BIOGRAPHICAL SKETCH

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NAME: **Zhang, Lanjing**

eRA COMMONS USER NAME (credential, e.g., agency login): **LANJING.ZHANG**

POSITION TITLE: **Chair of Pathology**

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

INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
Tongji Medical University, Wuhan, China	M.D., M.S.	06/00	Medicine, Cell biology
University of Michigan Medical School, Ann Arbor, MI	Postdoc	06/06	Cell biology
Mount Sinai Medical Center, New York, NY	Residency	06/10	Pathology
Hospital of the University of Pennsylvania, Philadelphia, PA	Clinical Fellowship	06/11	GI and Liver Pathology
UC Berkeley/Edx	Certificate	06/20	Foundations of Data Science: Prediction and Machine Learning

A. Personal Statement

I am a board-certified pathologist, clinical epidemiologist and data scientist. I am also an Early Stage Investigator and highly motivated to pursue an academic, translational-research career. With little extramural support, I have published more than 110 peer-reviewed publications, including >60 ones with (co-)first or (co-)corresponding authorship, with 6,000+ Google citations and i10-index of 48. Most of them are focused on statistical methodology and clinical epidemiology. I have recently focused on methodology and application of machine learning (ML).

Ongoing and recently completed projects that I would like to highlight include:

NSF/IIS-2128307
PI: Zhang
10/1/2021-9/30/2022
EAGER: Integration and analysis of high-dimensional dataset

1. Feng CH, Disis ML, Cheng C, **Zhang L**. (2021) Multimetric feature selection for analyzing multicategory outcomes of colorectal cancer: random forest and multinomial logistic regression models. *Lab Invest.* doi: 10.1038/s41374-021-00662-x. PMID: 34537824

2. Deng F, Huang J, Yuan X, Cheng C, **Zhang L**. (2021) Performance and efficiency of machine learning algorithms for analyzing rectangular biomedical data. *Lab Invest.* doi: 10.1038/s41374-020-00525-x. PMID: 33574440.

3. Wang J, Deng F, Zeng F, Shanahan AJ, Li WV, **Zhang L**. (2020) Predicting long-term multicategory cause of death in patients with prostate cancer: random forest versus multinomial model. *Am J Cancer Res*. 10(5):1344-1355. PMID: 32509383 PMCID: PMC7269775

4. Deng F, Shen L, Wang H, **Zhang L**. (2020) Classify multicategory outcome in patients with lung adenocarcinoma using clinical, transcriptomic and clinico-transcriptomic data: machine learning versus multinomial models. *Am J Cancer Res* **10**(12):4624-4639. PMID: 33415023 PMCID: PMC7783755.

B. **Positions, Scientific Appointments, and Honors**
<u>**Positions and Employment**</u>
2023-   Chair, Department of Pathology, Princeton Medical Center, Plainsboro, NJ
2022-   Research Professor of Chemical Biology, Rutgers School of Pharmacy
2021-2022   Coadjutant Faculty in Biological Sciences, Rutgers University-Newark
2019-2023   Vice Chair, Department of Pathology, Princeton Medical Center, Plainsboro, NJ
2016-2021   Visiting Professor in Biological Sciences, Rutgers University-Newark
2013-   Associate Member, Rutgers Cancer Institute of New Jersey
2012-2016   Clinical Assistant Professor, Rutgers RWJ Medical School
2011-   Director of Gastrointestinal and Liver Pathology, and Staff Pathologist, Princeton Medical Center
             - Rutgers RWJ Medical School, Plainsboro, NJ

<u>**Honorary Scientific Appointments**</u>
2022-   Adjunct Professor of Pathology and Lab Medicine, University of Pennsylvania, PA
2018-2019   Honorary Professor in Infectious Diseases, Shanghai Jiaotong University, Shanghai, China
2017-2018   Honorary Professor in Pathology, Tianjin Medical University Cancer Center, Tianjin, China
2014-2015   Honorary Professor in Pathology, Tongji University, Shanghai, China
2013-2015   Honorary Professor in Gastroenterology, PLA General (301) Hospital, Beijing, China
2013-2016   Honorary Professor in Forensic Medicine, Huazhong Univ Sci& Tech, Wuhan, China

<u>**Licensure**</u>
2011-   New Jersey State Medical License (No. 25MA08962300)
2010-   Diplomate, American Board of Pathology (Anatomic and Clinical Pathology)
2009-   New York State Medical License (No. 255005, inactive since 1/2013).

