Mentoring
2022	Aislinn Gilmour	Master's Student (QBS)	Career Mentoring
2022	Tianyue Zhou	Master's Student (QBS)	Career Mentoring

C. MEDICAL STUDENTS: N/A

D. RESIDENTS/FELLOWS/RESEARCH ASSOCIATES: N/A

XII. ENGAGEMENT, COMMUNITY SERVICE / EDUCATION:

2015	American Heart Association Advocacy, Advocacy Intern, Oakland, CA
2011-2019	Special Olympics, Head Coach, Walnut Creek, CA
2015-2018	Coaching Corps, King Middle School, Basketball Coach, Berkeley, CA
2015-2018	Coaching Corps Berkeley Chapter Executive Recruitment Coordinator, Berkeley, CA
2015-2017	American Foundation for Suicide Prevention, Outreach Coordinator, Berkeley, CA
2011-2016	Telescope Makers Workshop, Astronomy Docent and Telescope Maker, Mount Diablo Astronomical Society, Berkeley, CA
2015-2018	National Suicide Prevention Lifeline, American Foundation for Suicide Prevention, Oakland, CA
2019	New Hampshire Academy of Sciences Mentor, Lyme, NH
2019	New Hampshire Special Olympics Volunteer, Lyme, NH

XIII. RESEARCH ACTIVITIES:

<u>Present</u>:

2021-	Prouty Grant *CRISPR Targeting of Merkel Cell Polyomavirus*	Levy J (Co-PI)	$50,000
2020-	Prouty Grant *Validation of In-Vivo Imaging* (20%)	LeBeouf M (Co-PI)	$50,000
2021-	Sun Damage Reversal Therapies (COBRE Pilot, P20GM104416)	Levy J (PI)	$80,000
2022-	Dartmouth Hitchcock ORO Capital Investment, *Pathology Advanced Computational Environment*	Levy J (Co-PI)	$250,000
2021-	Richard Baughman Scholar Award	Levy J (PI)	$300,000
2022-	Student Digital Pathology Laboratory 2.0 (Neukom)	Levy J (Co-PI)	$18,000
2022-	Stephen Marsh Tenney, M.D., Medical Student Fellowship Award	Co-Mentor	$30,000
2022-	Burroughs Wellcome Fellowship	Co-Mentor	$60,000
2022-	Conflict Analysis VA Web Intervention: A Whole Health Resource for Rural Veterans	Levy (Site-PI)	DH-$12,000
2022-	R24 Biomedical National Elemental Imaging Resource (BNEIR)	Levy J (Site-PI)	DH-$271,000
2022-	NIGMS P20GM130454 Project Leader: Predicting colon cancer metastasis through spatial molecular characterization of the tumor immune microenvironment	Levy J (PI)	$1,250,000
2022	Informatics Software to Develop Cell-Type Specific Spatial Molecular, Elemental and Histological Signatures Associated with Tumor Metastasis	Levy J (PI)	$60,000
2022	Machine Learning Strategies for Predicting the Risk of Suicide Using Clinical Note Text Department of Defense	$2,000,000 Levy J (Site-PI)	DH-$465,000

<u>Past</u>:

2016	Online Mental Health Education at UC Berkeley	Levy J (Co-PI)	$30,000
2019	Burroughs Wellcome Fund, Big Data Life Sciences Fellow 100% effort	Levy J (PI)	$60,000
2020	I-Corps Business Development (33% effort)	Levy J (Co-PI)	$3,000
2020	COBRE CQB Paper Travel Award	Levy J (PI)	$2,000
2021	Dartmouth Entrepreneurs Startup Competition Finalist (33%)	Levy J (Co-PI)	$5,000
2020-2022	Dartmouth Hitchcock ORO Capital Investment, *QDP-Alpha* (33% effort)	Levy J (Co-PI)	$160,000
2020	Neukom Institute CompX *Virtual Flow Cytometry* (20% effort)	Sriharan A (Co-I)	$40,000
2020	Neukom Institute CompX *Virtual Laboratory for Students* (95% effort)	Levy J (Co-PI)	$25,000
2020	Quantitative Biomedical Sciences, TA Fellowship 100% effort	Levy J (PI)	$5,000
2021	Single Cell Genomics Core Visium Pilot Funds	Levy J (Co-PI)	$10,000
2022	ELLIS Travel Award, EDIT students Ram and Ramya Reddy	Levy J (PI)	$3,000

2021-2022	IDeA States Pediatric Clinical Trials, Biostatistics Consulting	Levy J (Co-I)	$5,000 (directs)
2020-2022	Dartmouth-Hitchcock Department of Psychiatry, Tucker Award	Levis M (Co-I)	$24,000 (directs)
2022	Hitchcock Foundation Pilot, Komal Satti *How Obesity Influences the Immune Repertoire in Children. A Pilot Study*	Levy J (Co-I)	$40,000

Pending:

2022	Opening DOORS to Low-Cost Library Synthesis for CRISPR Off-Target Screening	Levy J (PI)	$40,000
2022	Deep Learning Histomorphological Choriocarcinoma Triage System (American Cancer Society)	Levy J (PI)	$30,000
2022	Development of a crowd peer review platform for transdisciplinary computational research	Levy J (Co-PI)	$40,000
2021	Advancing Clinical Translational Science through Validation of Emerging Diagnostic Artificial Intelligence Technologies	Levy J (PI)	$1,250,000
2022	Machine Learning, NLP, Suicide Prevention	Levis M (Co-I)	$18,000 (directs)
2022	Evaluating choriocarcinoma risk factors in first trimester miscarriages using quantitative deep learning histological assessments of abnormal villous morphology	Levy J (PI)	$30,000
2022	Emerging Diagnostic and Investigative Technologies (EDIT) AI: a virtual summer program for underserved high school students exploring artificial intelligence applications in medicine	Levy J (PI)	$1,250,000
2022	Pre-operative Stereotactic Radiosurgery (SRS) for Brain Metastases with or without Hyperbaric Oxygen (HBO): an Exploratory Molecular Marker Analysis	Levy J (Co-PI)	$100,000
2022	Impact of Phenols on Healthy Placental Growth	Levy J (Site-PI)	$4,000,000
2023	Phase IIa interim analysis of the effects of L-serine in ALS	Levy J (Co-I)	TBD

XIV. PROGRAM DEVELOPMENT:

Aug 2018 – present:
EDIT (Emerging Diagnostic and Investigative Technologies)
Research Program, Department of Pathology and Laboratory Medicine, DHMC, Lebanon, NH

- Investigating emerging diagnostic deep learning technologies: molecular, histopathological, text, and image (Founder EDITor)
- Collaborating with other EDITors to automate diagnostic technologies
- User-centered design and validation.
- Machine-learning arm co-lead, whole genome sequencing
- Internship program co-head: conception, mentorship, skill development

XV. ENTREPRENEURIAL ACTIVITIES:
Related to the design of deep learning techniques for the analysis of whole slide images and high-resolution anorectal manometry devices (ongoing).

