BIOGRAPHICAL SKETCH

NAME: Silverstein, Jonathan Charles

eRA COMMONS USER NAME (credential, e.g., agency login): JCSilverstein

POSITION TITLE: Chief Research Informatics Officer and Professor, Department of Biomedical Informatics

EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)

| INSTITUTION AND LOCATION | DEGREE  (if applicable) | Completion Date  MM/YYYY | FIELD OF STUDY |
| --- | --- | --- | --- |
| University of Illinois at Urbana-Champaign | BS | 05/86 | Microbiology |
| Washington University Medical School, St. Louis | MD | 05/90 | Medicine/Surgery |
| Washington University Informatics Lab, St. Louis |  | 05/91 | Informatics |
| Rush-Presbyterian-St. Luke’s, Chicago |  | 05/96 | Surgery Residency |
| Harvard School of Public Health, Boston | MS | 05/98 | Clinical Epidemiology |

**A. Personal Statement**

In addition to seven years’ experience as an academic attending surgeon (no longer in practice), and formal training in public health, I have expertise in: electronic health record deployment (both Cerner and Epic implementations); inter-institutional science collaboration leadership serving as PI for Federal peer-reviewed research in advanced biomedical computing infrastructures, being an application service provider for web-based systems and serving on Boards of the National Library of Medicine. I served as the Chief Medical Informatics Officer at Tempus, a cancer genomics company which collects, normalizes and combines clinical data and genomic data for oncologist decision support. Since 2017, in my role as Chief Research Informatics Officer at University of Pittsburgh School of Medicine, I am providing services for use of extraordinary data assets and technical capabilities and collaborating across research using phone sensor technologies, imaging, genomics, and secondary use of electronic health record data, focused on enhancing capabilities, and learning health systems. My office is home to Pitt/UPMC Health Record Research Request (R3) data provisioning system and honest broker system. In HuBMAP I serve as a PI for the infrastructure and engagement (IEC) component in collaboration with Phil Blood and the other HIVE components. In SenNet I serve as the CODCC Contact PI. I also serve as Contact PI for the Breast Cancer Research Foundation Global Data Hub. The common theme of my research is bringing together complex data from many sources and dimensions and re-organizing and providing data back to other investigators in a “Science-as-a-Service” model.

**Ongoing and recently completed projects include:**

**UL1 TR001857 (Reis)** NIH/NCATS 07/12/2016-05/31/2026

Biomedical Informatics Core, Clinical and Translational Science Institute

This is the University of Pittsburgh’s CTSA program.

**U01TR002393 (Shireman)** NIH/NCATS 07/25/2018-06/30/2022

Harnessing the power of CTSA-CDRN data networks: Using social determinants of health, frailty and functional status to identify at-risk patients and improve risk adjustment

Safety net hospitals take care of people with social risk factors and are judged on the quality of care provided without accounting for challenges faced by poor people. We study the effect of social risk factors and frailty on health outcomes after surgery to identify patients that would benefit from more focused care.

**OT2OD026675 (Blood; Silverstein)** Office of the Director/NIH 09/01/2018-09/20/2022

Flexible Hybrid Cloud Infrastructure for Seamless Management of HuBMAP Resources

To provide for the Infrastructure and Engagement Component HuBMAP, we created and manage a flexible and scalable hybrid cloud infrastructure. IEC seamlessly connects HuBMAP with storage and co-located compute resources for depositing, accessing, querying, searching, analyzing, and visualizing HuBMAP data.

**OT2OD030545 (Blood; Silverstein; Borner)** Office of the Director/NIH09/01/2020-08/31/2022

Amplifying the Value of HuBMAP Data Through Data Interoperability and Collaboration (CFDE Data Distillery)

This award is an extension of HuBMAP IEC and HIVE to work with the Common Fund Data Ecosystem (CFDE) to ingest HuBMAP metadata and collaborate with the KidsFirst and other Common Fund programs.

