

# Juexiao Zhou

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## RESEARCH INTERESTS

My research interests lie in machine learning, deep learning, intelligent healthcare, privacy and security, bioinformatics, artificial general intelligence, and large language model. Towards this vision, I am committed to achieving Privacy-preserving Artificial General Intelligence (PAGI) for healthcare and bioinformatics.

## ACADEMIC EXPERIENCES

### King Abdullah University of Science and Technology

Saudi Arabia

PhD Student in Computer Science, Advisor: Xin Gao; **GPA: 4.00/4.00**

Dec 2021 – Present

Master of Science, M.S. in Computer Science, Advisor: Xin Gao; **GPA: 3.95/4.00**

Aug 2020 – Dec 2021

### Southern University of Science and Technology

Shenzhen, China

Bachelor of Science, B.S. (Honored) in Bioinformatics, Advisor: Wei Chen; **GPA: 3.92/4.00**

Sep 2016 – Jun 2020

## PUBLICATIONS

**Journal** (#equal contribution, \*corresponding author)

1. **Juexiao Zhou**<sup>#</sup>, Haoyang Li<sup>#</sup>, Xingyu Liao, Bin Zhang, Wenjia He, Zhongxiao Li, Longxi Zhou, Xin Gao\*. A unified method to revoke the private data of patients in intelligent healthcare with audit to forget. *Nature Communications* (**IF: 17**). DOI: 10.1038/s41467-023-41703-x
2. **Juexiao Zhou**<sup>#</sup>, Siyuan Chen<sup>#</sup>, Yulian Wu<sup>#</sup>, Haoyang Li, Bin Zhang, Longxi Zhou, Yan Hu, Zihang Xiang, Zhongxiao Li, Ningning Chen, Wenkai Han, Di Wang and Xin Gao\*. PPML-Omics: A privacy-preserving federated machine learning method protects patients' privacy in omic data. *Science Advances* (**IF: 15.4**).
3. **Juexiao Zhou**<sup>#</sup>, Bin Zhang<sup>#</sup>, Haoyang Li, Longxi Zhou, Zhongxiao Li, Yongkang Long, Wenkai Han, Mengran Wang, Huanhuan Cui, Wei Chen, Xin Gao\*. Annotating TSSs in Multiple Cell Types Based on DNA Sequences and RNA-seq Data via DeeReCT-TSS. *Genomics, Proteomics & Bioinformatics* (**IF: 10.1**). DOI: 10.1016/j.gpb.2022.11.010
4. **Juexiao Zhou**<sup>#</sup>, Longxi Zhou<sup>#</sup>, Di Wang, Xiaopeng Xu, Haoyang Li, Yuetan Chu, Wenkai Han, Xin Gao\*. Personalized and privacy-preserving federated heterogeneous medical image analysis with PPPML-HMI. *Computers in Biology and Medicine* (**IF: 7.7**).
5. Haoyang Li<sup>#</sup>, **Juexiao Zhou**<sup>#</sup>, Zhongxiao Li, Siyuan Chen, Xingyu Liao, Bin Zhang, Ruochi Zhang, Yu Wang, Shiwei Sun, Xin Gao\*. A comprehensive benchmarking with practical guidelines for cellular deconvolution of spatial transcriptomic. *Nature Communications* (**IF: 17**). DOI: 10.1038/s41467-023-37168-7
6. Longxi Zhou<sup>#</sup>, Xianglin Meng<sup>#</sup>, Yuxin Huang<sup>#</sup>, Kai Kang<sup>#</sup>, **Juexiao Zhou**, Yuetan Chu, Haoyang Li, Dexuan Xie, Jiannan Zhang, Weizhen Yang, Na Bai, Yi Zhao, Mingyan Zhao, Guohua Wang, Lawrence Carin, Xigang Xiao, Kaijiang Yu, Zhaowen Qiu, Xin Gao\*. An Interpretable Deep Learning Workflow for Discovering Sub-Visual Abnormalities in CT Scans of COVID-19 Inpatients and Survivors. *Nature machine intelligence* (**IF: 25.9**). DOI: 10.1038/s42256-022-00483-7
7. Wenkai Han<sup>#</sup>, NingNing Chen<sup>#</sup>, Xinzhou Xu, Adil Salhi, **Juexiao Zhou**, Zhongxiao Li, Huawen Zhong, Elva Gao, Ruochi Zhang, Yu Wang, Shiwei Sun, Peter Cheung, Xin Gao\*. Predicting the antigenic evolution of SARS-COV-2 with deep learning. *Nature Communications* (**IF: 17**). DOI: 10.1038/s41467-023-39199-6.
8. Xiaopeng Xu, **Juexiao Zhou**, Chen Zhu, Qing Zhan, Zhongxiao Li, Ruochi Zhang, Xingyu Liao, Xin Gao\*. Optimization of binding affinities in chemical space with generative pre-trained transformer and deep reinforcement learning. *F1000 Research*. DOI: 10.12688/f1000research.130936.1