<u>**Other Experiences**</u>
<u>Grant Reviewer-ship</u>
2022-   Grant Reviewer, National Medical Research Council, Singapore
2021   Ad hoc grant review, COVID-19 Study Section, NIAID, NIH
2021   Panelist, NSF grant review panel
2020   Ad hoc grant review, COVID-19 Study Section, NIAID, NIH
2019   Study section for TCR Flagship grants, National Medical Research Council, Singapore
2019   Ad hoc grant review, Cancer Health Disparity Study Section, CSR, NIH
2018   Ad hoc grant reviewer, World Cancer Research Fund International, UK
2014-2018   International Expert Panel Member, National Medical Research Council, Singapore
2013   Grant Reviewer, Center for the Advancement of Science in Space, the Manager of International
             Space Station U.S. National Laboratory, NASA
2006-2013   Grant Reviewer, National Medical Research Council, Singapore (1 to 2 times per year)

<u>Editorial Experiences</u>
2023-   Senior Associate Editor, *Lab Invest*
2021-2022   Editorial Board, *Mod Pathol*
2021-2023   Associate Editor, *IEEE Trans Network Sci Engin*
2020-   Section Editor in Computational Pathology, *Int J Clin Exp Pathol*
2018-   Editorial Board, *Lab Invest* (Guest editor for computational biology special issue, 2019-present)
2015-   Section Editor, *Stem Cell Investigation*
2015-   Academic Editor, *Sci Reports*
2015-   Editorial Review Board, *Gastrointest Endosc*
2015-2021   Academic Editor 2015- , Section Editor 2016-2020, *Medicine*
2014-   Section Editor in GI pathology 2015- , Associate Editor 2016- , *Arch Pathol Lab Med*
2014-   Executive Editor-in-Chief, *Am J Dig Dis*
2014-   Academic Editor, *Plos ONE*
2012-   Associate Editor, *J Clin Transl Hepatol*
2011-2021   Editorial Board Member, *Exp Hematol& Oncol*

| 2010-2016 | Acting Editor-in-chief for the April Issues, 2012-2014; Co-Managing Editor 2010-2012; Editorial Board Member 2010-2016, *North Am J Med& Sci* |

Public Services

2019-2021	President, New Jersey Society of Pathology
2017-2019	Hematology-Pathology Devices Panel, Medical Devices Advisory Committee, the US FDA
2016-	Chair, Steering Committee, New Jersey Department of Health Cancer Epidemiology Services

Honors

2022	Excellent Editor Award, IEEE Communications Society
2021	Ramzi Cotran Young Investigator Award, United States and Canadian Academy of Pathology (One award each year given to the scientist who is under the age of 45 and contributed significantly to the diagnosis and understanding of human disease. Past awardees include Celina Kleer, Shuji Ogino, Christine Lacobuzio-Donahue, Anirban Maitra and Arul M. Chinnaiyan)
2019	President's award, Sonic Healthcare USA
2018	Elected Fellow through published works, The Royal College of Pathologists, UK
2015	Elected Fellow, American College of Gastroenterology
2013-2021	*Gastrointest Endosc* Outstanding Reviewer Award, each year
2010	Elected Fellow, College of American Pathologists
2000	Dean's List of Graduates, Tongji Medical University, China
1999	Merit Award, Scientific Research Competition of Hubei Province, China
1997	Third Prize, College Student Research Competition of Hubei Province, China
1993-2000	Medical Scientist Training Program Fellowship, Tongji Medical University, China

C. Contributions to Science

1. *Machine learning.* We are recently focused on applying machine learning tools to address biological and clinical questions. First, we used machine learning based tools to analyzed single cell RNA seq data (Yu 2020). Second, we tuned and used a random forest model to predict 5-category outcomes, and showed pathological factors are important in predicting 5-category outcomes in lung cancer patients (Deng, Zhou et al 2020). Third, we compared the usefulness of clinical, transcriptomic and clinico-transcriptomic data in classifying multicategory outcome of lung adenocarcinoma with ML (Deng, Shen 2020). Finally, we developed an adaptive, multimetric pipeline for feature selection and showed addition of expert-curated genomic alternations increased most of the ML's performance metrics (Feng, et al 2021).
   a. Yu S, Balasubramanian I, Laubitz D, Tong K, Bandyopadhyay S, Lin X, Flores J, Singh R, Liu Y, Macazana C, Zhao Y, Béguet-Crespel F, Patil K, Midura-Kiela MT, Wang D, Yap GS, Ferraris RP, Wei Z, Bonder EM, Häggblom MM, **Zhang L**, Douard V, Verzi MP, Cadwell K, Kiela PR, Gao N. (2020) Paneth Cell-Derived Lysozyme Defines the Composition of Mucolytic Microbiota and the Inflammatory Tone of the Intestine. Immunity. 53(2):398-416.e8
   b. Deng F, Zhou H, Lin Y, Heim J, Shen L, Li Y, **Zhang L**. (2020) Predict multicategory causes of death in lung cancer patients using clinicopathologic factors. Comput Biol Med Doi: 10.1016/j.compbiomed.2020.104161 PMID: 33307409
   c. Deng F, Shen L, Wang H, **Zhang L**. (2020) Classify multicategory outcome in patients with lung adenocarcinoma using clinical, transcriptomic and clinico-transcriptomic data: machine learning versus multinomial models. Am J Cancer Res 10(12):4624-4639. PMID: 33415023 PMCID: PMC7783755.
   d. Feng CH, Disis ML, Cheng C, **Zhang L**. (2021) Multimetric feature selection for analyzing multicategory outcomes of colorectal cancer: random forest and multinomial logistic regression models. Lab Invest. doi: 10.1038/s41374-021-00662-x. PMID: 34537824

