

Denislav Paris Nikolov

Mailing Address: Upon Request * (909) 576-2408 * dnikolov@umich.edu

EDUCATION

University of Michigan, Ann Arbor, MI

Class of 2025

Doctor of Philosophy in Mechanical Engineering

California State Polytechnic University, Pomona, CA

Class of 2020

Bachelor of Science in Mechanical Engineering, GPA: 3.97

❖ **Minor:** Mathematics

❖ **Honors:** Summa Cum Laude, President's List (4 times), Dean's List (10 times)

RESEARCH EXPERIENCE

University of Michigan, Ann Arbor, MI

August 2020 – Present

Graduate Student Researcher

❖ **Advisor:** Jon Estrada, PhD (Professor of Mechanical Engineering)

❖ **Project:** 3D kinematics for soft material characterization

California State Polytechnic University, Pomona, CA

August 2018 – May 2020

Materials Science and Mechanics Student Researcher

❖ **Advisor:** Mehrdad Haghi, PhD, P.E. (Professor of Mechanical Engineering)

❖ **Project:**

- Fabricated and tested a 3D printed porous vertebrae model, as a candidate for osteoporosis research and vertebral implants
- Project includes 3D CAD modeling and printing of bone, Finite Element Analysis (FEA) of vertebrae under compressive loads, fabrication of apparatus in compressive loading test, and data visualization from compressive load test
- Ultimate goal is to successfully utilize the model with bio materials (hydroxyapatite and collagen fiber composites) as the 3D printed substance to better understand bone diseases, such as osteoporosis, and generate potential replacements for fractured vertebrae in patients

University of Michigan, Ann Arbor, MI

May 2019 – July 2019

Summer Research Opportunity Program (SROP)

❖ **Advisor:** David Kohn, PhD (Professor of Biomedical Engineering and Dentistry)

❖ **Project:**

- Inherited a comprehensive understanding of collagen cross-links in terms of biochemistry and biomechanics
- Conducted experiments to induce advanced glycation end-products (AGEs) cross-links via incubation with ribose, glucose, and glyoxal
- Utilized high-performance liquid chromatography to investigate the collagen composition of powdered bone
- Utilized MatLab to process scanning electron microscope (SEM) images to understand the mechanical properties of fractured bone
- Utilized three-point notch bend tests on dissected mouse bones for compiling data on post-processing
- Ultimate goal is to discover a scientific understanding of why AGEs accumulation negatively impacts bone strength

University of California, Santa Cruz, CA

June 2018 – Sept 2018

NSF Research Experience for Undergraduate Students (REU)

❖ **Advisor:** Marco Rolandi, PhD (Professor and Department Chair of Electrical and Computer Engineering)

❖ **Project:**

- Fabricated and characterized bio-electronic devices used to modulate pH levels in biological buffers
- Material analysis of gold, palladium nanoparticles, silver chloride nanoparticles, PEDOT:PSS, PVA:PSS
- Employed techniques and equipment: Photolithography, Scanning Electron Microscopy (SEM), Spin Coater, Mask Aligner, Ultraviolet Light Exposure, Reactive Ion Etching, Metal Evaporator, Optical Profilometer, Stylus Profilometer, Sonicator, Cyclic Voltammetry, Chronoamperometry, Chronopotentiometry

PROFESSIONAL EXPERIENCE

Quiet Machines, Pasadena, CA

June 2017 – Nov 2017

Programming and Robotics Engineering Intern

- ❖ **Objective:** Created a program that communicates to a motor to allow tracking for a camera that detects movement
- ❖ **Main Skills:** C++ and C programming, computer vision (OpenCV), Linux OS and command terminal
- ❖ **Other Skills:** Hardware and software setup of Nvidia Jetson TX1 (Linux OS with Arm Processor)
- ❖ **Experience:** Utilized advanced programming techniques, including the use of libraries, API and CV homography

Zodiac Aerospace, Ontario, CA

May 2016 – Sept 2016

Manufacturing Engineering Intern

- ❖ **Objective:** Constructed a 3D model of an injection mold to produce parts for an Airbus plane
- ❖ **Main Skills:** Utilized a CAD program known as CATIA to develop the injection mold part and the mold
- ❖ **Other Skills:** Managed Microsoft Excel data sheets for the engineering department, and templates for presentations
- ❖ **Experience:** Developed knowledge for plastics engineering, injection molding and thermoforming principles

LEADERSHIP EXPERIENCE

National Association of Engineering Student Councils (NAESC)