9. Zhongxiao Li<sup>#</sup>, Elva Gao<sup>#</sup>, **Juexiao Zhou**, Wenkai Han, Xiaopeng Xu, and Xin Gao\*. Applications of Deep Learning in Understanding Gene Regulation. *Cell Reports Methods*. DOI: 10.1016/j.crmeth.2022.100384
10. Xingyu Liao, Wufei Zhu, **Juexiao Zhou**, Haoyang Li, Xiaopeng Xu, Bin Zhang, Xin Gao\*. Repetitive DNA sequence detection and its role in the human genome. *Communications Biology (IF: 6.548)*. DOI: 10.1038/s42003-023-05322-y .
11. Xiaopeng Xu, Tiantian Xu, **Juexiao Zhou**, Xingyu Liao, Ruochi Zhang, Yu Wang, Lu Zhang, Xin Gao\*. AB-Gen: Antibody Library Design with Generative Pre-trained Transformer and Deep Reinforcement Learning. *Genomics, Proteomics & Bioinformatics (IF: 10.1)*. DOI: 10.1016/j.gpb.2023.03.004.
12. Yongkang Long<sup>#</sup>, Bin Zhang<sup>#</sup>, Shuye Tian, Jiajia Chan, **Juexiao Zhou**, Zhongxiao Li, Yisheng Li, Zheng An, Xingyu Liao, Yu Wang, Shiwei Sun, Ying Xu, Yvonne Tay, Wei Chen\*, Xin Gao\*. Accurate transcriptome-wide identification and quantification of alternative polyadenylation from RNA-seq data with APAIQ. *Genome Research (IF: 9.438)*. In press.
13. Haoyang Li, Hanmin Li, **Juexiao Zhou** and Xin Gao\*. SD2: Spatially resolved transcriptomics deconvolution through integration of spatial and dropout information. *Bioinformatics (IF: 6.931)*. DOI: 10.1093/bioinformatics/btac605
14. Haoyang Li, **Juexiao Zhou**, Yi Zhou, Jieyu Chen, Feng Gao, Ying Xu, Xin Gao\*. An interpretable computer-aided diagnosis method for periodontitis from panoramic radiographs. *Frontiers in Physiology, section Computational Physiology and Medicine (IF: 4.755)*. DOI: 10.3389/fphys.2021.655556.
15. Zhongxiao Li, Yisheng Li, Bin Zhang, Yu Li, Yongkang Long, **Juexiao Zhou**, Xudong Zou, Min Zhang, Yuhui Hu, Wei Chen, Xin Gao\*. DeeReCT-APA: Prediction of Alternative Polyadenylation Site Usage through Deep Learning. *Genomics Proteomics and Bioinformatics (IF: 10.1)*. DOI: 10.1016/j.gpb.2020.05.004.
16. Liongxi Zhou, Zhongxiao Li, **Juexiao Zhou**, Haoyang Li, Yupeng Chen, Yuxin Huang, Dexuan Xie, Lintao Zhao, Ming Fan, Shahrukh Hashmi, Faisal AbdelKareem, Riham Eiada, Xigang Xiao, Lihua Li, Zhaowen Qiu, and Xin Gao\*. A Rapid, Accurate and Machine-agnostic Segmentation and Quantification Method for CT-based COVID-19 Diagnosis. *IEEE Transactions on Medical Imaging (IF: 11.037)*. DOI: 10.1109/TMI.2020.3001810.
17. Haoyang Li, **Juexiao Zhou**, Huiyan Sun, Zhaowen Qiu, Xin Gao\* and Ying Xu\*. CaMeRe: A novel tool for inference of cancer metabolic reprogramming. *Front. Oncol. (IF: 6.244)*. DOI: 10.3389/fonc.2020.00207.
18. Yisheng Li<sup>#</sup>, Bernhard Schaefer<sup>#</sup>, Xudong Zou, Min Zhang, Florian Heyd, Wei Sun, Bin Zhang, Guipeng Li, Weizheng Liang, Yuhao He, **Juexiao Zhou**, Yunfei Li, Liang Fang, Yuhui Hu\*. Pan-tissue analysis of allelic alternative polyadenylation suggests widespread functional regulation. *Molecular Systems Biology (IF: 12.744)*. DOI: 10.15252/msb.20199367.

