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# Yaqiang Cao, Ph.D., *Curriculum Vitae*

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## EDUCATION

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### East China University of Science and Technology

Bachelor of Bioengineering

2008.09 - 2012.06

### CAS-MPG Partner Institute for Computational Biology

Ph.D. of Computational Biology  
(M.S. included)

2012.09 -2019.01

## EXPERIENCES

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Postdoc, visiting fellow, with Dr. Keji Zhao, NHLBI, NIH

2019.04-2024.04

Postdoc, research fellow, with Dr. Keji Zhao, NHLBI, NIH

2024.04-

## RESEARCH INTEREST

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bioinformatics, chromatin organization, single-cell epigenetics, T-cell immunology

## SELECTED PUBLICATIONS

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1. Ma, F. \*, **Cao, Y. \***, Du, H., Braikia, F., Zong, L., Ollikainen, N., Bayer, M., Qiu, X., Park, B., Roy, R., Nandi, S., Sarantopoulou, D., Ziman, A., Bianchi, A., Beerman, I., Zhao, K., Grosschedl, R., Sen, R. #. (2024) Three-dimensional chromatin reorganization regulates B cell development during ageing. **Nat Cell Biol.**
2. Liu, S. \*, **Cao, Y. \***, Cui, K\*, Ren, G., Zhao, T., Wang, X., Wei, D., Chen, Z., Gurram, R.K., Liu, C. and Wu, C., Zhu, J., & Zhao, K. # (2024) Regulation of T helper cell differentiation by the interplay between histone modification and chromatin interaction. **Immunity**. 57(5), 987-1004.
3. **Cao, Y. \***, Liu, S. \*, Cui, K. \*, Tang, Q., & Zhao, K. # (2023). Hi-TrAC detects active sub-TADs and reveals internal organizations of super-enhancers. **Nucleic Acids Research**, gkad378.
4. **Cao, Y. \***, Liu, S. \*, Ren, G. \*, Tang, Q., & Zhao, K. # (2022). cLoops2: a full-stack comprehensive analytical tool for chromatin interactions. **Nucleic Acids Research**, 50(1), 57-71.
5. Zhen, T. \*, **Cao, Y. \***, Ren, G., Zhao, L., Hyde, R. K., Lopez, G., Feng, D., Alemu, L., Zhao, K., & Liu, P. P. # (2020). RUNX1 and CBF $\beta$ -SMMHC transactivate target genes together in abnormal myeloid progenitors for leukemia development. **Blood**, The Journal of the American Society of Hematology, 136(21), 2373-2385. (selected as Plenary Paper)

\* co-first author # correspondence

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## OTHER PUBLICATIONS ([full list](#))

1. Hong, S., Huang, Y., **Cao, Y.**, Chen, X., & Han, J. D. J. (2014). Approaches to uncovering cancer diagnostic and prognostic molecular signatures. **Molecular & Cellular Oncology**, 1(2), e957981. (co-first author)
2. Chen, W., Qian, W., Wu, G., Chen, W., Xian, B., Chen, X., **Cao, Y.** Green, C.D., Zhao, F., Tang, K., & Han, J. (2015). Three-dimensional human facial morphologies as robust aging markers. **Cell research**, 25(5), 574-587.
3. Huang, Y., Yu, X., Sun, N., Qiao, N., **Cao, Y.**, Boyd-Kirkup, J. D., Shen, Q., & Han, J. (2015). Single-cell-level spatial gene expression in the embryonic neural differentiation niche. **Genome research**, 25(4), 570-581.
4. Wang, L. \*, Xu, X. \*, **Cao, Y. \***, Li, Z., Cheng, H., Zhu, G., Duan, F., Na, J., Han, J., & Chen, Y. G. (2016). Activin/Smad2-induced H3K27me3 reduction is crucial to initiate mesendoderm differentiation of human embryonic stem cells. **Journal of Biological Chemistry**, jbc-M116. (co-first author)