**U24CA268108 (Silverstein; Blood; Bar-Joseph)** NCI/NIH 12/01/2021 – 11/30/2026

Cellular Senescence Network (SenNet) Consortium Organization and Data Coordinating Center (CODCC)

The CODCC will engage the rapidly growing community of single-cell genomics mapping consortia including HuBMAP, HCA and HTAN. In particular, SenNet focuses on discovery, induction, and mapping of specific physiology at the cellular and molecular level, under a variety of normal, experimental and disease conditions.

**R01NS098023 (Xia)** NINDS/NIH 08/01/2020-06/30/2021

INTEGRATING EHR AND GENOMICS TO PREDICT MULTIPLE SCLEROSIS DRUG RESPONSE

This project will extend work in Multiple Sclerosis (MS) under Dr. Xia to include data mart development for use for research with electronic health records in both MS and Alzheimer’s Disease (AD).

**NU38OT000316-03-02 (Block)** Task Force for Public Health/CDC10/01/2020-07/31/2022

COVID-19 Electronic Health Data Initiative

The COVID-19 electronic healthcare data initiative project will demonstrate PCORnet sites’ ability to collect information on COVID data through the implementation of a nationally distributed data infrastructure.

**RI-CRN-2020-006 (McTigue; Becich)** PCORI 04/01/2020-02/28/2021

Advancement of PCORnet Infrastructure: Clinical Research Network Project

PaTH supports observational studies, pragmatic clinical trials and quality improvement studies. The PaTH Common Data Model (CDM) includes de-identified data from over 10 million patients.

**TBCRC Aurora DCC (Lee)** JHU/Breast Cancer Research Foundation 01/01/2019-12/31/2021

Aurora Data Coordinating Center

This project ingests data from AURORA partners and indexes the metadata into a searchable repository.

**SPEC-20-009 (Silverstein)** Breast Cancer Research Foundation 01/15/2022 – 12/15/2023

Breast Cancer Research Foundation Global Data Hub

This is a grant to make leaps forward in the scientific usability, use, and democratization of breast cancer research data, rather than incremental progress in data sharing collaboration procedures, by leveraging hybrid cloud technologies to deploy data sharing and computation from and for BCRF investigators.

**R34DA050004 (Merlin)** NIH/NIDA 06/01/2021 – 05/31/2023

Consensus-based algorithms to address opioid misuse behaviors among individuals prescribed long-term opioid therapy: developing implementation strategies and pilot testing

The NIH Helping to End Addiction Long-term (HEAL) initiative has identified a critical next step to addressing the opioid crisis: improving treatments for opioid misuse behaviors (e.g., using more opioids than prescribed, illicit substance use) in patients prescribed long-term opioid therapy for chronic pain.

**Citations:**

1. HuBMAP Consortium. The human body at cellular resolution: the NIH Human Biomolecular Atlas Program. Nature. Nature Publishing Group; 2019 Oct 9;574(7777):187–192. PMCID: PMC6800388
2. SenNet Consortium. NIH SenNet Consortium to map senescent cells throughout the human lifespan to understand physiological health. Nature Aging. 2022 Dec 20;2(12):1090–100.
3. Erberich SG, **Silverstein JC**, Chervenak A, Schuler R, Nelson M, Kesselman C. Globus MEDICUS - Federation of DICOM Medical Imaging Devices into Healthcare Grids. Stud Health Technol Inform. 2007;126:269-278. PMID: 17476069
4. Friedman CP, Allee NJ, Delaney BC, Flynn AJ, **Silverstein JC**, Sullivan K, Young KA. The science of Learning Health Systems: Foundations for a new journal. Learn Health Sys. 2017;1:e10020. doi: 10.1002/lrh2.10020. PMCID: PMC6516721

**B. Positions, Scientific Appointments and Honors**

***Positions and Scientific Appointments***

2017-current Chief Research Informatics Officer, Professor

Department of Biomedical Informatics, University of Pittsburgh School of Medicine

2016-2017 Chief Medical Informatics Officer, Tempus

2011-2016 Davis Family Chair of Informatics

2011-2016 Vice President and Head, Center for Biomedical Research Informatics (CBRI)

Research Institute, NorthShore University HealthSystem

2007-2011 Associate Professor, Departments of Surgery, Radiology, and the

Collegiate Division, Biological Sciences Division, University of Chicago

2006-2011 Associate Director, Computation Institute (CI)