- I-Corps Incubator
- Dartmouth Innovations Accelerator
- DRIVEN Accelerator
- Dartmouth Entrepreneurs Startup Competition Finalists
- 3 Patents Pending

XVI. MAJOR COMMITTEE ASSIGNMENTS:
International: N/A

National: **N/A**

Institutional:

2018-2021 Synergy Biostatistics Consultant, Geisel School of Medicine at Dartmouth, Hanover, NH
2022- DCC Trace Element Analysis Core Statistical/Machine Learning Consultant, Hanover, NH
2022- CQB COBRE Project Leader, Hanover, NH
2019-2021 Burroughs Wellcome Fund Fellow, Geisel School of Medicine at Dartmouth, Hanover, NH
2018-2020 Graduate Student Council Executive, Dartmouth College, Hanover, NH
2021- Quantitative Biomedical Sciences Ad-Hoc Reviewer Master's Admission Committee, Hanover, NH
2022- Biostatistics and Bioinformatics Shared Resource Faculty, Hanover, NH
2022- Bioinformatics Curriculum Committee, Quantitative Biomedical Sciences, Hanover, NH
2022 PhD Qualification Exam Committee Chair, Jeff Joseph, Hanover, NH

XVII. MEMBERSHIPS, OFFICE, AND COMMITTEE ASSIGNMENTS IN PROFESSIONAL SOCIETIES:

2017-2019 Artificial Intelligence (AI) Enthusiast Club, Walnut Creek, CA, Founder
2018-2019 QuantBlitz Data Science Club, Hanover, NH, Member
2019 Epidemiology Students Club, Hanover, NH, Member
2020-2021 Natural Language Processing (NLP) Consultant, Department of Psychiatry, Hanover, NH
2019-2020 International Society for Computational Biology and Bioinformatics
2022 Association for Computing Machinery
2021- Quantitative Biomedical Sciences Ad-Hoc Reviewer Master's Admission Committee, Hanover, NH
2022- Dartmouth Cancer Center, Cancer Population Sciences
2022- Dartmouth Cancer Center, Metals in cancer working group
2022- Dartmouth Cancer Center, Biostatistics and Bioinformatics Shared Resource
2022- Quantitative Biomedical Sciences Bioinformatics Curriculum Committee, Hanover, NH

XVIII. EDITORIAL BOARDS:

2021-present Frontiers in Medical Technology Co-Guest Editor
2021-present Cancers Co-Guest Editor

XIX. JOURNAL REFEREE ACTIVITY:

Crohn's and Colitis 360 (x1)
Pacific Symposium on Biocomputing (x3)
BMC Biomedical Medical Research Methodology (x1)
Laboratory Investigation (x2)
PLOS Computational Biology (x3)
Cancer Cytopathology (x1)
Computational Statistics & Data Analysis (x1)
Computerized Medical Imaging and Graphics (x2)
Computer Methods and Programs in Biomedicine (x2)
Clinical Epigenetics (x2)
Journal of Translational Medicine (x1)

Neural Processing Letters (x1)
All Life (x1)
BMC Medical Informatics (x1)
BMC Bioinformatics (x2)
The Lancet (x1)
Nature Communications (x3)
Nature Scientific Reports (x2)
IEEE Journal of Biomedical and Health Informatics (x1)
Bioinformatics (x1)
Frontiers in Education (x2)
Cancers (x2)
Annals of Applied Statistics (x1)
Journal of Medical Artificial Intelligence (x1)
NAR Genomics and Bioinformatics (x1)
Biomolecules (x1)

XX. AWARDS AND HONORS:

2015-2017 UC Berkeley, Dean's List (Fall 2015, Spring 2016)
Honors (All Semesters); Highest Distinction; Cum. GPA: 3.97 / 4.0; Major GPA: 3.98 / 4.0

2020 Geisel School of Medicine at Dartmouth College
Center for Quantitative Biology Travel Award $2,000

2020 BIOSTEC 2020 Comp2Clinic Workshop, Best Paper

2021 Modern Pathology Article Top Pick of January 2021

2022 Guarini School of Graduate and Advanced Studies
Hannah Croasdale Award for academic excellence $1,000

XXI. INVITED PRESENTATIONS:

(*) those presentations to which an individual invitation was extended
(#) those presentations that were meetings where a poster/talk, was presented at a large society meeting)
(^) if the talk/presentation was applicable as a CME activity.