5. Xu, C., Ai, D., Shi, D., Suo, S., Chen, X., Yan, Y., **Cao, Y.**, Zhang, R., Sun, N., Chen, W., McDermott, J., Zhang, S., Zeng, Y. & Han, J. (2018). Accurate Drug Repositioning through Non-tissue-Specific Core Signatures from Cancer Transcriptomes. **Cell reports**, 25(2), 523-535.
6. Chen, X., Xu, C., Hong, S., Xia, X., **Cao, Y.**, McDermott, J., Mu, Y., & Han, J. (2019). Immune Cell Types and Secreted Factors Contributing to Inflammation-to-Cancer Transition and Immune Therapy Response. **Cell reports**, 26(7), 1965-1977.
7. **Cao, Y.** \*, Chen, G. \*, Wu, G. \*, Zhang, X. \*, McDermott, J., Chen, X., Xu, C., Jiang, Q., Chen, Z., Zeng, Y., Ai, D., Huang, Y., & Han, J. # (2019). Widespread roles of enhancer-like transposable elements in cell identity and long-range genomic interactions[J]. **Genome research**, 2019, 29(1): 40-52. (first author)
8. **Cao, Y.** \*, Chen, Z. \*, Chen, X. \*, Ai, D. \*, Chen, G., McDermott, J., Huang, Y., Guo, X., & Han, J. # (2020). Accurate loop calling for 3D genomic data with cLoops. **Bioinformatics**, 36(3), 666-675. (first author)
9. Huang, F. \*, **Cao, Y.** \*, Wu, G., Chen, J., Lin, W., Lan, R., Wu, B., Xie, X., Hong, J., & Fu, L. (2020). BMP2 signaling activation enhances bone metastases of non-small cell lung cancer. **Journal of cellular and molecular medicine**, 24(18), 10768-10784. (co-first author)
10. Zeng, Y. \*, **Cao, Y.** \*, Halevy, R. S. \*, Nguyen, P., Liu, D., Zhang, X., Ahituv, N., & Han, J. (2020). Characterization of functional transposable element enhancers in acute myeloid leukemia. **Science China Life Sciences**, 1-13. (co-first author)
11. Han, M. \*, Li, J. \*, **Cao, Y.** \*, Huang, Y., Li, W., Zhu, H., Zhao, Q., Han, J., Wu, Q., Li, J., Feng, J., & Wong, J. (2020). A role for LSH in facilitating DNA methylation by DNMT1 through enhancing UHRF1 chromatin association. **Nucleic Acids Research**, 48(21), 12116-12134. (co-first author)
12. Xia, X., Chen, X., Wu, G., Li, F., Wang, Y., Chen, Y., Chen, M., Wang, X., Chen, W., Xian, B., Chen, W., **Cao, Y.**, Xu, C., Gong, W., Chen, G., Cai, D., Wei, W., Yan, Y., Liu, K., Qiao, N., Zhao, X., Jia, J., Wang, W., Kennedy, B., Zhang, K., Cannistraci, C., Zhou, Y., & Han, J. (2020). Three-dimensional facial-image analysis to predict heterogeneity of the human ageing rate and the impact of lifestyle. **Nature Metabolism**, 2(9), 946-957.
13. Qiu, X., Ma, F., Zhao, M., **Cao, Y.**, Shipp, L., Liu, A., Dutta, A., Singh, A., Braikia, F.Z., De, S., Wood, W. H., Becker, K.G., Zhou, W., Ji, H., Zhao, K., Atchison, M.L., & Sen, R. (2020). Altered 3D chromatin structure permits inversional recombination at the IgH locus. **Science advances**, 6(33), eaaz8850.
14. Huang, F., **Cao, Y.**, Wang, C., Lan, R., Wu, B., Xie, X., Hong, J., Fu, L., & Wu, G. (2021). PNMA5 promotes bone metastasis of non-small-cell lung cancer as a target of BMP2 signaling. **Frontiers in cell and developmental biology**, (2021): 1400.
15. Ku, W. L., Pan, L., **Cao, Y.**, Gao, W., & Zhao, K. (2021). Profiling single-cell histone modifications using indexing chromatin immunocleavage sequencing. **Genome Research**, gr-260893.
16. Fang, D., Cui, K., **Cao, Y.**, Zheng, M., Kawabe, T., Hu, G., Khillan, J., Li, D., Zhong, C., Jankovic, D., Sher, A., Zhao, K., & Zhu, J. (2022). Differential regulation of transcription factor T-bet induction during NK cell development and T helper-1 cell differentiation. **Immunity**, 55(4), 639-655.
17. Pan, L., Ku, W. L., Tang, Q., **Cao, Y.**, & Zhao, K. (2022). scPCOR-seq enables co-profiling of chromatin occupancy and RNAs in single cells. **Communications biology**, 5(1), 1-9.
18. Ren, G., Lai, B., Harly, C., Baek, S., Ding, Y., Zheng, M., **Cao, Y.**, Cui, K., Yang, Y., Zhu, J., Hager, G., Bhandoola, A., & Zhao, K. (2022). Transcription factors TCF-1 and GATA3 are key factors for the epigenetic priming of early innate lymphoid progenitors toward distinct cell fates. **Immunity**, 55(8), 1402-1413.
19. Lin, X., Liu, Y., Liu, S., Zhu, X., Wu, L., Zhu, Y., Zhao, D., Xu, X., Chemparathy, A., Wang, H., **Cao, Y.**, Nakamura, M., Noordermeer, J., Russa, M., Wong, W., Zhao, K., & Qi, L. S. (2022). Nested epistasis enhancer networks for robust genome regulation. **Science**, 377(6610), 1077-1085.
20. Zhang, X., Jiang, Q., Li, J., Zhang, S., **Cao, Y.**, Xia, X., Cai, D., Tan, J., Chen, J., & Han, J. D. J. (2022). KCNQ1OT1 promotes genome-wide transposon repression by guiding RNA-DNA triplexes and HP1 binding. **Nature Cell Biology**, 1-13.
21. Liu, S. \*, **Cao, Y.** \*, Cui, K., Tang, Q., & Zhao, K. # (2022). Hi-TrAC reveals division of labor of transcription factors in organizing chromatin loops. **Nature communications**, 13(1), 1-17. (co-first author).
22. Cui, K. \*, Chen, Z. \*, **Cao, Y.** \*, Liu, S. \*, Ren, G., Hu, G., Fang, D., Wei, D., Liu, C., Zhu, J., Wu, C. #, & Zhao, K. # (2023). Restraint of IFN-γ expression through a distal silencer CNS-28 for tissue homeostasis. **Immunity**, 56(5), 944-958 (co-first author, selected as cover)