2002-2011 Scientific Director, Chicago Biomedical Consortium

2001-2007 Assistant Professor, Department of Surgery, The University of Chicago (UC)

1999,2000-01 Adjunct Appointments, Bioengineering, Radiology, Library and Information Science

1998-2001 Co-Director, UIC Virtual Reality in Medicine Laboratory (VRMedLab)

1996-2001 Assistant Professor, School of Biomedical and Health Information Sciences, UIC

1996-2001 Assistant Professor, Dept. of Surgery, University of Illinois at Chicago (UIC)

**C. Contributions to Science**

1. **Data warehousing and integration of complex biomedical data**. Dr. Silverstein’s research and professional duties are significantly focused on the warehousing, integration, and analyses of large-scale biomedical data resources.

* 1. Visweswaran S, McLay B, Cappella N, Morris M, Milnes JT, Reis SE, Silverstein JC, Becich MJ. An atomic approach to the design and implementation of a research data warehouse. J Am Med Inform Assoc [Internet]. 2021 Oct 6; 10.1093/jamia/ocab204
  2. Wang X, Liu L, Fackenthal J, Cummings S, Olopade OI, Hope K, Silverstein JC, Olopade OI. Translational integrity and continuity: Personalized biomedical data integration. Journal of Biomedical Informatics 2009 Feb.;42(1):100–112. PMID: 18760382, PMCID: PMC2675887
  3. Rashid R, Copelli S, Silverstein JC, Becich MJ (2023) REDCap and the National Mesothelioma Virtual Bank-a scalable and sustainable model for rare disease biorepositories. J Am Med Inform Assoc 30:1634–1644. PMID: 37487555 PMCID: PMC10531116
  4. Maraganore DM, Frigerio R, Kazmi N, Meyers SL, Sefa M, Walters SA, Silverstein JC. Quality improvement and practice-based research in neurology using the electronic medical record. Neurol Clin Pract. 2015 Oct;5(5):419–429. PMID: 26576324, PMCID: PMC4634157

2. **Biomedical visualizations.**  Dr. Silverstein’s research extends to research on the use of mapping and visualizations of organs and tissues. In our 2008 paper we addressed the problem of volume visualization for surgery and radiology, where grayscale is used because of unpredictable perceptual characteristics of pseudo-colored images. Our automated visualization retains grayscale characteristics (perceptual brightness) with the addition of color. We discovered a method to combine generic field data and an arbitrary map of the data to colors and apply perceptual contrast theory to adjust the colors for display perceptually correctly, gaining the contrast-enhancement typical of grayscale images without losing the color.   
 In our recent paper in Nature Methods, we describe methods advancing tissue visualization with multiplexed antibody-based imaging that enables the detailed characterization of molecular and cellular organization in tissues. In our 2022 paper from Communications Biology, we discuss visualization interfaces to support human reference tissue and organ atlases.

1. Silverstein JC, Parsad NM, Tsirline V. Automatic perceptual color map generation for realistic volume visualization. J Biomed Inform. 2008;41(6):927–935. PMID: 18430609, PMCID: PMC2651027
2. Quardokus EM, Saunders DC, McDonough E, Hickey JW, Werlein C, Surrette C, Rajbhandari P, Casals AM, Tian H, Lowery L, Neumann EK, Björklund F, Neelakantan TV, Croteau J, Wiblin AE, Fisher J, Livengood AJ, Dowell KG, Silverstein JC, Spraggins JM, Pryhuber GS, Deutsch G, Ginty F, Nolan GP, Melov S, Jonigk D, Caldwell MA, Vlachos IS, Muller W, Gehlenborg N, Stockwell BR, Lundberg E, Snyder MP, Germain RN, Camarillo JM, Kelleher NL, Börner K, Radtke AJ. Organ Mapping Antibody Panels: a community resource for standardized multiplexed tissue imaging. Nat Methods. 2023 Aug;20(8):1174-1178. doi: 10.1038/s41592-023-01846-7. Epub 2023 Jul 19. PMID: 37468619; PMCID: PMC10406602.
3. Börner K, Bueckle A, Herr BW 2nd, Cross LE, Quardokus EM, Record EG, Ju Y, Silverstein JC, Browne KM, Jain S, Wasserfall CH, Jorgensen ML, Spraggins JM, Patterson NH, Weber GM. Tissue registration and exploration user interfaces in support of a human reference atlas. Commun Biol. 2022 Dec 13;5(1):1369. doi: 10.1038/s42003-022-03644-x. PMID: 36513738; PMCID: PMC9747802.
4. Silverstein JC, Parsad NM, Tsirline V. Automatic perceptual color map generation for realistic volume visualization. J Biomed Inform. 2008 Dec;41(6):927-35. doi: 10.1016/j.jbi.2008.02.008. Epub 2008 Mar 13. PMID: 18430609; PMCID: PMC2651027.