International:

2020 Preliminary Evaluation of Generative Image Translation Technologies for Histopathology
Podium presentation (Best Paper Award), Biomedical Engineering Systems and Technologies (Biostec) 2020 C2C Workshop, Valletta, Malta

2022 Federated Data Networks, *SIGAPP ACM 2022*, Virtual Conference

2022 Multimodal Learning, *SIGAPP ACM 2022*, Virtual Conference

2022 Graph Neural Networks for Lymphocyte Prediction, GeoMedIA Workshop, *MICCAI*, Amsterdam

National

2017 Snapshots of genome evolution and population dynamics in the allopolyploid grass Brachypodium hybridum. Poster, American Society of Plant Biologists (ASPB), Honolulu, HI

2020 PathFlowAI: Scalable Digital Pathology
Pacific Symposium Biocomputing 2020, Kona, HI

2021 Topological Feature Extraction for Whole Slide Images with Graph Neural Networks
Podium Talk, Pacific Symposium Biocomputing 2021, Kona, HI

2021 Digital spatial profiling identifies novel biomarkers for locally invasive tumors, *Association for Molecular Pathology 2021,* Virtual

2022 Mixed effects machine learning on spatially localized immuno-oncology markers for colon metastasis prediction
Pacific Symposium Biocomputing 2022, Kona, HI

Local/Regional

2018 Where are Your Bug's Genes and What do They Do? Workflow Automation and Machine Learning for Gene Annotation and Function. Zymergen, Emeryville, CA & Seattle, WA

2019 Machine Learning Analytics of Pancancer Methylation Microarray and RNA-sequencing Profiles at Susceptibility Loci. Poster, Celebration of Biomedical Research at Dartmouth (CBRaD), Hanover, NH

2019 MethylNet: A Modular Deep Learning Approach to DNA Methylation Prediction
Quantitative Biomedical Sciences: (QBS) Retreat and NCCC Retreat, Hanover NH

2020 PathFlowAI: Scalable Digital Pathology
Dartmouth-Hitchcock Retreat, Hanover NH

2020 Improving Data Representation Software for DNAm and Histopathology,
Research in Progress, QBS, Hanover, NH

2020 Mortality Prediction from Satellite Imagery
Burroughs Wellcome Fellowship, Hanover, NH

2020 Automating the Paris System
Burroughs Wellcome Fellowship, Hanover, NH

2021 Opportunities for Machine Learning Research in Pathology and Dermatology
Department of Dermatology, Hanover, NH

2021 Introduction to Neural Networks, Guest Lecture for QBS Class, Hanover NH

2021 Application of Hierarchical Bayesian Methods for Medical Artificial Intelligence, Guest Lecture for QBS Class, Hanover NH

2021 Uncertainty in Disease Staging, Research in Progress, QBS, Hanover NH

2021 Emerging Diagnostic and Investigative Technologies: Validation of Deep Learning Technologies for DNA Methylation and Histopathology, Thesis Seminar Talk, Hanover NH

2021 Emerging Machine Learning Methods in Digital Pathology, EDIT Seminar Talk, Hanover NH

2021 Opportunities for Machine Learning Research in Pathology, QBS, Hanover NH

2021 R Software Packaging, Guest Lecture for QBS Class, Hanover NH

2021 Research Overview, Department of Epidemiology, Hanover NH

2021 Mixed effects machine learning on spatially localized immuno-oncology markers for colon metastasis prediction, NCCC Retreat, Lebanon NH

2022 Introduction to Machine Learning and Research Opportunities in Pathology and Dermatology, Geisel School of Medicine Medical Student AI Interest Group, Lebanon NH

2022 Rapid 100% Margin Assessment through AI in the Surgical Pathology Setting, Melanoma Retreat, DHMC, Lebanon NH

2022 EDIT Machine Learning Internship Program, Dermatology Research Night, DHMC, Lebanon NH

2022 Introduction to Neural Networks, Guest Lecture for QBS177 Class, Hanover NH

2022 Advancing Clinical Translational Sciences through Validation of Emerging Artificial Intelligence Technologies, Cancer Population Sciences, Hanover NH

2022 Medical AI Opportunities, Oakland Tech, Oakland CA

2022 Artificial Intelligence @ Dartmouth Health, Guest Lecture for ENGS 56, Thayer School of Engineering, Hanover NH

2022 Virtual QBS Master's Capstone Conference, QBS, Hanover NH

2022 Virtual EDIT AI Conference, DHMC, Hanover NH

2022 EDIT: Advancing Clinical Translational Sciences through Validation of Emerging AI Technologies, QBS, Hanover NH

XXII. BIBLIOGRAPHY:

A. Peer-reviewed publications in print or other media

PhD Thesis:

1. **Levy J.** Emerging Diagnostic and Investigative Technologies: Validation of Deep Learning Technologies for DNA Methylation and Histopathology. 2021

Reviews:

1. **Levy J**, Vaickus L. Applications of AI in Anatomic Pathology. *Advances in Molecular Pathology,* 2021

Book Chapters:

1. **Levy J**, Vaickus L. Applications of AI in Molecular Pathology. *Diagnostic Molecular Pathology,* 2023

Original articles:

1. **Levy J**, Titus A, Salas L, Christensen B. PyMethylProcess - convenient high-throughput preprocessing workflow for DNA methylation data. Bioinformatics. 2019.

2. **Co-first:** *Gordon SP, * **Levy J**, Vogel JP. PolyCRACKER, a robust method for the unsupervised partitioning of polyploid subgenomes by signatures of repetitive DNA evolution. BMC Genomics. 2019.

3. **Levy J**, Titus AJ, Petersen CL, Chen Y, Salas LA, Christensen BC. MethylNet: An Automated and Modular Deep Learning Approach for DNA Methylation Analysis. BMC Bioinformatics. 2020.

4. **Levy J**, Salas LA, Christensen BC, Sriharan A, Vaickus LJ. PathFlowAI: A High-Throughput Workflow for Preprocessing, Deep Learning and Interpretation in Digital Pathology. Pacific Symposium on Biocomputing, 2020;25:403–14.

5. **Levy J**, O'Malley AJ. Don't Dismiss Logistic Regression: The Case for Sensible Extraction of Interactions in the Era of Machine Learning. BMC Medical Research Methodology. 2020.

6. **Levy J**, et al. Preliminary Evaluation of the Utility of Deep Generative Histopathology Image Translation at a Mid-Sized NCI Cancer Center. Proceedings of the 13th International Joint Conference on Biomedical Engineering Systems and Technologies (BIOSTEC 2020) - Volume 3: BIOINFORMATICS

7. **Levy J**, et. al. Topological Feature Extraction of Whole Slide Images with Graph Neural Networks. Pacific Symposium on Biocomputing. 2021.

8. **Levy J**, et. al. A Large-Scale Internal Validation Study of Unsupervised Virtual Trichrome Staining Technologies on Non-alcoholic Steatohepatitis Liver Biopsies. Modern Pathology, 2021

9. **Levy J**, Chen Y, et al. Biologically Motivated Organization of DNAm Neural Networks, Inspired by Capsule Networks, NPJSBA, 2021.

