

# Yi Xu

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## RESEARCH INTERESTS

Planetary geology, Ground penetrating radar, Remote sensing technology, Space big data analysis, Pattern recognition, Computer Architecture

## EDUCATION

<b>Ph.D.</b> in Electrical and Computer Engineering, ECE Department Advisor	UNIVERSITY OF PITTSBURGH, USA December, 2012 Jun Yang
<b>M.S.</b> in Microelectronics Department of Physics Advisor	NANJING UNIVERSITY, Nanjing, China June, 2007 Li Li
<b>B.S.</b> in Physics Department of Physics Advisor	NANJING UNIVERSITY, Nanjing, China June, 2004 Bo Shen

## APPOINTMENTS

- 2021.7~ present    Associate Professor  
SKL of Lunar and Planetary Sciences, Macau University of Science and Technology, Macau
- 2013.7 ~ 2021.7    Assistant Professor  
SKL of Lunar and Planetary Sciences, Macau University of Science and Technology, Macau
- 2012.4 ~ 2013.7    Senior Researcher  
AMD Research China Lab, Beijing, China
- 2007.8 - 2012.3    Graduate Teaching/Research Assistant  
Department of Electrical and Computer Engineering, University of Pittsburgh, USA

## SELECTED JOURNAL PUBLICATIONS

- [1]. X Meng, **Y Xu\***, Q Jin, L Xiao, X Xu, H Liu, "Compositional Constraints of Ice Lobes at the Edge of Martian South Polar Cap and the Possibility for CO<sub>2</sub> Ice," *The Astronomical Journal*, 166:6, Nov. 2023.
- [2]. M Zhang, J Zhao, L Xiao, **Y Xu**, R Bugiolacchi, J Wang, "*Fan-shaped deposits in the northern Hellas region, Mars: Implications for the evolution of water reservoir and climate*", *Icarus* 395, 115470, 2023.
- [3]. R Liu, **Y Xu\***, R Chen, J Zhao, X Xu, "*An improved hyperbolic method and its application to property*

