Elana Fertig, Ph.D.

Titles & Department

Professor, Primary Appointment: Oncology, Secondary Appointments: Biomedical Engineering and Applied Mathematics and Statistics
Director, Research Program in Quantitative Sciences
Associate Director of Quantitative Sciences, Sidney Kimmel Comprehensive Cancer Center (SKCCC)
Co-Director, Convergence Institute
Co-Director, Single-Cell Training and Analysis Center (STAC)

Specialization Area

Computational biology and precision medicine in cancer; Single-cell multi-omic technologies; Systems biology, bioinformatics, and pattern detection.

Unmet Need

Develops computational tools to guide precision medicine delivery for cancer, helping researchers and clinicians understand why some patients develop treatment resistance.

Summary of Research & Work

Targeted cancer therapeutics have higher efficacy and fewer adverse side effects than standard regimens. However, these precision medicine approaches require a clear understanding of how patient and tumor genetics drive therapeutic outcomes. Dr. Fertig's laboratory combines wet lab and quantitative techniques to develop mathematical models and algorithms that can identify important patient-specific molecular processes. These data can help stratify patients to guide precision delivery of immunotherapy, monitor patient responses to treatment, and predict therapeutic resistance. These techniques are broadly generalizable across cancer types and other disease indications.

Value Proposition

− Unique combination of wet lab and quantitative approaches that include computational, mathematical, and AI-based modeling.
− Expertise in single cell multi-omics algorithm development.
− Develops accurate predictive models of therapeutic response in cancer.
− Strong history of collaborative, multidisciplinary research activity.

Recent Publications

− Li K, Tandurella JA, Gai J, Zhu Q, Lim SJ, Thomas DL 2nd, Xia T, Mo G, Mitchell JT, Montagne J, Lyman M, Danilova LV, Zimmerman JW, Kinny-Köster B, Zhang T, Chen L, Blair AB, Heumann T, Parkinson R, Durham JN, Narang AK, Anders RA, Wolfgang CL, Laheru DA, He J, Osipov A, Thompson ED, Wang H, Fertig EJ, Jaffee EM, Zheng L. Multi-omic analyses of changes in the tumor microenvironment of pancreatic adenocarcinoma following neoadjuvant treatment with anti-PD-1 therapy. Cancer Cell. 2022 Nov 14;40(11):1374-1391.e7.

- Sidiropoulos DN, Stein-O'Brien GL, Danilova L, Gross NE, Charmsaz S, Xavier S, Leatherman J, Wang H, Yarchoan M, Jaffee EM, Fertig EJ, Ho WJ. Integrated T cell cytometry metrics for immune-monitoring applications in immunotherapy clinical trials. JCI Insight. 2022 Oct 10;7(19):e160398.
- Ho WJ, Croessmann S, Lin J, Phyo ZH, Charmsaz S, Danilova L, Mohan AA, Gross NE, Chen F, Dong J, Aggarwal D, Bai Y, Wang J, He J, Leatherman JM, Yarchoan M, Armstrong TD, Zaidi N, Fertig EJ, Denny JC, Park BH, Zhang ZY, Jaffee EM. Systemic inhibition of PTPN22 augments anticancer immunity. J Clin Invest. 2021 Jul 20;131(17):e146950.
- Ho WJ, Erbe R, Danilova L, Phyo Z, Bigelow E, Stein-O'Brien G, Thomas DL 2nd, Charmsaz S, Gross N, Woolman S, Cruz K, Munday RM, Zaidi N, Armstrong TD, Sztein MB, Yarchoan M, Thompson ED, Jaffee EM, Fertig EJ. Multi-omic profiling of lung and liver tumor microenvironments of metastatic pancreatic cancer reveals site-specific immune regulatory pathways. Genome Biol. 2021 May 13;22(1):154.
- Kagohara LT, Zamuner F, Davis-Marcisak EF, Sharma G, Considine M, Allen J, Yegnasubramanian S, Gaykalova DA, Fertig EJ. Integrated single-cell and bulk gene expression and ATAC-seq reveals heterogeneity and early changes in pathways associated with resistance to cetuximab in HNSCC-sensitive cell lines. Br J Cancer. 2020 Jul;123(1):101-113.

Awards & Honors
- 2022 College of Fellows, American Institute for Medical and Biological Engineering (AIMBE)
- 2020, 2016 Discovery Award Winner, Johns Hopkins University
- 2017 Catalyst Award Winner, Johns Hopkins University
- 2017 Synergy Award Winner, Johns Hopkins University
- 2013 HPN-DREAM8 Challenge Winner (team leader)