10. **Levy J**, et. al. Journey across Epidemiology's Third Variables: An Anesthesiologist's Guide for Successfully Navigating Confounding, Mediation, and Effect Modification. BMJ RAPM, 2021.

11. **Levy J**, Lebeaux, R. M., Hoen, A. G., et al. Using Satellite Images and Deep Learning to Identify Associations Between County-Level Mortality and Residential Neighborhood Features Proximal to Schools: A Cross-Sectional Study. Frontiers in Public Health 9, 1652 (2021).

12. **Levy J**, Bobak C, et. al. Mixed Effects Machine Learning Models for Colon Cancer Metastasis Prediction using Spatially Localized Immuno-Oncology Markers. Pacific Symposium on Biocomputing. 2022.

13. **Levy, J.,** Vattikonda, N., Haudenschild, C., Christensen, B. & Vaickus, L. Comparison of Machine Learning Algorithms for the Prediction of Current Procedural Terminology (CPT) Codes from Pathology Reports. *Journal of Pathology Informatics* (2022)

14. Co-first: *Kelliher, M., ***Levy, J.,** *Nerenz, R., *et.al.* Comparison of Symptoms and Antibody Response Following Administration of Moderna or Pfizer SARS-CoV-2 Vaccines. *Archives of Pathology & Laboratory Medicine* (2022).

15. **Levy, J. J.** et al. Machine Learning Approaches for Hospital Acquired Pressure Injuries: A Retrospective Study of Electronic Medical Records. Frontiers in Medical Technology 4, (2022).

16. **Levy J**, et. al. *Uncovering Additional Predictors of Urothelial Carcinoma from Voided Urothelial Cell Clusters Through a Deep Learning Based Image Preprocessing Technique*. Cancer Cytopathology 2022.

17. **Levy J**, et. al. Large-Scale Longitudinal Comparison of Urine Cytological Classification Systems Reveals Potential Early Adoption of The Paris System Criteria. *Journal of the American Society of Cytopathology* 2022.

18. **Levy J**, et. al. Video-Based Deep Learning to Detect Dyssynergic Defecation with 3D High-Definition Anorectal Manometry. *Digestive Diseases and Sciences*, 2022

19. **Levy J**, Vaickus L. Virtual Staining. *Pathology Outlines* (2022).

20. **Levy J**, et. al. Artificial Intelligence, Bioinformatics, and Pathology: Emerging Trends Part I– An Introduction to Machine Learning Technologies. *Diagnostic Molecular Pathology (2023).*

21. **Levy J**, et. al. Artificial Intelligence, Bioinformatics, and Pathology: Emerging Trends Part II– Current Applications in Anatomic and Molecular Pathology. *Diagnostic Molecular Pathology (2023).*

22. **Levy J**, et. al. Identification of Spatial Proteomic Signatures of Colon Tumor Metastasis using the Digital Spatial Profiler. *The American Journal of Pathology* (2023).

23. Azher, Z. L., Vaickus, L. J., Salas, L. A., Christensen, B. C. & **Levy, J. J.** *Development of Biologically Interpretable Multimodal Deep Learning Model for Cancer Prognosis Prediction*. ACM/SIGAPP SAC 2022.

24. Haudenschild, C., Vaickus, L. & **Levy, J.** *Configuring a federated network of real-world patient health data for multimodal deep learning prediction of health outcomes*. 2021. ACM/SIGAPP SAC 2022.

25. Reddy R*, Reddy R*, …, **Levy J.** Graph Neural Networks Ameliorate Potential Impacts of Imprecise Large-Scale Autonomous Immunofluorescence Labeling of Immune Cells on Whole Slide Images, *Proceedings of Machine Learning Research* (2022)

26. Farhadi F, …, **Levy J**. Applications of Artificial Intelligence in Orthopaedic Surgery. *Frontiers in Medical Technology (2022).*

27. Greenburg J, …, **Levy J**. Development of an Interactive Web Dashboard to Facilitate the Reexamination of Pathology Reports for Instances of Underbilling of CPT Codes. *Pathology Informatics (2022)*

28. Copeland-Halperin L, Reategui M, **Levy J**, et al. Does the Timing of Postoperative Showering Impact Infection Rates? A Systematic Review and Meta-Analysis. JPRAS. 2020.

29. Gordon SP, Moreira BC, **Levy J**, et. al. Gradual polyploid genome evolution revealed by a pan-genomic analysis of Brachypodium hybridum and its diploid progenitors. Nature Comm. 2020.

30. Brady R, **Levy J**, et. al. The mediating effects of perceived vulnerability to disease in the relation between disgust and contamination-based OCD. J Anxiety Disord. 2021

31. Copeland-Halperin L, Reategui M, **Levy J**, et. al. MRI Screening after Silicone Implant-based Breast Surgery: A Survey of Patient Awareness of and Adherence with FDA Recommendation. *Plastic and Reconstructive Surgery*. 2022

32. Glass, R. E., Marotti, J. D., Kerr, D. A., …, **Levy, J. J.**, et al. Using molecular testing to improve the management of thyroid nodules with indeterminate cytology: an institutional experience with review of molecular alterations. Journal of the American Society of Cytopathology (2021).

33. Glass, R. E., **Levy, J. J.,** Motanagh, S. A., et al. Atypia of undetermined significance in thyroid cytology: Nuclear atypia and architectural atypia are associated with different molecular alterations and risks of malignancy. Cancer Cytopathology 129, 966–972 (2021).

34. Azizgolshani, N., Petersen, C. L., Chen, Y., **Levy, J.J.,** et al. DNA 5-hydroxymethylcytosine in pediatric central nervous system tumors may impact tumor classification and is a positive prognostic marker. Clinical Epigenetics (2021).