2. *Reporting and methodology of statistics.* We analyzed and reported the low reporting quality of meta-analysis in pathology (Liu 2017). Our letter to editor also raises several statistical concerns over a trend analysis on the reduced use of post-lumpectomy breast surgery among breast cancer women (Yang 2018). Moreover, we commented on the lack of age-standardization, shorter-segmental period and important cofounders in a trend analysis of fatly liver disease in the U.S. (Zhang 2019). Finally, we examined the reporting quality of trend analyses in leading medicine and oncology journals. (Yuan 2020).

a. Liu X, Kinzler M, Yuan J, He G, **Zhang L**. (2017) Low reporting quality of the meta-analyses in diagnostic pathology. *Arch Pathol Lab Med* **141**(3):423-430 PMID 28055241

b. Yang M, Bao W, **Zhang L**. (2018) Trend analysis in reoperation after initial lumpectomy for breast cancer. *JAMA Oncol* **4**(5):746-747 PMID: 29423512

c. Zhang J, **Lin Y, Zhang L**. (2019) Trends in Alcoholic Fatty Liver Disease. *JAMA*. **322**(10):979-980. doi: 10.1001/jama.2019.10347. PubMed PMID: 31503302.

d. Yuan X, Lin Y, Wang Y, **Zhang L**. (2020) Reporting quality of trend analyses in leading medicine and oncology journals. bioRxiv 2020.09.18.303701; [**Preprint**]; doi: https://doi.org/10.1101/2020.09.18.303701

3. *COVID-19 epidemiology.* Since the outbreak of COVID0-19, my lab has used various statistical and epidemiological models to understand COVID-19 epidemics. We have modeled COVID-19 daily incidence in China, Hubei Province and Wuhan city. We then showed that frequencies of internet search terms corrected with daily incidence and deaths of COVID-19 in the USA, and might help predict COVID-19 epidemics. Further, we found stay-at home orders and face-masking policy both reduced the daily growth rate of COVID-19 incidence by 9% (absolute change). Finally, we showed that state' geographic relationship with COVID-19 epicenter was strongly correlated with daily COVID-19 new cases and deaths in the European Union.

a. Xu J, Cheng Y, Yuan X, **Li WV, Zhang L**. (2020) Trends and prediction in daily incidence of novel coronavirus infection in China, Hubei Province and Wuhan City: an application of Farr's law. *Am J Transl Res*. **12**(4):1355-1361. PMID: 32355547 PMCID: PMC7191162

b. Yuan X, Xu J, Hussain S, Wang H, Gao N, **Zhang L.** (2020) Trends and prediction in daily new cases and deaths of COVID-19 in the United States: An internet search-interest based model. *Explor Res Hypothesis Med*. **5**(2):1-6. doi: 10.14218/ERHM.2020.00023. PMID: 32348380 PMCID: PMC7176069

c. Xu J, Hussain S, Lu G, Zheng K, Wei S, Bao W, **Zhang L**. (2020) Associations of stay-at-home order and face-masking recommendation with trends in daily new cases and deaths of laboratory-confirmed COVID-19 in the United States. *Explor Res Hypothesis Med*. **5**(3) 1-10. doi: 10.14218/ERHM.2020.00045. PMCID: PMC7361445

d. Yuan X, Hu K, Xu J, Zhang X, Bao W, Lynch CF, **Zhang L**. (2020) State heterogeneity of human mobility and COVID-19 epidemics in the European Union. medRxiv 2020.06.10.20127530 [Preprint]; doi: https://doi.org/10.1101/2020.06.10.20127530 (Accepted by Am J Transl Res)

