Ping Cao

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EXPERIENCE

Maastricht University Medical Centre+ — Maastricht, Netherlands
Doctoral Researcher — *Jan 2022 – Present*

- **Generative AI for Embryo Imaging**: I designed and benchmarked state-of-the-art generative models (GANs, diffusion models, GPT-based) for synthetic embryo image generation, developing data augmentation strategies to overcome limited medical dataset constraints
- **Multimodal Deep Learning**: I developed a multimodal AI pipeline integrating genomics, imaging, and spatiotemporal analysis of embryo development for non-invasive viability prediction
- **Clinical LLM Applications**: I developed domain-specialized large language models for reproductive medicine by implementing retrieval-augmented generation (RAG) and fine-tuning strategies, I also deployed AI-powered patient education chatbots and clinical decision support systems
- **Innovative Genomic Diagnostics**: I contributed to developing a clinical-grade whole genome sequencing method for all forms of preimplantation genetic testing, and I designed deep learning pipelines for automated chromosomal aberration detection and data visualization platforms

Sun Yat-sen University — Guangzhou, China
Graduate Researcher — *Sep 2017 – Jul 2020*

- **Computational Genomics**: Analyzed whole-exome sequencing data from 1,000+ patients to identify novel genetic biomarkers predicting ovarian stimulation response and IVF pregnancy outcomes
- **University Innovation Grant**: Awarded research funding (6,600EUR) to discover and validate *de novo* mutations in premature ovarian insufficiency patients, independently directing experimental design, budget management, and collaborations

National Key Laboratory of Life Sciences — Guangzhou, China
Visiting Researcher — *Aug 2019 – Jan 2020*

- **Functional Genomics**: Identified novel SMC1B gene mutation in premature ovarian insufficiency patient through genomic screening, then designed and executed knockout cell models with comprehensive functional assays to establish causative molecular mechanisms

Helmholtz Munich German Research Center — Munich, Germany
Visiting Researcher — *Nov 2020 – Mar 2021*

- **Functional Genomics**: Designed and executed leptin receptor knockout experiments in mouse models, including RNA-seq library preparation and transcriptomic data analysis, to elucidate molecular mechanisms linking metabolic disorders to ovarian dysfunction

Sun Yat-sen University First Affiliated Hospital — Guangzhou, China
Clinical Resident — *Jan 2018 – Dec 2021*

- **Clinical Training**: Mastered comprehensive IVF clinical workflow including infertility diagnosis, controlled ovarian stimulation, artificial insemination, ultrasound-guided oocyte retrieval, and embryo transfer in one of China's highest-volume centers (8,000+ annual cycles)

South China University Second Affiliated Hospital — Hengyang, China
Medical Student — *Sep 2014 – Jul 2016*

- **Clinical Training**: Completed intensive clinical rotations in Obstetrics & Gynecology, gaining hands-on experience such as cesarean sections, labor management, and gynecological procedures

EDUCATION

Maastricht University — Maastricht, Netherlands
PhD Candidate — *Jan 2022 – Present*

Sun Yat-sen University — Guangzhou, China
Master of Medicine — *Sep 2017 – Jul 2020*

South China University — Hengyang, China
Bachelor of Medicine — *Sep 2012 – Jul 2017*

Technical Skills

- **Programming Languages**: Python, R, Bash, Shell, JavaScript
- **Computer Vision**: object detection, semantic/instance segmentation, image/video generation
- **Large Language Models**: RAG, tool calling, prompt engineering, parameter-efficient fine-tuning
- **ML Engineering**: inference optimization, experiment tracking, model deployment
- **Infrastructure**: multi-GPU clusters, Slurm scheduling, Docker/Singularity containerization
- **Frameworks**: PyTorch, TensorFlow, Keras, scikit-learn, HuggingFace, OpenCV, NumPy, pandas
- **Bioinformatics**: variant/haplotype calling, WGS/WES/GWAS analysis
- **Technical Communication**: scientific presentations, data visualization, Adobe creative suite, video editing

Selected Publications

- M Naghdi[†], **P Cao**[†], R Essers, M Heijligers, A Paulussen, A van der Lugt, R Ruiter, W Zelst-Stams, A Salumets, M Zamani Esteki. Artificial intelligence-simplified information to advance reproductive genetic literacy and health equity. *Hum Reprod*, 2025. DOI: 10.1093/humrep/deaf135. ([†]Joint first author)

- **P Cao**, G Acharya, A Salumets, M Zamani Esteki. Large language models to facilitate pregnancy prediction after in vitro fertilization. *Acta Obstet Gynecol Scand*, 2025. DOI: 10.1111/aogs.14989

- **P Cao**, J Derhaag, E Coonen, H Brunner, G Acharya, M Zamani Esteki. Generative artificial intelligence to produce high-fidelity blastocyst-stage embryo images. *Hum Reprod*, 2024. DOI: 10.1093/humrep/deae064

- A Janssen[†], R Koeck[†], R Essers[†], **P Cao**, W van Dijk, ..., E Coonen, H Brunner, A van den Wijngaard, A Paulussen, M Zamani Esteki. Clinical-grade whole genome sequencing-based haplarithmisis enables all forms of preimplantation genetic testing. *Nat Commun*, 2024. DOI: 10.1038/s41467-024-51508-1.