35. Torres, V., Hodge, S., Chen, E., **Levy, J.** & Vaickus, L. Rapid tumor margin analysis using paired-agent imaging to guide Mohs micrographic surgery. in *Proc. of SPIE Vol* vol. 11943 1194304–1 (2022)

36. Torres, V., Hodge, S., Chen, E., **Levy, J.** & Vaickus, L. Whole-Tissue Margin Evaluation for Mohs Surgery Using Paired-Agent Imaging. *Optica Biophotonics Congress: Optics in the Life Sciences (2023)*

37. Lindqwister A, …, **Levy J,** Sin J. AI-RADS: Successes and Challenges of a Novel Artificial Intelligence Curriculum for Radiologists Across Different Delivery Formats. *Frontiers in Medical Technology (2022).*

38. Ondrasik R, **Levy J**, et. al. Passive Order Auditing Associated with Reductions in Red Blood Cell Utilization. National Blood Shortage Experience. *Transfusion* (2022).

39. Levis M, **Levy J**, et. al. Leveraging unstructured electronic medical record notes to derive population-specific suicide risk models. *Psychiatry Research* (2022).

40. Levis M, **Levy J**, et. al. Leveraging Natural Language Processing to Improve Electronic Health Record Suicide Risk Prediction. *Journal of Clinical Psychiatry (2022)*

41. Levis M, **Levy J**, et. al. Dynamic Suicide Topic Modeling: Deriving population-specific, psychosocial, and time-sensitive suicide risk variables from EHR psychotherapy notes. *Clinical Psychology & Psychotherapy* (2023)

42. Copeland-Halperin L, Reategui M, **Levy J**, et. al. A Systematic Review and Meta-Analysis of Factors Pertaining to Gastronomy Tube Placement. *Journal of Reconstructive Microsurgery Open* 2022.

43. Hong J, Quon R, Song Y, Xie T, **Levy J**, et. al. Seizure onset in the supplementary motor area drives re-mapping of the mesial frontal motor areas. *Neurosurgery* 2022.

44. Copeland-Halperin L, Reategui M, **Levy J**, et. al. Predictors of Gastrostomy Tube Placement in Head and Neck Cancer Patients at a Rural Tertiary Care Hospital. *Journal of Reconstructive Microsurgery Open 2022*.

45. Kerr D, Goyette E, **Levy J**, et. al. Utility of Retrospective Molecular Analysis in the Diagnosis of Problematic Mesenchymal Neoplasms. *International Journal of Surgical Pathology. 2022.*

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1. **Levy J**, et. al. Pathflow-MixMatch for Whole Slide Image Registration: An Investigation of a Segment-Based Scalable Image Registration Method

2. **Levy J**, et. al. GCN4R: Latent Position of Actors in Social Networks with Graph Neural Networks

3. **Levy J**, Bobak C, et. al. Bridge Category Models: Development of Bayesian Modelling Procedures to Account for Bridge Ordinal Ratings for Disease Staging

4. **Levy J**, Bobak C, et. al. Application of Hierarchical Bayesian Bridge Modeling Approaches for Estimating Inter-Rater Variability in Fibrosis Staging

5. **Levy J**, Bobak C, et. al. An Improvement to the Virtual Trichrome Assessment through Bridge Category Models

6. **Levy J**, LeBoeuf M, Christensen C, Vaickus L. ArcticAI: A Deep Learning Platform for Rapid and Accurate Histological Assessment of Intraoperative Tumor Margins

7. **Levy J**, et. al. Large scale retrospective validation study of Autoparis for bladder cancer screening from urine cytology specimens

8. **Levy J**, et. al. Examining longitudinal markers of bladder cancer recurrence through a semi-autonomous machine learning system for quantifying specimen atypia from urine cytology

9. **Levy J**, et. al. PathologyOutlines Automated Assessment of Cytology Specimen

10. McNutt B, …, **Levy J**. Federated Learning for Multicenter Collaborations of Small Biomedical Research Institutions: A Framework for Navigating Challenges and Realizing Opportunities

11. Fatemi M, …, **Levy J**. Inferring Spatially Resolved Transcriptomics Data from Whole Slide Images for the Assessment of Colorectal Tumor Metastasis: A Feasibility Study

12. Ahzer Z, …, **Levy J**. Assessment of Emerging Pretraining Strategies in Interpretable Multimodal Deep Learning for Cancer Prognostication

13. Bobak C, …, **Levy J**, et. al.. GRANDPA: GeneRAtive Networks using Degree and Property Augmentation for the simulation and generation of privacy-preserving healthcare networks

14. Zheng Z, **Levy J**, et. al. Hierarchical Primary Site Inference Leveraging DNA Methylation

15. Farrel K, **Levy J**, et. al. Vaginal Birth after Cesarean in Northern New England: Adoption and Impact of a Regional Guideline

16. Kranyk A, … **Levy J,** et al. Alopecia Areata and Thyroid Screening in Down Syndrome: Leveraging Epic Cosmos Dataset

17. Montagnese B, **Levy J**, et al., Machine learning prediction of neurocognitive deficits using central auditory tests

Select manuscripts in preparation:

1. **Levy J**, et. al. HistoBayes: An Interactive Web Application for Bayesian Deep Learning on Histopathology, with Applications in Cytopathology
2. **Levy J**, et. al. Hyperbolic MethylMaps: Hyperbolic Embeddings Pseudotime Bulk DNA Methylation
3. **Levy J**, et. al. InteractMethylXtract: Random Forest Selected DNA Methylation Interactions
4. **Levy J**, Haudenschild C, et. al. MetaCRACKER: Deep Clustering of Metagenomic Reads
5. **Levy J**, LeBoeuf M, Christensen C, Vaickus L. Quantitative machine learning method to assess the quality of frozen specimens during intraoperative margin assessments
6. **Levy J**, LeBoeuf M, Christensen C, Vaickus L. Deep learning approach for intraoperative margin assessment for Mohs micrographic resection of squamous cell carcinoma tumors
7. Chacko R***, Levy J***, LeBoeuf M. Integration of a deep learning basal cell carcinoma detection and tumor mapping algorithm into the Mohs micrographic surgery workflow: a simulated, retrospective study
8. **Levy J**, Christensen C, Vaickus L, Shah E. Multicenter Prospective Validation of Anorectal Manometry AI Technologies
9. **Levy J** *, Ratna S*, et al. PyNuclei: A Software Framework for Nuclei Segmentation

