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PERSONAL STATEMENT

Dongxiao Zhu's recent research interests are in Trustworthy Machine Learning and Applications in health, urban, and social computing with emphasis on adversarial robustness, explainability, fairness and S & P. Dr. Zhu is the Founding Director of Wayne AI Research Initiative, Director of Trustworthy AI Lab, and co-Director of Master Program in AI at Wayne State University. He has published over 80 peer-reviewed publications and served on program committees (Senior PC or PC) of flagship AI conferences (NuerIPS, ICML, ICLR, AAAI, IJCAI, ACL, EMNLP, AMIA, MICCAI) and of premier biomedical informatics journals (*Bioinformatics*, *Nucleic Acids Research*, *TCBB*, *Medical Physics*, *Scientific Reports*, *BMC Genomics*, and *Frontiers in Genetics*). In addition to foundational AI research, Dr. Zhu is passionate about leveraging AI for scientific research and social good, development and community outreach. He develops robust, fair and explainable AI algorithms and efficient systems to optimize public service delivery via learning geo-social features from geo-tagged big data, in efforts to achieve the sustainable development goals such as zero hunger, better cyber-social behaviors, good health and well-being, and reduced inequalities in socially vulnerable regions/groups.

PRIMARY RESEARCH AREAS

Trustworthy AI: Adversarial Machine Learning, Explainability and Interpretability, Fairness, and Security & Privacy

Data Science: Social Media Content, Electrical Health Record (EHR), Medical Imaging (CXR/CT/MRI), Geospatial, and Genome/Transcriptome Sequencing data

EMPLOYMENTS

Associate/Assistant Professor of Computer Science, Wayne State University	2011 – Present
Assistant Professor of Computer Science, University of New Orleans	2008 – 2011
Biostatistician, Stowers Institute for Medical Research, Kansas City, MO	June 2006 – December 2007

EDUCATION

Ph.D. in Bioinformatics, **University of Michigan, Ann Arbor**	2006
M.A. in Statistics, **University of Michigan, Ann Arbor**	2005
M.A. in Math concentration on Computer Science, **Eastern Michigan University, Ypsilanti**	2002
M.S. in Microbiology, **Peking University**, China	1999
B.S. in Microbiology, **Shandong University**, China	1996

HONORS AND RECOGNITIONS

- **Excellence in Research Award**, College of Engineering, Wayne State University, 2022
- **Excellence in Teaching Award**, College of Engineering, Wayne State University, 2016
- **Top Cited Article 2020-2021**, Journal of Biophotonics, Wiley, for the article "Deep learning protocol for improved photoacoustic brain imaging"
- **Best Student Paper Award**, AMIA-2020 Clinical Informatics Summit (first authored by my PhD student)
- **Best Paper Award top 3 finalist**, ICMLA-2017
- **Best Poster Award top 3 finalist**, ICMLA-2017

SELECTED NSF/NIH RESEARCH AWARDS

- **NSF/IIS 2211897**, *"Collaborative Research: HCC: Small: Understanding Online-to-Offline Sexual Violence through Data Donation from Users"*, Total Amount: $600,000, 2022 – 2025, **Role: PI**, 33%.

- **NIH/R61HD105610**, *"Severity Predictors Integrating salivary Transcriptomics and proteomics with Multi neural network Intelligence in SARS-CoV2 infection in Children (SPITS MISC)"*, Total Amount: $1,433,469, 2021 – 2023, **Role: MPI**, 33%.

- **NSF/CNS 2043611**, *"SCC-CIVIC-PG Track A: Leveraging AI-assist Microtransit to Ameliorate Spatiotemporal Mismatch between Housing and Employment."*, Total Amount: $49,898, 2021, **Role: PI**, 25%.

- **NSF/CNS 1724227**, *"S&AS: INT: Autonomous Battery Operating System (ABOS): An Adaptive and Comprehensive Approach to Efficient, Safe, and Secure Battery System Management."*, Total Amount: $1,249,998, 2017-2021, **Role: Senior Personnel**, 10%.

- **NSF/CNS 1637312**, *"S&CC: Promoting a Healthier Urban Community: Prioritization of Risk Factors for the Prevention and Treatment of Pediatric Obesity."*, Total Amount: $199,996, 2016-2018, **Role: co-PI**, 33%.

- **NSF/CCF 1451316**, *"EAGER: A novel algorithmic framework for discovering subnetworks from big biological data."*, Total Amount: $179,989, 2014-2016, **Role PI**, 100%.

- **NIH/R21LM010137**, *"A new informatics paradigm for reconstructing signaling pathways in human disease."*, Total Amount: $440,989, 2009-2011, **Role: PI**, 100%.

- **NSF/CCF 0939108**, *"CPATH: A verification based learning model that enriches CS and related undergraduate programs."*, Total Amount: $300,000, 2009-2012, **Role: co-PI**, 25%.

