Liangliang Xu

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EDUCATION

- **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

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

PROJECTS

- **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

- 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

- 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

- 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

- **Programming Languages** : Java. C/C++. Matlab. Python. Linux Shell.

- **Distributed systems** : HDFS. Ceph.

Talks

- **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.