10. **Levy J** *, Harish H*, et al. DeepCellCluster: A Software Framework for Nuclei Clustering
11. **Levy J**, Glaser A, et. al. DNA Methylation Brain Cell-Type Adjustment and Meta-Analysis Reveals Important Markers of Huntington's Disease
12. **Levy J**, et. al. Turing Test 2.0: Improving Clinical Applicability of Visual Inspection of Virtual Staining Technologies
13. **Levy J**, et. al. On the Potential for Selection Bias using Digital Spatial Profiling Technologies
14. **Levy J**, et. al. PathologyOutlines Application of Graph Neural Networks To Whole Slide Images
15. **Levy J**, et. al. PathologyOutlines Artificial Intelligence
16. **Levy J**, et. al. PathologyOutlines Computational Methods for Molecular Pathology
17. **Levy J**, et. al. Perspectives on Technology and Stakeholder Readiness Stress Testing
18. **Levy J**, et. al. Impact of Travel Distance to Nearest Clinic on Health Outcomes for Patients with Cutaneous Squamous Cell Carcinomas
19. **Levy J**, et. al. Impact of Autostaining on Spatial Transcriptomics Assays
20. **Levy J**, et. al. A Deep Learning Assessment of the CytAssist Spatial Transcriptomics Platform
21. **Levy J**, et. al. Impact of H&E Staining on Spatial Elemental Mapping
22. **Levy J**, et. al. Co-registration tool for Spatial Elemental Mapping
23. **Levy J**, et. al. Statistical Analysis Platform for Multimodal Spatial Elemental Mapping
24. Anderson E, …, **Levy J**. Quantitative Deep Learning Approach to Assess Risk of Choriocarcinoma from Products of Conception
25. Cronin T, …, **Levy J**. Machine Learning Approaches to Develop Quantitative Histomorphological Placental Signatures of Abnormal Fetal Development: A Comprehensive Review
26. Pietrowicz S, …, **Levy J**. EDIT AI: Internal Evaluation of Pilot Remote Machine Learning and Healthcare High School Internship Program
27. Pietrowicz S, …, **Levy J**. Mitigating Bias In AI-Augmented Clinical Decision Making by Diversifying the STEM Workforce through Engaging Students from Underserved Backgrounds through a Remote Instruction Model
28. Hunt B, …, **Levy J**. Development of a Cell Phone Fluorescence Assessment Hardware for Examining Photocarcinogenesis
29. McFadden J, …, **Levy J**. A Survey on Cell Phone Technologies Outfitted to Study Fluorescence Spectra
30. Lu Y, …, **Levy J**. Comparison of Deep Learning Approaches for Various Natural Language Processing Tasks on Pathology Reports
31. Lu Y, …, **Levy J**. Position paper on the role of generative modeling on scientific communication
32. Lu S, …, **Levy J**. Resident education progression through natural language processing
33. Lu Y, …, **Levy J**. Case report evaluation through generative modeling: a single-institution experience
34. Lu Y, …, **Levy J**. Generative text modeling of pathologist case reports: how well do you know your colleagues?
35. Hudson T, …, **Levy J**. Degenerate Oligo Optimization with Randomized Synthesis for Low-Cost Library Synthesis for CRISPR Off-Target Screening
36. Hudson T, …, **Levy J**. Validating DOORS for Off-Target Screening In-Vitro via the OneSeq Assay
37. Hudson T, …, **Levy J**. A Method to Leverage Degenerate Oligo Design for Optimizing CRISPR Guide-Enzyme Pairs
38. Gilbert-Diamond A, …, **Levy J**. In Silico Design of Merkel Cell Polyomavirus CRISPR Guides to Inhibit Merkel Cell Carcinoma
39. Montivero M, …, **Levy J**. Development of a Deep Learning Approach for Cervical Cancer Screening of Pap Smears in Honduras
40. Miles C, …, **Levy J**. A Machine Learning Approach to Quantify Atypia for Thyroid Cancer Cytopathology
41. Miles C, …, **Levy J**. Deep Learning Automated Assessment of Thyroid Nodules Improves Evaluation of Atypical Specimens
42. Srinivasan G, …, **Levy J.** Systematic Review for HAM10000 Dataset
43. Srinivasan G, …, **Levy J.** A Novel Augmentation Approach for Multiclass Dermatological Image Classification
44. McOsker S, …, **Levy J**. Data Valuation of Graph Structured Data in Pathology