SELECTED RECENT PUBLICATIONS

***Full* publications can be found at Google Scholar**

† my PhD students as the first author.

Foundational AI Research

[1] Y. Qiang†, D, Pan, C. Li, X. Li, R. Jang, and **D. Zhu**, "AttCAT: Explaining Transformers via Attentive Class Activation Tokens." `NuerIPS-22`. In Press.

[2] Y. Qiang†, C. Li, M. Brocanelli, and **D. Zhu**, "Counterfactual Interpolation Augmentation (CIA): A Unified Approach to Enhance Fairness and Explainability of DNN." `IJCAI-22`.

[3] Y. Qiang†, TS. Supriya, Kumar, M. Brocanelli, and **D. Zhu**, "Tiny RNN Model with Certified Robustness for Text Classification." `IJCNN-22` (oral presentation).

[4] C. Li†, Zheng, Dong, N. Fisher, and **D. Zhu**, "Coupling User Preference with External Rewards to Enable Driver-centered and Resource-aware EV Charging Recommendation." `ECML-22`.

[5] D. Pan†, X. Li†, and **D. Zhu**, "Explaining deep neural network models with adversarial gradient integration." `IJCAI-21`.

[6] X. Li†, X. Li†, D. Pan†, and **D. Zhu**, "Improving adversarial robustness via probabilistically compact loss with logit constraints." `AAAI-21`.

[7] L. Wang† and **D. Zhu**, "Tackling ordinal regression problem for heterogeneous data: sparse and deep multi-task learning approaches. *Data Mining and Knowledge Discovery.*" pp. 1–28, 2021.

[8] D. Pan†, X. Li†, X. Li†, and **D. Zhu**, "Explainable recommendation via interpretable feature mapping and evaluation of explainability." `IJCAI-20`.

[9] X. Li†, X. Li†, D. Pan†, and **D. Zhu**, "On the learning property of logistic and softmax losses for deep neural networks." `AAAI-20`.

[10] Y. Qiang†, X. Li†, and **D. Zhu**, "Toward tag-free aspect based sentiment analysis: A multiple attention network approach." `IJCNN-20`.

[11] L. Wang†, Y. Li, J. Zhou, **D. Zhu**, and J. Ye, "Multi-task survival analysis." `ICDM-17`.

[12] X. Li[†] and **D. Zhu**, "Robust feature selection via l2, 1-norm in finite mixture of regression." *Pattern Recognition Letters*, vol. 108, pp. 15–22, 2018.

[13] X. Li[†], **D. Zhu**, and M. Dong, "Multinomial classification with class-conditional overlapping sparse feature groups." *Pattern Recognition Letters*, vol. 101, pp. 37–43, 2018.

[14] L. Wang[†], **D. Zhu**, and M. Dong, "Clustering over-dispersed data with mixed feature types." *Statistical Analysis and Data Mining: The ASA Data Science Journal*, vol. 11, no. 2, pp. 55–65, 2018.

Use-Inspired AI Research

[13] X. Li[†], Bagher, HE, Kim, J, **D. Zhu**, and I, Chetty, "An uncertainty-aware deep learning architecture with outlier mitigation for prostate gland segmentation in radiotherapy treatment planning," *Medical Physics*, accepted.

[14] X. Li[†], **D. Zhu**, and P. D. Levy, "Predicting clinical outcomes with patient stratification via deep mixture neural networks." *AMIA Summits on Translational Science Proceedings*, vol. 2020, p. 367, 2020.

[15] X. Li[†], J. Hect, M. Thomason, and **D. Zhu**, "Interpreting age effects of human fetal brain from spontaneous fmri using deep 3d convolutional neural networks.' in *2020 IEEE 17th International Symposium on Biomedical Imaging (ISBI)*. IEEE, 2020, pp. 1424–1427.

[16] X. Li[†], R. Cao, and **D. Zhu**, "Vispi: Automatic visual perception and interpretation of chest x-rays." in *International Conference on Medical Imaging with Deep Learning: MIDL 2020*. IEEE, 2020.

[17] X. Li[†], C. Li, and **D. Zhu**, "Covid-mobilexpert: On-device covid-19 patient triage and follow-up using chest x-rays." in *2020 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*. IEEE, 2020, pp. 1063–1067.

[18] X. Li[†], D. Pan[†], and **D. Zhu**, "Defending against adversarial attacks on medical imaging ai system, classification or detection?" in *2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI)*. IEEE, 2021.

[19] X. Li[†] and **D. Zhu**, "Robust detection of adversarial attacks on medical images." in *2020 IEEE 17th International Symposium on Biomedical Imaging (ISBI)*. IEEE, 2020, pp. 1154–1158.