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1. [cLoops](#): accurate and flexible loops calling tool for 3D genomic data (released in 2017)
  2. [cLoops2](#): full stack analysis tool for chromatin interaction data such as Hi-TrAC, HiChIP and Hi-C (released in 2021)
  3. [astroBoy](#): streamlined NGS data automatic processing web service for in-house data and public data (GEO database), in-house service within NIH since December 2022
  4. [Ranger iGenome Browser](#): a lightweight efficient genome browser for hosting in-house chromatin interaction 3D data and epigenome data tracks, in developing
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## AWARDS

1. **2024 NHLBI Director's Awards of Innovation**: For discovering the first negative regulatory element for interferon-gamma expression and elucidating its mechanism of function in preventing enhancer-promoter interaction through long-distance chromatin interactions.
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## INVITED TALKS

1. **Epigenetics Retreat, November 2017, Ningbo, China**; Accurate loop calling for 3D genomic data with cLoops.
  2. **DECODE Seminar Series, August 2023, NIH, Bethesda, USA**; Fine-scale dynamic chromatin loops and domains: beyond cohesin.
  3. **Invited by Prof. Lei Hou, August 2023, Boston University, Boston, USA**: Fine-scale dynamic chromatin loops and domains: beyond cohesin.
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## POSTERS

1. **Otto Warburg Summer School, September 2015, Max Planck Institute for Molecular Genetics, Berlin, German**; Yaqiang Cao (2015) iDBSCAN: An improvement to density-based clustering method for ultrafast detection of chromosomal interactions
  2. **The 3th International Symposium on 3D genomics, November 2016, Huazhong Agricultural University, Wuhan, China**; Yaqiang Cao (2016) Widespread Associated Retrotransposons MIR and L2 Function as Seeds of Cis-regulatory Units Marking Cell Identities
  3. **The First Chromatin Biology Conference of the Chinese Society for Cell Biology, April 2017, Shenzhen, China**; Yaqiang Cao (2017) Widespread Associated Retrotransposons MIR and L2 Function as Seeds of Cis-regulatory Units
  4. **Cold Spring Harbor Asia Conferences on Chromatin, Epigenetics & Transcription, April 2018, Suzhou, China**; Yaqiang Cao (2018) cLoops-A clustering-based loops calling method for ChIA-PET, HiChIP and Hi-C
  5. **4D Nucleosome Annual Meeting, December 2019, DC, USA**; Shuai Liu, Yaqiang Cao, Qingsong Tang, Keji Zhao (2019) TrAC-looping2 – A Highly Sensitive Technique for Detecting Multiple Levels of Chromatin Interactions
  6. **SCBA DC-Baltimore chapter annual scientific symposium, December 2022, University of Maryland, USA**; Yaqiang Cao (2022) Hi-TrAC reveals internal organizations of super-enhancers
  7. **NHLBI Fellow Festival, April 2023, NIH, Bethesda, USA**; Yaqiang Cao (2023) Hi-TrAC reveals internal organizations of super-enhancers
  8. **Gordon Research Conference, Genome Architecture in Cell Fate and Disease, June 2023, Ventura, California, USA**; Yaqiang Cao (2023) Hi-TrAC: Revealing Fine-Scale Dynamic Chromatin Loops and Domains
  9. **NIH/FDA IMMUNOLOGY INTEREST GROUP 2024 RETREAT, January 2024, DC, USA**; Yaqiang Cao (2024) T Helper Cell Fate Orchestrated by H3K4me1–Chromatin Loop–GATA3 Tangos
  10. **NHLBI Fellow Festival, March 2024, NIH, Bethesda, USA**; Yaqiang Cao (2024) T Helper Cell Fate Orchestrated by H3K4me1–Chromatin Loop–GATA3 Tangos
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## REVIEW CONTRIBUTIONS

Frontiers in Immunology  
Frontiers in Bioinformatics  
Frontiers in Oncology  
Frontiers in Pharmacology  
Frontiers in Genetics  
Communication Biology  
BMC Genomics  
F1000Research

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Cancer Control

Genes

Cells

Biomolecules

Journal of Personalized Medicine

International Journal of Molecular Sciences