- inversion in Martian Tianwen-1 GPR data*", IEEE Transactions on Geoscience and Remote Sensing (Q1), 2023.
- [4]. Jilin You, Xiaoping Zhang, Hsinchen Yu, Haiyan Zhang, Cunhui Li, Roberto Bugiolacchi, **Yi Xu**, Yi Wang, Pengwei Luo, Liping Chen, etc., "Unveiling the mechanics of lunar regolith erosion through analysis of CE-4 and CE-5 landing images and fluid simulation" Acta Astronautica (Q1), 2023.
- [5]. Ruonan Chen, Ling Zhang, **Yi Xu\***, Renrui Liu, Roberto Bugiolacchi, Xiaoping Zhang, Lu Chen, Zhaofa Zeng, Cai Liu, "Martian soil as revealed by ground-penetrating radar at the Tianwen-1 landing site" Geology (Q1, top 1 of the category), 51(3), pp.315-319, 2023.
- [6]. H Cao, **Y Xu\***, L Xu, L Zhang, R Bugiolacchi, F Zhang, "From Schrödinger to Von Kármán: An Intriguing New Geological Structure Revealed by the Chang'e-4 Lunar Penetrating Radar", Geophysical Research Letters 50 (2), e2022GL101413, 2023. (JCR-Q1)
- [7]. MH Ng, X Zhang, **Y Xu**, L Li, "Major Elements Concentrations in Chang'E-3 Landing Site from Active Particle-Induced X-ray Spectrometer", Remote Sensing 15 (6), 1643, 2023.
- [8]. Mingjie Zhang, Qi Yan, **Yi Xu\***, Long Xiao, Jiannan Zhao, Dingbao Song, Jiang Wang, Shuoran Yu, Zhenkun He, Hansheng Liu, Deshan Cui, Xiaoping Zhang. "Self-weight consolidation process of water-saturated deltas on Mars and Earth," Icarus, 390: 115304, 2023.1.
- [9]. Ting Huang, Qiliang Lai, Long Xiao, Linfeng Gong, Zongze Shao, Hongmei Wang, **Yi Xu**, Ricardo Amils, Cristina Escudero, José M Martínez. "Sediminibacillus dalangtanensis sp. nov., a moderate halophile isolated from hypersaline sediments of the Qaidam Basin in Northwest China," International Journal of Systematic and Evolutionary Microbiology, 71(8), 2022.8.
- [10]. Ruonan Chen, **Yi Xu\***, Minggang Xie, Ling Zhang, Shengli Niu, Roberto Bugiolacchi. "Sub-surface stratification and dielectric permittivity distribution at the Chang'E-4 landing site revealed by the lunar penetrating radar," Astronomy & Astrophysics, 664:A35, 2022.8.
- [11]. Shuai Fu, Zheyi Ding, Yongjie Zhang, Xiaoping Zhang, Cunhui Li, Gang Li, Shuwen Tang, Haiyan Zhang, **Yi Xu**, Yuming Wang, Jingnan Guo, Lingling Zhao, Yi Wang, Xiangyu Hu, Pengwei Luo, Zhiyu Sun, Yuhong Yu, Lianghai Xie, "First report of a solar energetic particle event observed by China's Tianwen-1 mission in transit to Mars," The Astrophysical Journal Letters 934 (1), L15, 2022.
- [12]. Ling Zhang, **Yi Xu\***, Rui Chen, Hon Kuan Wong, Jialong Lai, Xindong Meng, Ruonan Chen, Zhaofa Zeng, Xuan Feng, Cai Liu. "Calculation of dielectric constant, loss property and scattering characteristics from the future martian GPR data," Icarus, 115181, 2022.7.
- [13]. YM Wang, KC Chow, J Xiao, **Y Xu**. "Characteristics of Dust Devils in Two Pre-Selected Landing Regions of the Tianwen-1 Mission—Comparing Observations and Predictions Using Numerical Model," Remote Sensing 14 (9), 2117, 2022.
- [14]. X Xu, **Y Xu\***, X Meng. "SHARAD Observations of Temporal Variations of CO<sub>2</sub> Ice Deposits at the South Pole of Mars," Remote Sensing 14 (3), 435, 2022.
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- [18]. Zhang L, **Xu Y\***, Zeng Z, Li J, Zhang D. "Simulation of Martian Near-Surface Structure and

- Imaging of Future GPR Data From Mars,*” IEEE Trans Geosci Remote Sens. 60, 1-12, 2021. (JCR-Q1)
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- [21]. Lai J, Cui F, **Xu Y\***, Liu C, Zhang L. “*Dielectric Properties of Lunar Materials at the Chang’e-4 Landing Site,*” Remote Sensing, 2021 Oct 11;13(20):4056.
- [22]. Chen L, **Xu Y\***, Li B. “*Comparative Study of the Geomorphological Characteristics of Valley Networks between Mars and the Qaidam Basin,*” Remote Sens. 2021;13(21):4471.
- [23]. Y Dang, F Zhang, J Zhao, J Wang, **Y Xu**, T Huang, L Xiao, “*Diverse Polygonal Patterned Grounds in the Northern Eridania Basin, Mars: Possible Origins and Implications*”, Journal of Geophysical Research: Planets, e2020JE006647, 2020. (JCR-Q1)
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<https://doi.org/10.1038/s41467-020-17262-w>. (JCR-Q1)
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- [35]. Fan Yang, **Yi Xu\***, Kwing Lam Chan, Xiaoping Zhang, Guoping Hu, Yong Li, “*Study of Chang’E-2 Microwave Radiometer Data in the Lunar Polar Region*”, Advances in Astronomy, 2019. (JCR-Q2)

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*Architecture and Code Optimization & HIPEAC*, 2014.

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- [53]. Xiuyi Zhou, Jun Yang, **Yi Xu**, Youtao Zhang, Xuandong Li, "Thermal Management for 3D Processors via Task Scheduling", *IEEE Transactions on Parallel and Distributed Systems*, Jan. 2010.