**Conference** (#equal contribution, \*corresponding author)

19. Haoyang Li, **Juexiao Zhou**, Yi Zhou, Jieyu Chen, Feng Gao, Ying Xu, Xin Gao\*. Automatic and interpretable model for periodontitis diagnosis in panoramic radiographs. *Medical Image Computing and Computer Assisted Interventions 2020*. DOI: 10.1007/978-3-030-59713-9.44.

**Posters & Technical Reports** (#equal contribution, \*corresponding author)

20. **Juexiao Zhou**, Xin Gao\*. Privacy in Bioinformatics and Intelligent Healthcare. Poster. *Smart-Health Student Research Symposium*, KAUST, Saudi Arabia, November 10, 2022.
21. Haoyang Li, **Juexiao Zhou**, Xin Gao\*. Deetal-Perio: DEEP denTAL Advisor for Periodontitis Diagnosis based on Two-step Segmentation of Teeth and Gingiva with Lower-dimensional Features. Poster. *DigitalHealth*, KAUST, 2020.

22. Haoyang Li, **Juexiao Zhou**, Huiyan Sun, Zhaowen Qiu, Xin Gao\* and Ying Xu\*. CaMeRe: A novel tool for inference of cancer metabolic reprogramming. Poster. *Advance In Artificial Intelligence*, KAUST, 2019.
23. Yongkang Long, **Juexiao Zhou**, Zhongxiao Li, Wei Chen, Xin Gao\*. DeeRect-PAS—A Deep-Learning based method for Transcriptome-wide PAS Identification. Poster. *Advance In Artificial Intelligence*, KAUST, 2019.
24. Min Zhang, Yisheng Li, **Juexiao Zhou**, Yuhao He, Guipeng Li, Liang Fang, Wei Chen\*. Systematical discovery of cis-elements regulating alternative polyadenylation in mammalian cells. Poster. *RNA Biology*, CSH Asia, 2019.
25. Min Zhang, Yisheng Li, **Juexiao Zhou**, Yuhao He, Guipeng Li, Liang Fang, Wei Chen\*. Systematical discovery of cis-elements regulating alternative polyadenylation in mammalian cells. Poster. *Regulatory RNAs, Cell Symposia*, Berlin, Germany, May 12-14, 2019.

### Pre-Prints (#equal contribution, \*corresponding author)

26. Siyuan Chen, Kaichuang Zhang, Bing Niu, Na Li, Qiuye Jin, Haoyang Li, **Juexiao Zhou**, Yongguo Yu, and Xin Gao\*. KaryoXpert: An Accurate Chromosome Segmentation and Classification Framework for Karyotyping Analysis without Training with Metaphase-Image Mask Annotations. under review.
27. **Juexiao Zhou**<sup>#</sup>, Bin Zhang<sup>#</sup>, Xiuying Chen, Haoyang Li, Xiaopeng Xu, Siyuan Chen, Xin Gao\*. Automated Bioinformatics Analysis via AutoBA. under review.
28. Xuan Zhou<sup>#</sup>, Baolei Yuan<sup>#</sup>, Yeteng Tian, **Juexiao Zhou**, Mengge Wang, Ismail shakir, Yingzi Zhang, Chongwei Bi, Bayan Mohammed Aljamal, Mais Omar Hashem, Omar Imad Abuyousef, Firdous Mohammed Abdulwahab, Afshan Ali, Sarah Dunn, James Moresco, John Robert Yates III, Francesco Frassoni, Xin Gao, Fowzan Alkuraya, Juan Carlo Izpisua Belmonte, Mo Li\*. Wiskott-Aldrich Syndrome Protein Regulates Nucleolar Organization and Function in Innate Immune Response. under review.
29. Xingyu Liao<sup>#</sup>, **Juexiao Zhou**<sup>#</sup>, Bin Zhang<sup>#</sup>, Xingyi Li, Xiaopeng Xu, Haoyang Li, Xin Gao\*. Deep Learning Enhanced Tandem Repeat Variation Identification via Multi-Modal Conversion of Nanopore Reads Alignment. under review.
30. **Juexiao Zhou**<sup>#</sup>, Xiuying Chen<sup>#</sup>, Xin Gao\*. Path to Medical AGI: Unify Domain-specific Medical LLMs with the Lowest Cost. under review.
31. **Juexiao Zhou**<sup>#</sup>, Xiaonan He<sup>#</sup>, Liyuan Sun<sup>#</sup>, Jiannan Xu, Xiuying Chen, Yuetan Chu, Longxi Zhou, Xingyu Liao, Bin Zhang, Xin Gao\*. SkinGPT-4: An Interactive Dermatology Diagnostic System with Visual Large Language Model. under review.
32. Yuetan Chu<sup>#</sup>, Longxi Zhou<sup>#</sup>, **Juexiao Zhou**, Yuxin Huang, Tianyi Xing, Dexuan Xie, Xigang Xiao, Zhaowen Qiu, Xin Gao\*. An end-to-end workflow for robust pulmonary artery-vein segmentation on thick-slice chest CT. under review.
33. Longxi Zhou, Yitong Ding, Jiayang Guo, Ming Fan, **Juexiao Zhou**, Haoyang Li, Yujiao Li, Yuxin Huang, Yi Zhao, Yuetan Chu, Kun Wang, Qiming Fang, Xin Gao, Hongxia Zhang, Lihua Li. Heart Region Anchoring: a Model-Agnostic Workflow to Improve Segmentation Robustness for Breast Cancer in DCE-MRI. under review.

