Kevin Williams
Summer 2021 REU
4/6/2021

# 498 Proposal

For the summer of 2021, I will be completing an REU under Professor Roberto Palmiere of Lehigh University. I will be working on the MED project. I will be sponsored by TCNJ's Dr. Knox.

**Problem Statement:**
Any large data repository requires underlying data structures to store and retrieve data efficiently. With large data repositories, there is often a necessity for concurrent access and concurrent programming. The topic of concurrent programming and data structures is often too complex for many.

**Solution:**
MED is a new concurrent Modular and Elastic Data Structure that supports bulk operations. MED is designed to act as a framework to abstract away concurrency and let the users program sequentially, while accessing the data concurrently. Our proposed MED data structure allows us to automatically reconfigure the internal structure to deal with workload fluctuations and different application access patterns. In addition to that, the MED data structure allows for new operations, such as bulk update of a range of keys. The MED data structure is designed to scale to hundreds of cores and on a distributed deployment though the Remote Direct Memory Access technology.

**My Focus:**
Developing a transactional memory implementation of MEDs and studying the impact that transaction memory will have on the system in comparison to the standard mutex lock implementation.

**Logistics:**
1. Work 20-30 hours per week for 13 weeks
2. Meet twice a week with Professor Palmiere for 1 hour intervals
    a. Technical discussions
    b. Professional development discussions, including graduate application preparation
3. Work completed remotely, all interactions through zoom
4. Shared Google docs with progress notes; GitHub code repository
5. Weekly presentations on work to the entire lab group
    a. Presentations archived in shared folder
    b. Engage with other lab members, including graduate students and other REU students

6. A publication will be targeted, with OPODIS 2021 (International Conference on Principles of Distributed Systems) as possible venue or other appropriate distributed systems conference, guided by Professor Palmiere
7. Sponsoring TCNJ Faculty Member: Dr. Knox
    a. Fall 2021 preparation of TCNJ formal presentation, final technical paper, and reflective essay as guided by the CSC Capstone Deliverables.