45. Kamau U, …, **Levy J**. Natural Language Processing Evaluation of Dynamic Topics Corroborates Changing Bladder Cancer Screening Practices in Response to Introduction of Paris System Criteria
46. Goel T, …, **Levy J**. Point2Cell: Efficient Augmentation of Cell Detection Datasets with Point Annotations, with application to Mohs Surgery
47. Goel T, …, **Levy J**. Exploring effective cell graph neural network training strategies for high resolution real-time intraoperative histological margin assessment
48. Goel T, …, **Levy J**. Expert in the Loop Approach for Rapid Curation of Nuclei Detection Annotations with Applications to Mohs Surgery
49. Zhao B, …, **Levy J.** Software to Extract Interactions from Bayesian Additive Regression Trees for use in Bayesian Hierarchical Regression Models
50. Lu Y, …, **Levy J**. Molecular Genomics Quality Control through Tumor Purity Estimation
51. Lu Y, …, **Levy J**. Tumor Cell Prediction is Improved through Immunofluorescence Tagging and Graph Neural Networks
52. Hamilton R, …, **Levy J**. Dendrite: An NLP Database for Facilitating Structured Querying of Pathology Reports
53. Cheng M, …, **Levy J**. Deep Learning Appraisal of Hirschsprung's disease
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55. Suvarna A, …, **Levy J**. Development of Cell Phone Application for Intraoperative Tissue Grossing
56. Fatemi M, …, **Levy J**. Large Scale Evaluation of RNA Inference Model to Assess Colorectal Tumor Metastasis
57. Sharma C, …, **Levy J**. Cell-Graph Neural Networks for Colorectal Cancer RNA Inference
58. Hart S, …, **Levy J**. Disentanglement of Tumor Immune Microenvironment for Colorectal Tumor Metastasis with DNA Methylation
59. McNutt B, …, **Levy J**. Formation of a Federated Learning Working Group for Digital Pathology Applications
60. McNutt B, …, **Levy J**. HistoCrypt: A Federated Learning Platform for Pathology
61. Gullet J, …, **Levy J**. Review and Tutorial of Hierarchical Bayesian Analyses in Pathology and Potential Machine Learning Applications
62. Ahzer Z, …, **Levy J**. Self-supervised Cross-Modal Spatial Pretraining using Spatial Transcriptomics and Whole Slide Images
63. Ratna S, …, **Levy J**. Graph Neural Networks for Staging NASH
64. Ramwala O, …, **Levy J**. Improvements in Virtual Trichrome Staining through Contextual Feature Mining
65. Zavras J, …, **Levy J.** Impact of Stain Normalization on Deep Learning Models
66. Zhang E, …, **Levy J**. Green Ink Imputation with Graph Neural Networks
67. Greenburg J, …, **Levy J**. Pressure Injury Prediction using Time-Stamped EHR Datasets
68. Chen J, …, **Levy J**. Bladder Cancer Survival Elucidated through DNA Methylation and Whole Slide Images
69. Zheng Z, **Levy J**, et. al. Cell Type Independent Clock Leveraging DNA Methylation
70. Zheng Z, …, **Levy J.** Cell Type Dependent Clock Leveraging DNA Methylation
71. Jackson C, **Levy J**, et. al. Smartphone Deployment of Neural Network Ki-67 Interpretation Tool
72. Levis M, **Levy J**, et. al. Dynamic Topic Models Predictive of Suicide Risk for Veterans
73. Emeny R, …, **Levy J**, et. al. Burbank Study: Maternal Self-Reported Depressive Symptoms and Infant Outcomes in Times of COVID-19
74. Satti K, …, **Levy J**, et. al. Inflammatory Markers Predictive of Changes in BMI in a Pediatric Cohort
75. Satti K, …, **Levy J**, et. al. The Relationship between BMI and Inflammation is Modified through Vitamin D Intake
76. Satti K, …, **Levy J**, et. al. The Relationship between Pediatric BMI, Microbiome Community Composition, T Cell Repertoire
77. Carter J, …, **Levy J**, et. al. Impact of Electrodessication and Curettage for Treating Moderately Differentiated Cutaneous Squamous Cell Carcinomas

78. Kerr D, Goyette E, **Levy J**, et. al. Decalcification Protocol with Optimal Timing and Maximal Tissue Preservation for High-Quality Histologic Examination and Molecular Analysis
79. Kerr D, Goyette E, **Levy J**, et. al. Digital Spatial Profiling Reveals Signatures of Dupuytren Treatment
80. Romero A**, Levy J,** et. al. Platelet Age is Not Associated with Increased Transfusion Reaction Rates
81. Coconubo D**, Levy J,** et. al. Molecular Testing Results as a Quality Metric in Thyroid AUS Cases
82. Salem I, …, **Levy J**, et. al. PpIX measurements study
83. Hamilton R, …, **Levy J**. AutoML: Investigation of Neural Architecture Search Methods for Digital Pathology Classification Systems
84. Hamilton R, …, **Levy J**, Vaickus L. Signet Ring Cell Carcinoma Evaluation through Deep Learning Approach
85. Dunkle A, **Levy J**, et. al. Influenza Test Positivity Rates From 2019-2020 with the Onset of Social Distancing Due To COVID
86. Glass R, **Levy J**, et. al. Comparing NC Ratios between Eyeball and Diameter-Based Measurements
87. Greene C, ..., **Levy J**. Opportunities and obstacles for deep learning in biology and medicine, 2nd update.

Internal Report:

1. **Levy J.** Interim analysis– A Phase IIa study of the effects of L-serine in Patients with Amyotrophic Lateral Sclerosis: A Phase II Study

Letters to the Editor: N/A

B. Other scholarly work in print or other media including editorially-reviewed publications (e.g., Op-Ed pieces, Letters to the Editor), print resources (e.g., workshops) and electronic resources (e.g., MOOCs, educational websites, modules, videos, virtual patients): N/A

C. Abstracts:

Presented at National Meetings:

1. Glass R, **Levy J**, et. al. Atypia of Undetermined Significance in Thyroid Cytology: Nuclear and Architectural Atypia are Associated with Different Molecular Alterations and Risks of Malignancy (abstract)
2. Glass R, **Levy J**, et. al. Utilizing molecular testing to improve the management of thyroid nodules with indeterminate cytology: an institutional experience (abstract)
3. Copeland-Halperin L, … **Levy J,** … et. al. Oral Cancer Patients Undergoing Resection with Free Flap Reconstruction: Predictors of Gastrostomy Tube Placement, *STARS* 2021
4. Stewart T, …, **Levy J**, … et. al. Predictors of Gastronomy Tube Placement for Patients Undergoing Resection of Head and Neck Cancer with Flap-based Reconstruction: Protocol for Systematic Review and Meta-Analysis. *ACSVT* 2021
5. Copeland-Halperin L, …, **Levy J,** …, et.al. Indications for Gastrostomy Tube Placement in Oral Cancer Patients Undergoing Resection with Immediate Free Flap Reconstruction. *AHNS* 2021
6. Copeland-Halperin L, …, **Levy J,** …, et.al. Does the Timing of Postoperative Showering Impact Infection and Complication Rates? *NESPRS* 2020
7. Barney RE, Palisoul SM, **Levy J**, Vaickus LJ, Lin CC, Tsongalis GJ, Zanazzi G. Digital Spatial Profiling Identifies Novel Biomarkers for Locally Invasive Tumors. J Molec Diagn 2021;23, 1648 (TT31)
8. Satti, K, **Levy, J**, et al. Effect of Vitamin D on the Relationship Between TNF-α and BMI. Pediatric Academic Societies (PAS) 2022 Meeting
9. Jackson C, **Levy J**, Liu X, Vaickus L. Smartphone deployment of neural network Ki67 interpretation tool USCAP (2022)
10. Levis M, **Levy J**, et al. Machine Learning and Natural Language Processing for Suicide Risk Prevention Amongst US Veterans (2022)
11. Salem I, … **Levy J,** et al. Portable Measurement of Cutaneous Protoporphyrin IX-Associated Fluorescence Intensity at Baseline, *Maui Derm 2023*