4. *Colorectal cancer pathology and epidemiology.* I have three active IRB approved projects characterizing colorectal cancer precursors, and have collected about 8,500 colorectal polyps since 2012. Our recent works also demonstrated an inverse association between Paneth cell presence and advanced adenoma/colorectal cancers, and suggest an alternative hypothesis on the carcinogenetic role of Paneth cells in colorectal carcinogenesis (Mahon 2016). Moreover, our data show that non-lymphatic metastasis of colorectal cancer (Tumor deposits) was also prognostically important and could serve as a prognostic marker (Mayo 2016). Furthermore, we have characterized the clinicopathologic features of synchronous neoplasm of sessile serrated adenomas (Chavali, 2020). In addition, we showed that Kras mutation, but not MSI status, was independently linked to colorectal cancer with tumor deposits (Zhang 2020). Finally, our manuscript under-review reports an enriched expression of Paneth cell related genes in non-advanced adenomas (vs. AA/CRC) and CRC (vs normal tissue), and delayed development of AA/CRC among the patients with Paneth cell-positive non-advanced adenoma.

a. Mahon M, Xu J, Yi X, Liu X, Gao N, **Zhang L.** (2016) Paneth cell in adenoma as of the distal colorectum is inversely associated with synchronous advanced adenoma and carcinoma. *Sci Rep.* **6**:26129. doi: 10.1038/srep26129. PMID: 27188450

b. Mayo E, Llanos AAM, Yi Y, Duan SZ, **Zhang L.** (2016) Prognostic value of tumor deposit and perineural invasion status in colorectal cancer patients: a SEER-based population study. *Histopathology* **69**(2):230-8 PMID 26802566

c. Chavali LB, Hu K, Sheth A, Gao N, Xiong W, **Zhang L.** (2020) Clinicopathological characteristics and synchronous neoplasm of sessile serrated adenoma. *Eur J Gastroenterol Hepatol*. **32**(2): 199-204. PMID: 31851088.

d. Zhang M, Hu W, Hu K, **Lin Y**, Feng Z, Yun JP, Gao N, **Zhang L**. (2020) Association of Kras mutation with tumor deposit status and overall survival of colorectal cancer. *Cancer Causes Control.* 31(7):683-

689. PMID: 32394229 PMCID: PMC7319095

5. *Collaboration on basic research.* I have collaborated with basic-research scientists on cancer biology and gastrointestinal epithelial biology, as a pathologist and the PI of several IRB-approved collaborative projects. We showed that the transitional basal cells at esophageal squamous-columnar junction gave rise to the Barrett's esophagus (Jiang 2017). We also developed and validated a therapeutic antibody targeting tumor- and osteoblastic niche-derived Jagged1 for breast cancer (Zheng 2017). Moreover, with our Co-investigator, we demonstrated that Enterocyte-specific Rab8a and Rab11a double-knockout mouse neonates showed immediate postnatal lethality and more severe enteropathy than single knockouts, with extensive formation of microvilli along basolateral surfaces (Feng 2017). Finally, we found that disruption of endosomes promotes carcinogenesis in both fly and mouse models (D'Agostino 2019). These collaborative works have helped translate the discoveries in basic science into human subjects.

a. Jiang M, Li H, Zhang Y, Yang Y, Lu R, Liu K, Lin S, Lan X, Wang H, Wu H, Zhu J, Zhou Z, Xu J, Lee D-K, **Zhang L**, Lee YC, Yuan J, Abrams JA, Wang TC, Sepulveda AR, Wu Q, Chen H, Sun X, She J, Chen X, Que J. (2017) Transitional basal cells at the squamous–columnar junction generate Barrett's oesophagus. *Nature* **550**(7677):529-533. PMID 29019984

b. Zheng H, Bae Y,Kasimir-Bauer S, Tang R, Chen J, Ren G, Yuan M, Esposito M, Li W, Wei Y, Shen M, **Zhang L**, Tupitsyn N, Pantel K, King C, Jan Sun J, Moriguchi J, Jun HT, Coxon A, Lee B, Kang Y. (2017) Therapeutic Antibody Targeting Tumor- and Osteoblastic Niche-Derived Jagged1 Sensitizes Bone Metastasis to Chemotherapy. *Cancer Cell*. **32** (6), 731–747. PMID: 29232552

c. Feng Q, Bonder EM, Engevik AC, **Zhang L**, Tyska M, Goldenring JR, **Gao N**. (2017) Disruption of Rab8a and Rab11a causes formation of basolateral microvilli in neonatal enteropathy. *J Cell Sci* **130**(15): 2491-2505. PMID: 28596241

d. D'Agostino L, Nie Y, Goswami S, Tong K, Yu S, Bandyopadhyay S, Flores J, Zhang X, Balasubramanian I, Joseph I, Sakamori R, Farrell V, Li Q, Yang CS, Gao B, Ferraris RP, Yehia G, Bonder EM, Goldenring JR, Verzi MP, **Zhang L**, Ip YT, **Gao N**. (2019) Recycling endosomes in mature epithelia restrain tumorigenic signaling. *Cancer Res.* **79**(16):4099-4112 PMID: 31239271

Complete List of Published Work in My Bibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/lanjing.zhang.1/bibliography/9460198/public/?sort=date&direction=descending