3. **The use of virtual reality** in surgical applications is an area in which we have made several contributions and for which Dr. Silverstein is best known. Students, staff, and colleagues in Dr. Silverstein’s lab did each of these publications under his NIH funding. Dr. Silverstein used these discoveries to teach anatomy to undergraduate students for six years in a course called “Immersive Virtual Anatomy”.

1. Silverstein JC, Dech F, Edison M, Jurek P, Helton WS, Espat NJ. Virtual Reality: Immersive Hepatic Surgery Educational Environment (IHSEE). Surgery. 2002 Aug;132(2):274-7. PMID: 12219023
2. Dobson HD, Pearl RK, Orsay CP, Rasmussen M, Evenhouse R, Ai Z, Blew G, Dech F, Edison MI, Silverstein JC, Abcarian H. Virtual Reality: new method of teaching anorectal and pelvic floor anatomy. Dis Colon Rectum 2003 Mar; 46(3):349-52. PMID: 12626910
3. Silverstein JC, Dech F. Precisely Exploring Medical Models and Volumes in Collaborative Virtual Reality. Presence: Teleoperators & Virtual Environments (MIT Press) 2005 Feb; 14(1):47-59.
4. Kaspar M, Parsad NM, Silverstein JC. An optimized web-based approach for collaborative stereoscopic medical visualization. Journal of the American Medical Informatics Association. 2013 Apr 10;20(3):535–43. PMID: 23048008, PMCID: PMC3628048

4. **General informatics**. Dr. Silverstein has contributed to many general informatics advances, four of which are identified here. They demonstrate various skills, from natural language processing to analyses of data warehouses of clinical trials and patient outcomes.

* 1. Garcia-Recio S et al. Multiomics in primary and metastatic breast tumors from the AURORA US network finds microenvironment and epigenetic drivers of metastasis. Nature Cancer. 2022 Dec 30;1–20.
  2. Marsolo K, Kiernan D, Toh S, Phua J, Louzao D, Haynes K, Weiner M, Angulo F, Bailey C, Bian J, Fort D, Grannis S, Krishnamurthy AK, Nair V, Rivera P, Silverstein J, Zirkle M, Carton T. Assessing the impact of privacy-preserving record linkage on record overlap and patient demographic and clinical characteristics in PCORnet®, the National Patient-Centered Clinical Research Network. J Am Med Inform Assoc [Internet]. 2022 Nov 30; PMCID: PMC9933062
  3. Chard K, Russell M, Lussier YA, Mendonça EA, Silverstein JC. A cloud-based approach to medical NLP. AMIA Annu Symp Proc. 2011;2011:207-16. Epub 2011 Oct 22. PMID: 22195072; PMCID: PMC3243210.
  4. Jacobs MA, Schmidt S, Hall DE, Stitzenberg KB, Kao LS, Brimhall BB, Wang CP, Manuel LS, Su HD, Silverstein JC, Shireman PK. A Surgical Desirability of Outcome Ranking (DOOR) Reveals Complex Relationships between Race/Ethnicity, Insurance Type and Neighborhood Deprivation. Ann Surg. 2023 Jul 14. doi: 10.1097/SLA.0000000000005994. Epub ahead of print. PMID: 37450703.