

## EDUCATION

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- **University of Science and Technology of China** Hefei, China  
*Computer Science; Working toward the Ph.D. degree; Advisors: Yinlong Xu & Min Lyu* 2017.09 - Now
- **Anhui University** Hefei, China  
*Information and Computer Science; B.S. degree; GPA: 3.69/4.0* 2013.09 - 2017.06

## RESEARCH INTERESTS

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My research interests include **distributed storage system**, **data recovery** and **erasure coding**.

## PROJECTS

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- **PDL**. This project proposes an efficient PBD-based (Pairwise Block Design) Data Layout, PDL, to speed up data repair for single node failure in mixed erasure-coded distributed storage systems. It achieves almost uniform distribution, and higher repair performance due to reduced cross-rack traffic and load balance of read and write I/Os during repair process. I design the data distribution method, and the corresponding failure recovery scheme. And I also implement them in Hadoop 3.1.1.
- **SelectiveEC**. This project proposes a balanced scheduling module, SelectiveEC, to dynamically select some stripes to be reconstructed in a batch, and select source and replacement nodes for each reconstruction task. It achieves balanced network recovery traffic, computing resources and disk I/Os against single node failure in erasure-coded storage systems. I design the scheduling algorithm, build the SelectiveEC prototype and validate it by simulation.
- **$D^3$** . The proposed distribution  $D^3$  uniformly distributes data/parity blocks among nodes in large scale erasure-coded distributed storage systems, and minimizes the cross-rack repair traffic against a single node failure. I integrate the distribution  $D^3$  into HDFS-EC module of Hadoop 3.1.0 and evaluate the repair performance over Reed-Solomon codes. In the journal version, I extend it to locally repairable codes, provide efficient strategy to maintain the  $D^3$  data layout after recovery, and conduct more experimental evaluations.
- **A note on one weight and two weight projective  $Z_4$ -codes**. This is the work in my undergraduate. I solve the open problems about algebraic codes, moreover, I work out the diophantine problem and then give the sufficient conditions for the nonexistence of two-Lee weight projective codes over  $Z_4$  with type  $4^{k_1}2^{k_2}$ .

## PUBLICATIONS

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- SelectiveEC: Selective Recovery in Erasure-coded Storage Systems.  
**Liangliang Xu**, Min Lyu, Qiliang Li, Lingjiang Xie, Yinlong Xu and Cheng Li.  
Submitted to 2021 USENIX Annual Technical Conference (USENIX ATC 2021).
- A Data Layout and Fast Failure Recovery Scheme for Distributed Storage Systems with Mixed Erasure Codes.  
**Liangliang Xu**, Min Lyu, Zhipeng Li, Cheng Li and Yinlong Xu.  
Submitted to IEEE Transactions on Computers (TC 2021).
- PDL: A Data Layout towards Fast Failure Recovery for Erasure-coded Distributed Storage Systems.  
**Liangliang Xu**, Min Lv, Zhipeng Li, Cheng Li and Yinlong Xu.  
IEEE International Conference on Computer Communications (INFOCOM 2020) accepted.  
(AR: 268/1354 = 19.8%)
- Deterministic Data Distribution for Efficient Recovery in Erasure-Coded Distributed Storage Systems.  
**Liangliang Xu**, Min Lyu, Zhipeng Li, Yongkun Li and Yinlong Xu.  
IEEE Transactions on Parallel and Distributed Systems (TPDS 2020), 31.10: 2248-2262.

- SelectiveEC: Selective Reconstruction in Erasure-coded Storage Systems.  
**Liangliang Xu**, Min Lyu, Qiliang Li, Lingjiang Xie and Yinlong Xu.  
12th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage 2020) accepted.  
(AR:  $26/64 = 40.6\%$ )
- D3: Deterministic Data Distribution for Efficient Data Reconstruction in Erasure-Coded Distributed Storage Systems.  
Zhipeng Li, Min Lv, Yinlong Xu, Yongkun Li and **Liangliang Xu**.  
33rd IEEE International Parallel & Distributed Processing Symposium (IPDPS 2019).  
(AR:  $102/372 = 27.7\%$ )
- A note on one weight and two weight projective  $Z_4$ -codes.  
Minjia Shi, **Liangliang Xu** and Gang Yang.  
IEEE Transactions on Information Theory (TIT 2017), 63.1: 177-182.

## PATENTS

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- A load balancing repair scheduling method based on erasure code storage system.  
Min Lyu, **Liangliang Xu**, Qiliang Li, Lingjiang Xie and Yinlong Xu.  
Chinese patent No. 202010313968.5, time of application: 2020-04-20.

## SELECTED AWARDS

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- Shenzhen Stock Exchange Scholarship, 2020.
- INFOCOM Student Conference Award, 2020.
- Graduate with Excellent Character and Learning in AHU, 2017.
- Award of Excellent B.E. Thesis in AHU, 2017.
- First-class Scholarship for Academic Science and Technology in AHU, 2016.
- Meritorious Winner of The MCM/ICM contest, 2016.
- AHU Merit Student, 2016.
- National Encouragement Scholarship, 2014/2015/2016.
- Scholarship for Group Study, 2015.
- Second Prize of The Challenge Cup in AHU, 2014.

## PROGRAMMING SKILLS

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- **Programming Languages** : Java. C/C++. Matlab. Python. Linux Shell.
- **Distributed systems** : HDFS. Ceph.

## TALKS

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- **2020.07**: Paper Presentation in INFOCOM 2020, PDL: A Data Layout towards Fast Failure Recovery for Erasure-coded Distributed Storage Systems, Online.
- **2020.07**: Paper Presentation in HotStorage 2020, SelectiveEC: Selective Reconstruction in Erasure-coded Storage Systems, Online.
- **2020.06**: Invited Talk in the 18th ChinaSys workshop, PDL: A Data Layout towards Fast Failure Recovery for Erasure-coded Distributed Storage Systems, Online.