[20] M. Z. Nezhad[†], N. Sadati, K. Yang, and **D. Zhu**, "A deep active survival analysis approach for precision treatment recommendations: Application of prostate cancer." *Expert Systems with Applications*, vol. 115, pp. 16–26, 2019.

[21] L. Wang[†], M. Dong, E. Towner, and **D. Zhu**, "Prioritization of multi-level risk factors for obesity." in *2019 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*. IEEE, 2019.

[22] X. Li[†], **D. Zhu**, and P. D. Levy, "Leveraging auxiliary measures: a deep multi-task neural network for predictive modeling in clinical research." *BMC medical informatics and decision making*, vol. 18, no. 4, p. 126, 2018.

[23] L. Wang[†], **D. Zhu**, E. Towner, and M. Dong, "Obesity risk factors ranking using multi-task learning." in *Biomedical & Health Informatics (BHI), 2018 IEEE EMBS International Conference on*. IEEE, 2018, pp. 385–388.

[24] X. Li[†], **D. Zhu**, M. Dong, M. Z. Nezhad, A. Janke, and P. D. Levy, "Sdt: A tree method for detecting patient subgroups with personalized risk factors." *AMIA Summits on Translational Science Proceedings*, vol. 2017, p. 193, 2017.

[25] M. Z. Nezhad[†], **D. Zhu**, N. Sadati, K. Yang, and P. Levi, "Subic: A supervised bi-clustering approach for precision medicine." in *2017 16th IEEE International Conference on Machine Learning and Applications (ICMLA)*. IEEE, 2017, pp. 755–760.

[26] X. Li[†], **D. Zhu**, and P. Levy, "Predictive deep network with leveraging clinical measure as auxiliary task." in *2017 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*. IEEE, 2017, pp. 786–791.

[27] L. Wang[†], **D. Zhu**, M. Dong, and Y. Li, "Modeling over-dispersion for network data clustering." in *Machine Learning and Applications (ICMLA), 2017 16th IEEE International Conference on*. IEEE, 2017, pp. 42–49.

[28] M. Z. Nezhad[†], **D. Zhu**, X. Li, K. Yang, and P. Levy, "Safs: A deep feature selection approach for precision medicine." in *Bioinformatics and Biomedicine (BIBM), 2016 IEEE International Conference on*. IEEE, 2016, pp. 501–506.

Bioinformatics & Computational biology

[28] C. Li[†], R. Sullivan, **D. Zhu**, and S. Hicks. "Putting the 'mi' in omics: discovering miRNA biomarkers for pediatric precision care," *Pediatrics Research*, https://doi.org/10.1038/s41390-022-02206-5.

[29] L. Wang[†], L., Acharya, C. Bai, and **D. Zhu**. "Transcriptome assembly strategies for precision medicine." *Quantitative Biology*, pp 1-11, https://doi.org/10.1007/s40484-017-0109-2.

[30] L. Wang[†], **D. Zhu**, Li, Y and Dong, M. "Poisson-Markov Mixture Model and Parallel Algorithm for Binning Massive and Heterogeneous DNA Sequencing Reads." In the Series of Lecture Notes in Computer Science (ISBRA 2016).

[31] Hou, J., Acharya, L.[†], **D. Zhu**, and Chen, J. An overview of bioinformatics methods for modeling biological pathways in yeast. *Briefings in Functional Genomics*, 15(2), 95-108.

[32] **D. Zhu**, Deng, N[†], and Bai C. "A Generalized dSpliceType Framework to Detect Differential Splicing and Differential Expression Events Using RNA-Seq." *IEEE Transaction on NanoBioScience*, DOI: 10.1109/TNB.2015.2388593.

[33] Deng, N[†] and **D. Zhu**, "dSpliceType: a multivariate model for detecting various types of differential splicing events using RNA-Seq." in the proceedings of 2014 International Symposium on Bioinformatics Research and Applications (ISBRA'14).

[34] Deng, N[†], Sanchez, C, Lasky, J, and **D. Zhu**, "Detecting splicing variants from non-differentially expressed genes of human idiopathic pulmoary fibrosis." *PLoS One* 8(7):e68352. doi:10.137/journal.pone.0068352.

[35] Judeh, T[†], Johnson, C, Kumar, A, and **D. Zhu**, "TEAK: Topological Enrichment Analysis frameworK for detecting activated biological subpathways." Nucleic Acids Res., doi: 10.1093/nar/gks1299. Software

[36] Deng, N[†] and **D. Zhu**, "Detecting various types of differential splicing events using RNA-Seq data." in the proceedings of 2013 ACM Conference on Bioinformatics, Computational Biology and Biomedicine (ACM BCB'13).

[37] Nguyen, T[†] and **D. Zhu**, "MarkovBin: An Algorithm to Cluster Metagenomic Reads Using a Mixture Modeling of Hierarchical Distributions." in the proceedings of 2013 ACM Conference on Bioinformatics, Computational Biology and Biomedicine (ACM BCB'13).

