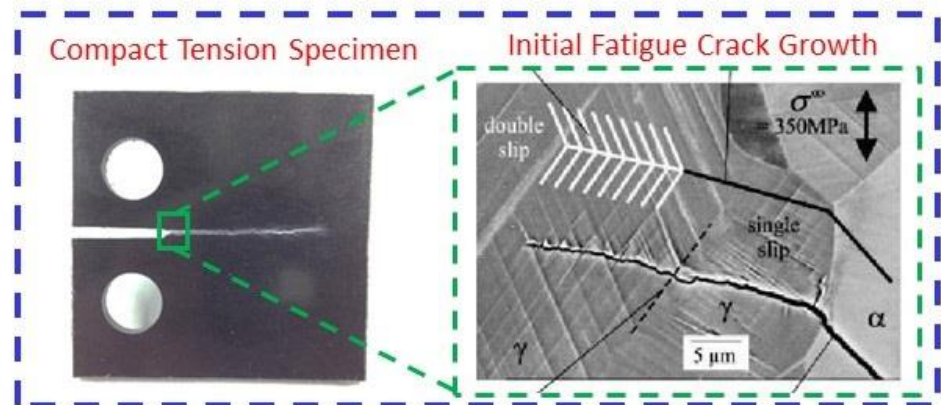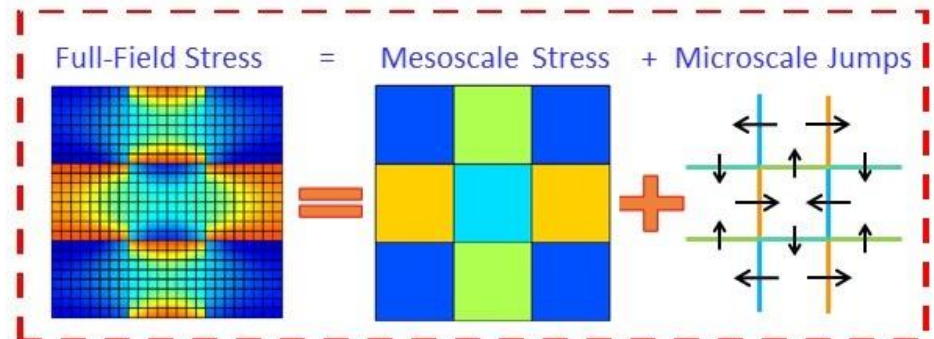# *MdAriful Hasan*
University of Tennessee, Knoxville

Machine learning based microstructural analysis of metal alloys

- Finite Element Analysis
- Multiscale Methods
- Homogenization Theory
- Estimation of fatigue behavior of Ti-Al alloys

Research Objective:
Mesoscale Stress Distribution Effects on Fatigue

Compact Tension Specimen   Initial Fatigue Crack Growth

$\sigma^{\infty} = 350\text{MPa}$

double slip

single slip

γ α

γ

5 μm

Novel Approach:
Multi-Resolution Discontinuous Galerkin Method

Full-Field Stress   =   Mesoscale Stress   +   Microscale Jumps

MdAriful Hasan
University of Tennessee, Knoxville

Computational Challenges

- Big Data

- HDF5

- Parallelization - MPI and OpenMP

- Scalable ML and Optimization

- Develop FE software, so extensive source control, profiling and optimization of codes are also become challenges at some points