Presented at Local Meetings:

1. Farrel K, **Levy J**, et. al. Vaginal Birth After Cesarean Section in Northern New England: Assessing the Adoption and Impact of Regional Guidelines, Dartmouth Hitchcock Medical Center, Lebanon, NH
2. Catalan P, …, Gordon S, **Levy J**, et. al. Integrative Genomic Characterization of the Brachypodium Polyploid Model to Unravel Bases of Success of Polyploidy in Flowering Plants, DOE JGI, Berkeley, CA
3. Chen Y, **Levy J**, et. al., Machine Learning Analytics of Pan-cancer Methylation Microarray and RNA-sequencing Profiles at Susceptibility Loci, CBRaD 2019
4. Jackson C, **Levy J**, Liu X, Vaickus L. Smartphone deployment of neural network Ki67 interpretation tool Mass General Brigham Research Poster (2022)

Other:

1. Chen Y, … **Levy J**, et.al. Radiomics analysis on the molecular targeted fluorescence image provides precise tumor mapping for surgery guidance of head and neck cancer. Frontiers in Medical Technology 2022.

D. Conference Session Chair:

Conference Sessions in Preparation / Under Review:

1. Carly A. Bobak, Courtney T. Schiebout, Sean McOsker, Yifan Zhao, Samuel Lefkowitz, Brady Hunt, Derek Williamson, Joseph Romano, Kristine A. Giffin, Christian Darabos, **Joshua Levy**, Jason H. Moore, Dennis P. Wall. *HUMAN INTRIGUE: BIG QUESTIONS WITH BIG DATA*
2. Samuel Lefkowitz, **Joshua Levy**, Carly A. Bobak. Biological and Medical Applications of Networks and Graph Theory
3. Carly A. Bobak, Courtney T. Schiebout, Sean McOsker, Yifan Zhao, Samuel Lefkowitz, Brady Hunt, Kristine A. Giffin, **Joshua Levy**, and Christian Darabos. STORYTELLING WITH DATA SCIENCE

XXIII. Personal Statement:

My formal background and training are in Physics and Quantitative Biomedical Sciences, the latter of which is an interdisciplinary data science discipline at the intersection of Epidemiology, Biostatistics and Bioinformatics. My experience in Physics motivated me to think abstractly about how information could be represented using n-dimensional objects, which has been of great benefit as my research shifted towards applied machine learning. Prior to my PhD training, I learned to develop, implement, and deploy over one hundred sophisticated reproducible, containerized genomics and bioinformatics workflows at scale in High Performance Computing (HPC) computing environments as a software developer/engineer at both the Lawrence Berkeley National Labs and Zymergen, which instilled in me a mindset of doing public good through high throughput computations. My motivations for my recent career aspirations originated through my work in the San Francisco Department of Public Health (SFDPH), where I witnessed first-hand some of the many challenges associated with implementing new digital technologies in a healthcare setting which was, at times, averse to change and frustrations on behalf of the stakeholders. This inspired me to think more critically about how to engage stakeholders, and now that I am in a position to develop and implement these novel biomedical technologies, I have taken these principles to heart by directly integrating with the stakeholders which I aim to benefit. I served as a Burroughs Wellcome Fellow, which enabled me to build closer relationships with the Department of Pathology.

Currently, I serve as an Assistant Professor of the Departments of Pathology and Laboratory Medicine, and Dermatology, an Adjunct Professor of Epidemiology, and faculty in the Quantitative Biomedical Sciences Graduate program and Biostatistics and Bioinformatics Shared Resource (Dartmouth Cancer Center). I am one of the founders and the co-director of the Machine Learning arm of the Emerging Diagnostic and Investigative Technologies (EDIT) program. My research group (https://levylab.host.dartmouth.edu/) aims to justify the use of digital pathology technologies by developing and validating machine learning technologies and envisioning how they would fit into the clinical workflow. As such, I am in an optimal position to develop and implement digital pathology technologies through effective stakeholder engagement. To this end, my doctoral work centered around creating standardized, high throughput, open-source software to enable domain experts to extract key insights from two high dimensional data types, DNA Methylation (DNAm) and histopathological

data, while validating emerging technologies which could provide immediate benefit to the end user, such as processes to virtually stain tissue to obviate the need for chemical tissue staining. My research group's aims extend beyond these original objectives to include new aims such as: 1) integration of hierarchical Bayesian statistical methodologies with machine learning technologies to provide fair assessments of digital pathology technologies, 2) further methods development and validation of spatial omics technologies, with 3) applications to further understanding of disease pathogenesis and epidemiology. My lab is also developing health informatics technologies that integrate multiple biomedical data modalities, from natural language processing to temporally captured diagnostic codes and lab measurements. I am committed to the vision of creating a self-sufficient digital pathology program in EDIT through building an independent research lab composed of researchers with diverse, interdisciplinary skillsets. My mentorship experience to date includes launching a year-round national internship program which has run successfully for three years. I have directly mentored 55 high school, 14 undergraduate, 15 Master's, 13 medical students, and 4 pathology resident fellows, and am taking on PhD rotation students (4 rotation students and 1 MD PhD student). I am currently mentoring one PhD student through the Burroughs Wellcome Fund for their dissertation work to study molecular and histological markers of healthy fetal development. Recently, I was awarded the Hannah T. Croasdale award for academic excellence, which was given based on a "sense of social responsibility to the community of scholars".

I am a member of the Cancer Population Sciences Program, which prides itself on interdisciplinary collaboration amongst basic and physician science researchers, broadly covering the identification of precancerous exposures and somatic alterations elucidated through environmental and molecular epidemiology, using data from translational research to inform our understanding of disease processes and iteratively refine translational work, to the implementation and dissemination of key findings. The research aims of my lab are optimally aligned with these pursuits– my lab is chiefly focused on tackling public health challenges through high throughput computation and building an understanding of which technologies are optimally aligned with stakeholders and thus likely to have a positive impact on the greater community.

Updated by:

Date: