

# Maxwell Xu Cai

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## EXPERIENCE

### POSTDOC RESEARCHER | LEIDEN OBSERVATORY, LEIDEN UNIVERSITY

September 2016 -- present | Leiden, The Netherlands

- Formation, Evolution and Habitability of Planetary System
- Dynamical coevolution of planetary systems and star clusters
- Deep Learning in Astrophysics
- Dwarf planets, minor objects, and the Oort cloud
- High-performance computing and high-availability distributed file systems

### VISITING SCHOLAR / STUDENT FELLOW

- Astronomisches Rechen-Institut, Zentrum für Astronomie, Aug 2018, Heidelberg, Germany
- Institute for Advanced Study, May 2018 - June 2018, Princeton, NJ, USA
- Chalmers University of Technology, March 2018, Gothenburg, Sweden
- National Astronomical Observatory of Japan, Aug 2017, Tokyo, Japan
- Advanced Institute for Computational Sciences, RIKEN, July 2017 – Aug 2017, Kobe, Japan
- Astronomisches Rechen-Institut, Zentrum für Astronomie, Jun 2016 – Jul 2016, Heidelberg, Germany
- University of California, Santa Cruz, Jul 2015 – Sep 2015, Santa Cruz, CA, USA
- Canadian Institute for Theoretical Astrophysics, Jun 2014 – Aug 2014, Toronto, Canada
- Leiden Observatory, Leiden University, Feb & Jun 2013, Leiden, The Netherlands
- Astronomisches Rechen-Institut, Zentrum für Astronomie, Jan & Jul 2013, Heidelberg, Germany

## EDUCATION

### CHINESE ACADEMY OF SCIENCES | PH.D. IN ASTROPHYSICS

September 2011 -- July 2016 | Beijing, China

- Supervisors: Rainer Spurzem, M.B.N. Kouwenhoven, Douglas N.C. Lin
- Thesis: Dynamical Evolution of Planetary Systems in Star Clusters

### SOUTH CHINA AGRICULTURAL UNIVERSITY | B.SC. IN COMPUTER SCIENCE

September 2007 -- July 2011 | Guangzhou, China

## COMPUTING SKILLS

- Data analysis: NumPy, SciPy, Pandas, Matplotlib, h5py
- Programming languages: Python, C/C++, Java, R, JavaScript, PHP, bash, L<sup>A</sup>T<sub>E</sub>X
- HPC frameworks: CUDA, MPI, OpenMP, Thrust, Boost
- Deep Learning frameworks: TensorFlow, Keras, PyTorch
- Operating systems: UNIX (including macOS), Linux (Red Hat/Ubuntu)
- Database systems: MySQL, PostgreSQL
- Infrastructure: Virtualization, Amazon Web Service, Google Cloud, Docker
- Software Engineering: Object-oriented Programming, git, svn, CI/CD
- Website Development: Drupal, HTML5, CSS

## PROFESSIONAL SERVICE

### STUDENT SUPERVISION

At Leiden University, I have supervised 6 master students for their master research projects (planetary system dynamics, machine learning) and 10 undergraduate students (planetary system dynamics, computational astrophysics), as of November 2018.

### REFEREE IN PEER-REVIEW JOURNALS

- Monthly Notices of the Royal Astronomical Society (MNRAS)
- Astronomy & Astrophysics (A&A)
- Geological Quarterly (GQ)

### SCIENTIFIC ORGANIZING COMMITTEE

- AMUSE workshop, April 2018, Leiden
- Third Dutch Star Cluster Meeting, Feb – Oct 2017, Leiden
- Leiden/ESA Astrophysics Program for Summer Students (LEAPS), Nov 2016 – Aug 2017, Leiden
- Formation of the Solar System and the Origin of Life, Sep 2016 – Feb 2017, Lorentz Center, Leiden
- IAU Symposium #312: “Star clusters and black holes in galaxies across cosmos time”, July – Aug 2014, Chinese Academy of Sciences, Beijing

### PART-TIME IT SPECIALIST

- Kavli Institute for Astronomy and Astrophysics, Peking University, Sep 2011 – Jun 2016, Beijing
- National Astronomical Observatory of China, Sep 2012 – Aug 2016, Beijing

## GRANTS, AWARDS & PROFESSIONAL MEMBERSHIPS

### GRANTS

- Leids Kerkhoven-Bosscha Fonds (LKBF) grant for international conference attendance (2017, 2018)
- 1.5 Million CPU-hours on the Dutch Supercomputer “Cartesius” (2017)

### AWARDS

- Postdoc fellowship, Leiden Observatory (2016-2018)
- KIAA-CAS postdoc fellowship (2016, declined)
- PhD fellowship, National Astronomical Observatory of China (2011-2016)
- Outstanding PhD candidate at the University of Chinese Academy of Sciences (2012/13/14/15)
- NAOC-AMD joint scholarship (2015)

### PROFESSIONAL MEMBERSHIPS

- Junior member of the International Astronomical Union (since 2018)
- Member of the European Astronomical Society (since 2017)

## LANGUAGES

- Native: Chinese, Cantonese
- Advanced: English
- Basic: Dutch, French, German

# PUBLICATIONS

## REFEREED, CORRESPONDING AUTHOR

1. **Cai, M. X.**, Portegies Zwart, S., & van Elteren, A. 2018, *The signatures of the parental cluster on field planetary systems*, MNRAS, 474, 5114
2. **Cai, M. X.**, Kouwenhoven, M. B. N., Portegies Zwart, S. F., & Spurzem, R., 2017, *Stability of Planetary Systems in Star Clusters*, MNRAS, 470, 4337
3. **Cai, M. X.**, Gieles, M., Heggie, D. C., & Varri, A. L. 2016, *Evolution of Star Clusters on Eccentric Orbits*, MNRAS, 455, 596
4. **Cai, M. X.**, Meiron, Y., Kouwenhoven, M. B. N., Assmann, P., & Spurzem, R. 2015, *Block Time Step Storage Scheme for Astrophysical N-body Simulations*, ApJS, 219, 31

## REFEREED, COAUTHOR

1. Van Eylen, Vincent; Albrecht, Simon; Huang, Xu; MacDonald, Mariah G.; Dawson, Rebekah I.; **Cai, Maxwell X.**; Foreman-Mackey, Dan; Lundkvist, Mia S.; Silva Aguirre, Victor; Snellen, Ignas; Winn, Joshua N., 2018, *The orbital eccentricity of small planet systems*, ApJ in press, arXiv:1807.00549
2. Varri, A. L., **Cai, M. X.**, Concha-Ramírez, F., et al. 2018, *A MODEST review*, accepted for publication in ‘Computational Astrophysics and Cosmology’, Computational Astrophysics and Cosmology, Volume 5, Issue 1, article id. 2, 26 pp.
3. Hamers, Adrian S.; **Cai, Maxwell X.**; Roa, Javier; Leigh, Nathan, 2018, *Stability of exomoons around the Kepler transiting circumbinary planets*, MNRAS, 480, 3800
4. Portegies Zwart, S., Torres, S., Pelupessy, I., Bedorf, J., & **Cai, M. X.**, 2018, *The origin of interstellar asteroidal objects like 1I/2017 U1 ‘Oumuamua*, MNRAS, 419L, 17P
5. Qian, P. X., **Cai, M. X.**, Portegies Zwart, S. F., & Zhu, M. 2017, *SiMon: Simulation Monitor for Computational Astrophysics*, PASP, 129, 094503
6. Kouwenhoven, M. B. N., Shu, Q, **Cai, M. X.** & Spurzem, R., 2016, *Planetary systems in star clusters*, MmSAI, v.87, p.630 (2016)
7. Qian, X, **Cai, X.**<sup>‡</sup>, Zhu, M., 2015, *A Study of 3D Visualization of Astronomical Data Based on the Blender*, Astronomy Research and Technology, 12, 2 (in Chinese)
8. Cui, C., Li, J., & **Cai, X.**<sup>‡</sup> et al. 2013, *Robotic Autonomous Observatory Network Review*, Progress in Astronomy, 31, 2 (in Chinese)

## PROCEEDINGS

1. **Cai, M. X.**, Spurzem, R., & Kouwenhoven, M. B. N. 2015, *Planetary Systems in Star Clusters*, Proceedings of the International Astronomical Union, IAU Symposium, Volume 312, pp. 235-236
2. Berczik, P., Spurzem, R., Wang, L., Zhong, S., & Huang, S., **Tsai, M.**<sup>‡</sup>, Kennedy, G., Naso, L., Li, C., 2013, *Up to 700k GPU cores, Kepler, and the Exascale future for simulations of star clusters around black holes*, HPC-UA 2013, Third International Conference “High Performance Computing”, HPC-UA 2013, p. 52-59

<sup>‡</sup> Before 2014, papers were published with names “Tsai, Maxwell” or “Cai, Xu”.

## SUBMITTED

1. A. van Elteren, S. Portegies Zwart, I. Pelupessy, **M. X. Cai** and S.L.W. McMillan, *The survivability of planetary systems in young and dense star clusters*, submitted to A&A.
2. F.Flammini, **Maxwell Xu Cai**, Rainer Spurzem, M.B.N. Kouwenhoven, *RainerPlanetary Systems in Star Clusters: the dynamical evolution and survival*, submitted to IAU proceedings
3. Javier Roa, Adrian Hamers, **Maxwell Xu Cai**, Nathan Leigh, *Moving Planets Around* (book), submitted to MIT Press

## CONFERENCES & PRESENTATIONS

### PRESENTATIONS <sup>†</sup>Presentations in group meetings, lunch talks, and AstroCoffee are not included on this list.

- The 2nd Workshop on Star and Planet Formation Simulation in the Post-K Era, Kobe, Japan (Oct 2018)
- IBM THINK conference, IBM, Amsterdam, The Netherlands (Oct 2018)
- Leiden Observatory Science Day, Leiden University, The Netherlands (Sept 2018)
- SFB881 (Sonderforschungsbereich) Workshop, Heidelberg University (Aug 2018)
- IAS informal astrophysical seminar, Institute for Advanced Study, Princeton, NJ, USA (June 2018)
- Netherlands Astronomy Conference, Groningen, The Netherlands (May 2018)
- Nanjing University Science Forum of Youth Talents, Nanjing, China (May 2018)
- NOVA Network II meeting, University of Groningen, The Netherlands (Oct 2017)
- Third Dutch Cluster Meeting, Leiden, The Netherlands (Oct 2017)
- MODEST-17, Charles University, Prague, Czech Republic (Sep 2017)
- “Moving Planets Around” writing workshop, RIKEN/AICS, Kobe, Japan (Aug 2017)
- Second Dutch Star Cluster Meeting, API/University of Amsterdam (Feb 2017)
- SFB881 (Sonderforschungsbereich) Workshop, Heidelberg University (June 2016)
- Beijing-Nanjing Bilateral Astrophysics Workshop, Peking University, Beijing (May 2016)
- 6th China-Korea Workshop on Stellar Dynamics and Gravitational Waves, National Astronomical Observatory of China (Dec 2015)
- Annual meeting of the Chinese Astronomical Society, Peking University, Beijing (Oct 2015)
- 5th China-Korea Workshop on Stellar Dynamics and Gravitational Waves, Seoul National University (Dec 2014)
- The International Summer-Institute for Modeling in Astrophysics Conference, Canadian Institute for Theoretical Astrophysics, University of Toronto (Aug 2014)
- 4th China-Korea Workshop on Stellar Dynamics and Gravitational Waves, National Astronomical Observatory of China (Dec 2013)
- European Week of Astronomy and Space Science, University of Turku, Finland (Jul 2013)
- Hands-on Workshop on Computational Astrophysics, Lorentz Center, Leiden (Feb 2013)
- 3rd China-Korea Workshop on Stellar Dynamics and Gravitational Waves, Seoul National University (Dec 2012)

### POSTERS

- Exoplanet and Planet Formation Conference, Shanghai Jiaotong University, Shanghai, China (Dec 2017)
- 72th Dutch Astronomy Conference, Radboud University, Nijmegen, The Netherlands (May 2017)
- ISC High Performance, Frankfurt, Germany (Jun 2016)
- Sagan Exoplanet Summer Workshop, Caltech, California, USA (Jul 2015)
- MODEST-15, University of Concepcion, Chile (Mar 2015)
- IAU Symposium #312: Star Clusters and Black Holes in Galaxies Across Cosmos Time, Chinese Academy of Science, Beijing, China (Aug 2014)

### ATTENDANCES

- AI in Practice, Amsterdam Science Park (Oct 2018)
- Formation of the Solar System and the Origin of Life, Lorentz Center, Leiden (Feb 2017)
- NOVA Network II meeting, University of Amsterdam (Feb 2017)
- Contemporary physical challenges in Heliospheric and Astrophysical Models, Ghent (Oct 2016)
- GPU Technology Conference, NVIDIA, Amsterdam (Sep 2016)
- Astro-GR: Gravitational Wave Astronomy 2012, Beijing (Sep 2012)
- IAU XXVIII General Assembly, Beijing (Aug 2012)

## REFERENCES

### **SIMON PORTEGIES ZWART**

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