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## EXPERIENCE

### Oak Ridge National Laboratory (ORNL)

Knoxville, TN

#### Research Intern

May–Aug 2018, Jun–Dec 2017

- Developed an *optimal tool path traversal algorithm* that uses IP (integer programming) model, based on traveling salesman problem (TSP) for any dense infill problem in 3D printing. Implemented in **Python** / **C++**, using **CPLEX**.
- Developed **C++** module to do *Euler transformation* of Triangle mesh and integrated it with ORNL SLICER 2.
- Tested and integrated variable density hexagonal meshing library in **C++** for ORNL SLICER 2.

### Washington State University

Pullman, WA

#### Graduate Researcher

May 2016–present

- Developed novel *mathematical theory* using combinatorial topology and graph theory as well as *polynomial-time algorithms* to generate continuous tool path using Euler transformation with no crossover for arbitrary infill lattice problem in 3D printing. Implemented the complete framework in Python.
- Proved NP-Completeness of dense fill 3D printing problem and developed scalable algorithms to solve large instances. Implemented in Python using CPLEX. Sample sizes: Buddha 799,716 nodes/169 layers, Bunny 812,733 nodes/360 layers.
- Developing a stable Mapper (from topological data analysis) algorithm for high dimensional data visualization.
- The first author on three manuscripts (see **PUBLICATIONS** below).

### Washington State University

Richland, WA

#### Graduate Research

Jan 2015–May 2016

- Developed a **C++** module in lammmps from scratch for nanoscale fluids, works for both shared memory and distributed shared memory systems.
- Developed a **C++** tool that captures 3D geometry projections on any plane in 3D during simulation in lammmps and a **C** tool to handle pre and post-processing for lammmps involving multiple formats.

### NEi Software

Westminster, CA

#### Finite Element Analysis intern

May 2013–Aug 2013

Integrated and tested a nonlinear optimization solver, **IPOPT** on NEi Nastran that gives better performance in terms of checkerboard and symmetry of design when forces are symmetric.

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## PROJECTS

**Text Classification using Convolution Neural Network (CNN):** Implemented CNN for sentimental analysis of Text data in **Python** using **TensorFlow** and evaluated on Movie Review Dataset on Kaggle with accuracy 62.2% , ranked in top 300(post competition).

**Letter recognition using Artificial Neural network (ANN):** Implemented a scalable binary classification algorithm in **Matlab** using ANN with one hidden layer, on UCI dataset of English letters with accuracy of 93.9% compared to original paper with 80% accuracy.

**Topological Data Analysis using Mapper algorithm:** Implemented Mapper algorithm in **Python** for detecting Topological features such as flares which cannot be identified by a standard principal component analysis.

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## EDUCATION

### Washington State University

PhD in Applied Mathematics

Jan 2015–present

Relevant Coursework: Non-Linear optimization I & II, Network Optimization, Advanced Matrix Computations, Integer and Combinatorial Optimization, Structured Prediction, Artificial Neural Networks, Machine learning, Deep Learning, Bayesian Analysis, Distributed Systems Concepts and Programming, Parallel Computing, Computational Topology

### University of Colorado at Boulder

MS in Simulation based Mechanical Engineering Science

Aug 2012–Dec 2014

Relevant Coursework: Numerical Methods, Applied Mathematics I & II, Markov processes, Queues, and Monte Carlo Simulations.

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## TECHNICAL SKILLS

OpenMP, open MPI, NumPy, Pandas, Cplex, Ipsolve, TensorFlow

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## PUBLICATIONS

1. Prashant Gupta, Bala Krishnamoorthy, Euler Transformation of Polyhedral Complexes, 2018, under revision IJCGA, [arXiv:1812.02412](#) .
2. Prashant Gupta, Bala Krishnamoorthy, and Gregory Dreifus. Continuous toolpath planning in a graphical framework for sparse infill additive manufacturing. Computer-Aided Design, 127:102880, 2020, **SPM 2020**.
3. Prashant Gupta, Bala Krishnamoorthy, Narasimha Boddeti, SFCDecomp: A Space-Filling Curve Based Domain Decomposition Method for Multicriteria Optimized Toolpath Planning in 3D Printing, 2020, submitted.