### Patents and Patent Applications

34. **Juexiao Zhou**, Xin Gao. Personalized and privacy-preserving federated heterogeneous medical image analysis with PPPML-HMI. KAUST reference: 2023-012.
35. Xingyu Liao, **Juexiao Zhou**, Xin Gao. A high-precision identification method of tandem repeat expansion based on refined alignment and deep learning. KAUST reference: 2023-054.
36. **Juexiao Zhou**, Xin Gao. Audit to forget: a unified suite to revoke patients' private data in intelligent healthcare. KAUST reference: 2023-056.

37. **Juexiao Zhou**, Xin Gao. A camera-based privacy-preserving early warning system for critical diseases. KAUST reference: 2023-074.

## WORK EXPERIENCE

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### **King Abdullah University of Science and Technology**

*Student Ambassador, CEMSE*

Saudi Arabia

*Dec 2021 – Present*

## TEACHING

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### **CS220, Data Analytics - AI Camp for Ministry of Interior, Saudi Arabia**

*Senior Teaching Assistant*

KAUST

*Fall 2023/2024*

- Cooperated with Prof. Xin Gao

### **CS220, Data Analytics**

*Teaching Assistant*

KAUST

*Fall 2022/2023*

- Cooperated with Prof. Xin Gao

### **BioE 201/230 Foundations of Bioengineering**

*Guest Lecturer*

Building 9 Room 4225, KAUST

*Fall 2022/2023*

- Cooperated with Prof. Xin Gao
- Lab 1. Genome data analysis, 2022.08.30, Content: Python basics, D/RNA sequence analysis, Biopython, BLAST, Reference genome
- Lab 2. Protein sequence analysis, 2022.09.06, Content: Protein sequence analysis, MSA, PDB, PyMOL, Secondary structure prediction
- Lab 3. Protein structure and function, 2022.09.13, Content: Ab initio with PyRosetta, AlphaFold2, NucleicNet, Docking with Smina, Pfam annotation with deep learning

### **CS398 Graduate Seminar**

*Teaching Assistant*

KAUST

*Spring 2022*

- Cooperated with Prof. Dominik Michels

## HONORS & AWARDS

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### **King Abdullah University of Science and Technology, KAUST, 2021-Present, PhD, Computer Science**

- CEMSE Dean's List Award, 2023
- KAUST AII's NeurIPS travel grant, 2022
- CEMSE Dean's List Award, 2022
- Excellent Research Award, CEMSE, 2021

### **King Abdullah University of Science and Technology, KAUST, 2020-2021, Master of Science, Computer Science**

- Student ambassador, CEMSE, 2021
- Yearly best student award, CEMSE, 2021
- Full scholarship for MS/PhD study, 2020

### **Southern University of Science and Technology, SUSTech, 2016-2020, Bachelor of Science, Bioinformatics, Biology**

- Outstanding graduate of SUSTech, 2020.
- Cum Laude Graduate of the Department of Biology (Top 1/10), 2020.
- The Guinness world record for "the most vows received by a single civilized act activity", 2019
- Candidate for 2019 National Scholarship, 2019
- Summer social practice excellent experience Award, 2018
- Excellent Student, The First Prize Scholarship, 2018