#### CONFERENCE PUBLICATIONS RECOMMENDED BY CCF (CHINA COMPUTER FEDRATION)

- [1]. **Y. Xu**, J. Yang, R. Melhem, "BandArb: mitigating the effects of thermal and process variations in silicon-photonic network," *Proceedings of the 12th ACM International Conference on Computing Frontiers*, May 2015.
- [2]. Xing Hu, **Yi Xu**, etc. "Thermal-sustainable power budgeting for dynamic threading", the 50<sup>th</sup> *Design Automation Conference (DAC)*, San Francisco, 2014. (CCF-A)
- [3]. Xing Hu, **Yi Xu**, Yu Hu, Yuan Xie, "Swimming Lane: A Composite Approach to Mitigate Voltage Droop effects in 3D Power Delivery Network", the 19<sup>th</sup> *Asia and South Pacific Design Automation Conference (ASP-DAC)*, 2014. (acceptance rate: 31%)
- [4]. Jia Zhan, Matt Poremba, **Yi Xu**, Yuan Xie, "No  $\Delta$ : Leveraging Delta Compression for End-to-End Memory Access in NoC Based Multicores", the 19<sup>th</sup> *Asia and South Pacific Design Automation Conference (ASP-DAC)*, 2014. (**Best Paper Candidate**)
- [5]. Dong Xiang, Yan Zhang, Shuchang Shan, **Yi Xu**, "A Fault-Tolerant Routing Algorithm Design for On-Chip Optical Networks", the 32<sup>nd</sup> *International Symposium on Reliable Distributed Systems (SRDS)*, Portugal, 2013. (CCF-B)
- [6]. **Yi Xu**, Jun Yang, Rami Melhem, "A Process Variation Tolerant Design for Nanophotonic Networks", the *Proceedings of the 39th International Symposium on Computer Architecture (ISCA-39)*, Portland, Oregon, 2012. (**acceptance rate: 47/262=17.9%, CCF-A**)
- [7]. **Yi Xu**, Jun Yang, Rami Melhem, "Channel Borrowing: An Energy-Efficient Nanophotonic Crossbar Architecture with Light-Weight Arbitration", the *International Conference on Supercomputing (ICS)*, Venice, Italy, 2012. (**acceptance rate: 22%, CCF-B**)
- [8]. **Yi Xu**, Yu Du, Youtao Zhang, Jun Yang, "A Composite and Scalable Cache Coherence Protocol for Large Scale CMPs", *25th International Conference on Supercomputing (ICS-25)*, Tucson, Arizona, 2011. (**acceptance rate: 35/161=21.7%, CCF-B**)
- [9]. **Yi Xu**, Bo Zhao, Youtao Zhang, Jun Yang, "Simple Virtual Channel Allocation for High Throughput and High Frequency On-Chip Routers", *16th International Symposium on High-Performance Computer Architecture (HPCA-16)*, India, 2010. (**acceptance rate: 32/175 = 18.3%, CCF-A**)
- [10]. **Yi Xu**, Yu Du, Bo Zhao, Xiuyi Zhou, Youtao Zhang, Jun Yang, "A Low-Radix and Low-Diameter 3D Interconnection Network Design", *15th International Symposium on High-Performance Computer Architecture (HPCA-15)*, Raleigh, North Carolina, pp. 30-41, 2009. (**acceptance rate: 35/184=19%, Nominated for the best paper reward, CCF-A**)

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- [12]. Xiuyi Zhou, **Yi Xu**, Yu Du, Youtao Zhang, Jun Yang, "Thermal Management for 3D Processors via Task Scheduling", *International Conference on Parallel Processing (ICPP-37)*, Portland, Oregon, pp. 115-122, 2008. (acceptance rate: 81/263 = 30%, CCF-B)