[38] Judeh, T[†], Jayyousi T, Reynolds, B and **D. Zhu**, "Gene Set Cultural Algorithm: A Cultural Algorithm Approach to Reconstruct Networks from Gene Sets." in the proceedings of 2013 ACM Conference on Bioinformatics, Computational Biology and Biomedicine (ACM BCB'13).

[39] Acharya, L[†], Judeh, T, Wang, G, and **D. Zhu**, "Optimal structural inference of signaling pathways from overlapping and unordered gene sets." *Bioinformatics*, doi 10.1093/bioinformatics/btr696, 28(4), 546-556

[40] Judeh, T[†], Nguyen, T and **D. Zhu**, "QSEA for fuzzy subgraph querying of KEGG pathways." in the proceedings of 2012 ACM Conference on Bioinformatics, Computational Biology and Biomedicine (ACM BCB'12).

[41] Acharya, L[†], Judeh, T, Duan, Z, Rabbat, M, and **D. Zhu**, "GSGS: A computational framework for reconstructing signaling pathways from gene sets." *IEEE/ACM transaction on Computational Biology and Bioinformatics (TCBB)*, 9(2), 438-450.

[42] Deng N[†], Puetter, A, Zhang, K, Johnson, K., Zhao, Z, Taylor, C, Flemington, E and **D. Zhu**, "Isoform-level microRNA-155 Target Prediction using RNA-seq." *Nucleic Acids Res.*, doi: 10.1093/nar/gkr042.

[43] Xu G[†], Deng N, Zhao, Z, Flemington EK, and **D. Zhu**, "SAMMate: A GUI tool for processing short read alignment information in SAM/BAM format." *Source Code for Biology and Medicine*, 6:2.

[44] **D. Zhu**, Acharya, L, and Zhang, H. (2011) "A generalized multivariate approach to pattern discovery from replicated and incomplete genome-wide measurements." *IEEE/ACM transaction on Computational Biology and Bioinformatics (TCBB)*, 8(5), pp1153-1169. Poster

[45] Xu G[†], Fewell C, Taylor C, Deng N, Hedges D, Wang X, Zhang K, Lacey M, Zhang H, Yin Q, Cameron J, Lin Z, and **D. Zhu**, Flemington EK. (2010) "Transcriptome and targetome analysis in MIR155 expressing cells using RNA-seq." *RNA*, 16(8): 1610-1622.

[46] Zheng, L, Xu G[†], Taylor C, and **D. Zhu**, Flemington EK. (2010) "Quantitative and Qualitative RNA-Seq-Based Evaluation of Epstein-Barr Virus Transcription in Type I Latency Burkitt's Lymphoma Cells." *J. Virology*, doi:10.1128/JVI.01521-10.

[47] Zhang, W, Edwards, A., Fan, W., **D. Zhu**, and Zhang, K. (2010) "SvdPPCS: An effective singular value decomposition-based method for conserved and divergent co-expression gene module identification." *BMC Bioinformatics* 11, art. no. 338.

PRESS COVERAGE

- **Scientific American:** *AI assisted diagnosis*   February 2019
- **DBusiness:** *AI to Bring Micro-transit to Hourly Workers*   February 2021
- **EurekAlert:** *AI to Aid Early Detection of SARS-CoV2 in Children*   February 2021

TEACHING EXPERIENCE

- *CSC 5825 Introduction to Machine learning and Applications*, Wayne State University, Winter 2017, Fall 2017/2018/2019/2020/2021/2022
- *CSC 7825 Machine learning*, Wayne State University, Winter 2019/2020/2021/2022
- *CSC 8800 Seminars in Machine learning and AI*, Wayne State University, Winter 2021/2022
- *CSC 8860 Seminars in Computer Vision and Pattern Recognition*, Fall 2017
- *CSC 6580 Design and Analysis of Algorithms*. Winter 2015/2016/2017
- *CSC 2110 Computer Science I*. Winter 2012/2013/2014

SELECTED LEADERSHIP ROLES AND SERVICE

- **Founding Director** *Wayne AI Research Initiative*, 2021-Present
- **Program Co-Director: Algorithm and Software track** *Wayne Master Program in AI*, 2022-Present
- **Chair, Computer Science Faculty Search Committee**, 2021-2022

- **College of Engineering Representative, University Faculty Senate**, 2022-2024
- **Graduate Program Director** *Wayne Computer Science Graduate Program*, 2018-2020
- **AI Conference SPC/PC** *NuerIPS/ICML/ICLR/AAAI/IJCAI/ACL/EMNLP/MICCAI/AMIA*
- **Journal editorship** *BMC Genomics, Frontiers in Genetics, Scientific Reports, Plos One.*