- Outstanding volunteer for the 12th CBIS Biennial Meeting, Shenzhen, China, 2018
- Candidate for 2018 National Scholarship, 2018
- Outstanding Volunteer of the 3rd Shenzhen International Life Science & Health Industry Summit (2016) Excellent Student, The First Prize Scholarship, 2017
- Dean scholarship, The First Prize Scholarship, 2017
- Excellent Student Cadre, 2017
- Outstanding Volunteer of 2017 Shenzhen International Precision Medicine Summit, 2017
- Alma mater practice excellent team, 2017
- National Literary Creation Award, 2016
- Excellent Student, The Second Prize Scholarship, 2016

## MEMBERSHIPS

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- Chinese Association for Artificial Intelligence (CAAI) Member
- The international Asia-Pacific Bioinformatics Network (APBioNET) Member
- Global Burden of Disease (GBD) Collaborator Network Member

## PRESS COVERAGE

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**PPML-Omics protects patients' privacy in omic data** was covered by:

- Algorithm Proposed to Protect Patient Privacy, **Inside Precision Medicine**
- An integrated shuffler optimizes the privacy of personal genomic data used for machine learning, **Today Headline**
- An integrated shuffler optimizes the privacy of personal genomic data used for machine learning, **Tech Xplore**
- Shuffling the deck for privacy, **ScienMag**
- Shuffling the deck for privacy, **Bioengineer.org**
- Shuffling the deck for privacy, **Newswise**
- Shuffling the deck for privacy, **EurekAlert**
- Novel Privacy-Preserving Machine-Learning Method Developed for Genomics Data, **Biocompare**

**Audit to forget** was covered by:

- Un logiciel pour garantir le droit à l'oubli des patients dans l'IA en milieu de santé, **Enerzine**
- Safeguarding the right to be forgotten, **KAUST Discovery**

## INVITED TALKS

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- [2023/11/22] Introduction to ChatGPT and Application of GPT in Healthcare. *Oral*. Saudi Olympiad Elite Camp, King Abdullah University of Science and Technology, Saudi Arabia.
- [2023/09/20] A Unified Method to Revoke the Private Data of Patients in Intelligent Healthcare with Audit to Forget. *Oral*. CBRC Seminar, King Abdullah University of Science and Technology, Saudi Arabia.
- [2023/06/12] SkinGPT-4: An Interactive Dermatology Diagnostic System with Visual Large Language Model. *Oral*. Unlocking the Power of 'ChatGPT', King Abdullah University of Science and Technology, Saudi Arabia.
- [2023/03/02] Audit to Forget: A Unified Method to Revoke Patients' Private Data in Intelligent Healthcare. *Poster*. CBRC session, KAUST Research Open Week, Saudi Arabia.
- [2023/02/02] Audit to Forget: A Unified Method to Revoke Patients' Private Data in Intelligent Healthcare. *Oral & Poster*. Spotlight, Rising Stars in AI Symposium 2023 at KAUST, Saudi Arabia.
- [2022/11/10] Privacy in Bioinformatics and Intelligent Healthcare. *Poster*. Smart-Health Student Research Symposium, KAUST, Saudi Arabia.

- [2022/03/29] PPML-Omics: a Privacy-Preserving federated Machine Learning system protects patients' privacy from omic data. *Oral*. CBRC Dual Seminar, King Abdullah University of Science and Technology, Saudi Arabia.
- [2022/03/09] PPML-Omics: a Privacy-Preserving federated Machine Learning system protects patients' privacy from omic data. *Oral*. BDAI, Beijing, China.

## ACADEMIC SERVICES

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### Reviewer

*(Journal/Conference Name, number of reviews)*

- AI4D3 @ NeurIPS 2023, #1
- Computers in Biology and Medicine, #6
- Genome Biology, #1
- Genome Research, #2
- Heliyon, #1
- IJCAI-ECAI 2022, #1
- ICONIP2020, #1
- ICMLA2021, #1
- Journal of Bioinformatics and Computational Biology, #1
- Medical Image Analysis, #1
- MICCAI2020, #1
- Multimedia Systems, #1
- SIGKDD2022, #2

### Conference Administrator

- The 21st International Conference on Bioinformatics (InCoB2022), Administrator