- Y Shi[†], BY Miao[†], XX Ai[†], **P Cao**, J Gao, ..., QY Mai, YX Wen, YL Qu, CQ Zhou, YW Xu. Identification of common genetic polymorphisms associated with down-regulated gonadotropin levels in an exome-wide association study. *Fertil Steril*, 2024. DOI: 10.1016/j.fertnstert.2023.03.031.

- **P Cao**, BY Miao, Y Xu, Q Fan, Q Zhang, GR Zhang, CQ Zhou, YW Xu. Role of gene polymorphisms related to progesterone elevation in women undergoing long GnRH agonist protocols. *Reprod Biomed Online*, 2020. DOI: 10.1016/j.rbmo.2019.12.013

- XY Liu[†], Q Fan[†], MF Deng, Y Xu, J Guo, **P Cao**, CQ Zhou, YW Xu. GGN repeat length of the androgen receptor gene is associated with antral follicle count in Chinese women undergoing controlled ovarian stimulation. *Journal of Southern Medical University*, 2025. DOI: 10.12122/j.issn.1673-4254.2025.02.01.

- **P Cao**, D Zhang, B Cai, YW Xu, YB Li. Clinical outcome analysis of single embryo transfer. *Journal of Sun Yat-sen University (Medical Sciences)*, 2019. DOI: 10.3969/j.issn.1672-3554.2019.05.024

- MF Deng, **P Cao**, Q Hua, L Luo, YB Li. A study on the second-child intention and its influencing factors in secondary infertile people. *Chinese Journal of Reproduction and Contraception*, 2019. DOI:10.3760/cma.j.issn.2096-2916.2019.02.011.

Conference Presentations

- European Society of Human Reproduction and Embryology (ESHRE) – Poster, Paris, 2025
- Maastricht University GROW Science Day – Oral, Maastricht, 2025
- European Society of Human Genetics (ESHG) – Oral, Milan, 2025
- Nederland Vereniging van Fertiliteitsartsen (VVF) Symposium – Oral, Utrecht, 2025
- American Society for Reproductive Medicine (ASRM) – Poster, Denver, 2024
- Dutch Society of Human Genetics (NVHG) – Poster, Amsterdam, 2024
- Genetics Retreat NVHG – Oral, Amsterdam, 2024
- European Society of Human Reproduction and Embryology (ESHRE) – Oral, Amsterdam, 2024
- BruMaStra Meeting – Oral, Maastricht, 2023
- Tromsø University IVF-on-a-Chip Meeting – Oral, Virtual, 2022

Awards & Honors

- Chinese Government Award for Outstanding Self-Financed Students Abroad, 2025
- Amrapali Zaveri Award for Early Career Data Scientist, 2025
- European Society of Human Genetics Travel Grant, 2025
- Dutch Society of Human Genetics Best Poster nomination, 2024
- Women in Data Science Maastricht Datathon First Place, 2023
- Guangzhou Elite Project Fellowship, 2021–2025
- Innovation Grant for Outstanding Graduate, 2019-2020
- First-Class Scholarship, 2018–2020
- Provincial Award for Outstanding Graduate, 2017
- Clinical Skills Olympiad First Place, 2016
- National Scholarship, 2015

Licenses & Certifications

- Data Scientist in Python – DataCamp, Apr 2022
- Deep Learning Specialization – Coursera, Jan 2022
- Machine Learning Specialization – Stanford Online, Oct 2021
- Medical Practitioner License – National Health Commission of China, Oct 2018
- English-Chinese Translator Certificate (CATTI) – CICG Academy of Translation and Interpretation, May 2017
- Psychological Counselor Certificate – Ministry of Human Resources and Social Security, Jun 2014

Service & Outreach

- *Volunteer*, UnliMited Student Community, Maastricht, Netherlands — Oct 2023 – Apr 2024
- *Manuscript Reviewer*, Medjaden Inc., Remote — Sep 2021 – Sep 2022
- *Translator*, Ovarian Club CoGen Asia Conference, Hong Kong, China — Dec 2017 & Dec 2018
- *Simultaneous Interpreter*, IVF International Forum, Shenzhen, China — Nov 2017
- *Event Organizer*, World Chinese School Library Forum, Changsha, China — Jul 2017