# Konstantinos Konstantinidis

Ph.D., Iowa State University, Ames, IA

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## SKILLS

**Proficient**: Python • SQL • AWS • MATLAB • PyTorch • NumPy • MPI • MapReduce
**Good**: C++ • Java • Hadoop • HDFS • Excel • scikit-learn • Bash • Git • Jenkins • Splunk

## EDUCATION

**Iowa State University**                                                                                         Ames, IA
*Ph.D., Electrical and Computer Engineering, GPA: 3.94/4, Advisor: Prof. Aditya Ramamoorthy.*          December 2022 (expected)
**Technical University of Crete**                                                                          Crete, Greece
*Diploma (5-year program), Electrical and Computer Engineering, GPA: 3.4/4, Advisor: Prof. George Karystinos.*          Dec. 2016

## INDUSTRY EXPERIENCE

**Software Engineering Intern at C3.ai** | *Java, Python, AWS, Jenkins, Splunk.*     Redwood City, CA | 06/2021 – 08/2021
Implemented an end-to-end framework for cluster failure prediction; the framework has two components. The first one is the data pipeline which loads cluster health metrics, handles missing data and creates a training data set. The second component is the ML pipeline which trains a model and makes predictions regarding the cluster's state as soon as new test data becomes available. Followed the process of continuous integration / continuous deployment (CI/CD).

## RESEARCH PROJECTS

**ByzShield: Robust distributed learning** | *Python, PyTorch, AWS, MPI, Bash.*                     01/2020 – 04/2021
Developed a novel defense for distributed deep learning scenarios in which computing devices may return erroneous or malicious gradients in an effort to fool the training. The method is robust to the most sophisticated attacks and achieves on average a **20**% increase in top-1 accuracy on the **CIFAR-10** dataset over defenses suggested by prior work. It maintains training convergence even when **30**% of the devices behave adversarially and enjoys a **36**% reduction on the fraction of corrupted gradients.

**CAMR: Aggregated MapReduce over multiple jobs** | *Python, AWS, MPI, Bash.*                     12/2018 – 04/2020
Proposed a method, named *CAMR*, which reduces the MapReduce communication overhead when the desired functions can be aggregated (amenable to deep learning applications). It achieves state-of-the-art communication load but with an exponentially smaller requirement on the minimum number of jobs. Its speedup is **4.3**× over the baseline approach.

**Staggler mitigation in matrix multiplication**                                                      07/2018 – 01/2019
Proposed and implemented a technique to tolerate the presence of *stragglers*, i.e., servers which periodically suffer from slow computation. Our algorithm can alleviate a higher number of slow servers than related work and requires approximately **80**% of the time needed by prior methods on actual AWS EC2 simulations.

**MapReduce communication load reduction** | *C++, AWS, MPI, Hadoop, HDFS, Bash.*                     05/2017 – 12/2018
Proposed an algorithm to reduce **MapReduce** communication load across the servers. The protocol uses *Single Parity Check* codes and design theory constructions to assign tasks to servers and splits files less finely than prior work. Tweaked the **TeraSort** algorithm (to sort data sets generated and fetched within the **HDFS** system) and adapted it to our scheme. The method uses **MPI** to facilitate communication among the servers. In practical setups, it supersedes the state-of-the-art by **2.6**× and the baseline approach by **4.7**× on AWS EC2 clusters.

## SELECTED AWARDS

- **Best Student Poster Award**, Midwest Machine Learning Symposium (MMLS), June 2019 (link).
- **Teaching Excellence Award**, Iowa State University, May 2019.

## PUBLICATIONS (GOOGLE SCHOLAR)

- **K. Konstantinidis** and A. Ramamoorthy, "Aspis: Robust Detection for Distributed Learning," January 2022 (preprint).
- **K. Konstantinidis** and A. Ramamoorthy, "ByzShield: An Efficient and Robust System for Distributed Training," *Machine Learning and Systems (MLSys)*, April 2021.
- **K. Konstantinidis** and A. Ramamoorthy, "Resolvable Designs for Speeding up Distributed Computing," *IEEE Transactions on Networking (ToN)*, May 2020.
- **K. Konstantinidis** and A. Ramamoorthy, "CAMR: Coded Aggregated MapReduce," *IEEE International Symposium on Information Theory (ISIT)*, Jul. 2019.
- **K. Konstantinidis** and A. Ramamoorthy, "Leveraging Coding Techniques for Speeding up Distributed Computing," *IEEE Global Communications Conference (GLOBECOM)*, Dec. 2018.
- L. Tang, **K. Konstantinidis** and A. Ramamoorthy, "Erasure coding for distributed matrix multiplication for matrices with bounded entries," *IEEE Communication Letters (CL)*, Jan. 2019.