## PATENTS

- [1]. **Y Xu**, X Hu, Y Xie, Voltage droop mitigation in 3D chip system, US Patent 10,361,175, 2019.
- [2]. **Yi Xu**, Kaidi Su, Method of Sorting Objects in an Image, Australian Patent No. 2018100159, 2018.
- [3]. Z Wang, Y Xie, **Y Xu**, J Gu, T Cao, Enhancing lifetime of non-volatile cache by injecting random replacement policy, US Patent 9,792,228, 2017.
- [4]. Z Wang, Y Xie, **Y Xu**, J Gu, T Cao, Enhancing lifetime of non-volatile cache by reducing intra-block write variation, US Patent 9,767,043, 2017.
- [5]. **Y Xu**, X Hu, Y Xie, Voltage droop mitigation in 3D chip system, US Patent 9,595,508, 2017.
- [6]. Z Wang, J Gu, **Y Xu**, Method and apparatus related to cache memory, US Patent 9,552,301, 2017.
- [7]. GH Loh, **Y Xu**, JM O'connor, Partitionable data bus, US Patent 9,454,419, 2016.
- [8]. **XU, Yi** and CHEN, Jiayang, Method for Edge Detection, Australian Innovation Patent 2016101504, 2016.
- [9]. **Y Xu**, NS Jayasena, Y Xie, Memory system with region-specific memory access scheduling, US Patent US Patent 11,474,703, 2022.
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## BOOKS

- [1] Long Xiao, **Yi Xu**, "Mars on Earth: Walking in Qaidam Basin", publisher: Macau University of Science and technology, Macau, 2019.
- [2] Y Dang, L Xiao, **Y Xu**, "Mars on Earth: A Study of the Qaidam Basin", Polygon, pp. 199-247, Publisher: World Scientific, 2021.

## RESEARCH PROJECTS

### China Space Agency

**Civil Aerospace Technology Advance Research Project**

*Main geological processes and the habitability of Mars*

**PI of Cooperation**

Jan. 2020-Dec. 2022

900,000 RMB

### Macau Science and Technology Development Fund

*Radar Detection of Subsurface Water Ice on Mars*

**PI**

January 2019 – December 2021

1,155,000 MOP

**ISSI/ISSI-BJ Joint Proposal for International  
Teams in Space and Earth Sciences**

**Member**

*Searching for subglacial water on Mars with orbiting ground penetrating radars* July 2019-June 2021  
40,000 EUR

**Macau Science and Technology Development Fund**

**Co-PI**

*Comparative study of basin evolution of paleo-basins in Terra Sirenum on Mars and the Qaidam Basin:  
Implications for astrobiology study* March 2018 - March 2021  
2,040,500 MOP

Ancient evaporate deposits of chlorides observed on Mars are potential targets for the search for biological signatures on Mars. Due to unavailability of samples from Mars, analog studies in astrobiology are of great importance to search for putative traces of life on martian salt environment. On Earth, terrestrial hypersaline environments of arid regions are the most relevant analogues to these martian regions with regard to the search for preserved biosignatures. Through the studies of playa and salty lakes in Qaidam Basin will enhance our understanding of the potential preservation of molecular biomarkers on Mars.

**Macau Science and Technology Development Fund**

**Co-PI**

*Analog study of typical geomorphology of Qaidam basin and Mars* April 2015 - April 2018  
2,950,000 MOP

The Qaidam Basin is located in a dry, cold, and high UV environment, similar to the surface of Mars. We demonstrate a variety of landforms and also their counterparts on Mars, which include aeolian dunes and yardangs, polygons, gullies, valleys, and fluvial fans. Saline lakes and playas representing different stages of lake evolution in arid environment are also present in the Qaidam Basin and provide promising cases for studying the habitability in Mars-like environments. Results for microorganism isolation suggest that halophiles are the most important fraction in the hypersaline sediments and this may shed light on studying present Martian habitability.

**Open Fund of State Key Laboratory of Remote Sensing Science**

**PI**

*Comparative Study of the Polygonal Surface Structures in the Qaidam Basin and Mars*  
Jan.2017-Dec.2018  
90,000 RMB

Polygonal Surface Structures (PSSs) have been found in ancient terrains on Mars, which were inferred to be playa geologic settings. Abundant PSS landforms within dried and undried playas in the Qaidam Basin, northwestern China, are considered to be excellent analogues for Martian PSSs. For this purpose, we have carried out field works in a dried salt lake in the northwestern Qaidam Basin, complemented with laboratory analysis of collected samples. This work will have important implications for the formation of their counterparts on Mars, and global or regional climatic transitions from wet conditions to arid on Mars.

**Open Fund of State Key Laboratory of Computer Architecture**

**PI**

*Silicon-photonics Network-on-Chip for multi-core System* Nov. 2012-Oct. 2014

20,000 RMB