May 2018 – present

- ❖ Board of Directors (May 2020 - Present): Correspond with the board and executive team of NAESC
 - Focused on larger action items and to ensure that NAESC maintains a non-profit status
 - Consulting the conference and competition committee, diversity and inclusion committee, and recruitment
- ❖ Vice President of Recruitment (May 2019 - May 2020): Recruit new member schools into NAESC
 - Lead the recruitment team of NAESC in terms of recruitment, retention, and new council initiation
 - Utilized a recruitment database to increase the size of NAESC by 10%
 - Recruited: South Dakota State University, Wayne State University, University of Oklahoma, Auburn University, University of California - Berkeley, University of North Dakota, University of Maryland - County Park, Indiana University and Purdue University - Indianapolis
- ❖ Western Recruitment Coordinator (April 2018 – April 2019): Manage recruiting schools for NAESC in the west region
 - Correspond with the recruitment team of NAESC in terms of recruitment status in the west region
 - Recruited: San Diego State University, Oregon State University, Utah State University

Cal Poly Pomona Engineering Student Council

June 2017 – May 2020

- ❖ General Council Member (May 2019 - May 2020): General member in charge of miscellaneous activities on the council
 - Lead the team of 10 general council members by incorporating 2 years of experience on the council
 - Assist with events associated with the Engineering Student Council
- ❖ Vice President-Internal (Apr 2018 - May 2019): Correspond with engineering organizations about finances and events
 - Track the meeting minutes, send invitations and meeting minutes to engineering organizations
 - Correspond between 60 engineering organization, the student government and the college of engineering
 - Led a team of an event committee to organize a full-day engineering outreach event with 200 attendees
- ❖ Public Relations (June 2017 - June 2018): Maintained and managed media and publicity for the engineering council

Tau Beta Pi National Engineering Honors Society

April 2018 – May 2020

- ❖ Vice President (October 2019 - May 2020): Assist the president by delegating duties between the board members
- ❖ ESC Representative (August 2018 - April 2019): Attend meetings and share information with the engineering council

Other Leadership Positions

June 2018 – May 2020

- ❖ Sub Team Lead for Cal Poly Pomona Northrop Grumman Collaboration Project (October 2019 - May 2020)
- ❖ Cal Poly Pomona American Society of Mechanical Engineers Mentor (October 2019 - May 2020)
- ❖ Treasurer for Cal Poly Pomona Tough Mudder Run Club (June 2018 - May 2019)

UNDERGRADUATE ACADEMIC PROJECTS

Viscous Drag-Cup System Design and Tracking

Mar 2020 - May 2020

- ❖ Designed a drag-cup system compliant with measuring the speed of a motor by the response of a viscous media
- ❖ Design considerations included motor sizing, sensor selection, mathematical modeling, and signal conditioning
- ❖ Tracking considerations were taken into account using rough theoretical estimates of angular displacement
- ❖ Data acquisition with a microprocessor and LCD monitor were utilized to provide a scheme for calibration

Hydroelectric Power Plant Design and Analysis

Jan 2020 - May 2020

- ❖ Designed a hydroelectric power plant that has a power capacity of 83 MW and a daily energy output of 1800 MW-hr
- ❖ Primary design considerations included sizes and capacities of the turbines, generators, watershed and reservoir
- ❖ Other analysis considerations included environmental impact, historical development, and economic impact

Simulink Double Pendulum Design and Analysis

Oct 2019 - Dec 2019

- ❖ Utilized MatLab and Simulink to successfully model and solve a chaotic system of double pendulums
- ❖ Researched impulse frequency responses, laplace domain analysis, and advanced differential equations
- ❖ Complemented my undergraduate experience academic experiences from 3 MatLab classes to a final capstone design
- ❖ Understood Simulink fundamentals from independent research on block diagrams and systems analysis

ASME A17.1 Compliant Elevator Design

August 2019 - Dec 2019

- ❖ Designed a high speed elevator modeled from the CITIC Tower in Beijing to travel 500 ft at 20 mph
- ❖ Designed a transmission system with a roller chain, planetary gearbox, shaft, hydrodynamic lubricant, and bearings
- ❖ Applied machine elements principles such as AGMA gear analysis, complete shaft design, and planetary gear design

Industrial Food Mixer Power Transmission Design

Oct 2019

- ❖ Designed a high speed food mixer that required to perform kneading, mixing and whipping
- ❖ Designed a transmission system with a roller chain and sprocket system and planetary gearbox
- ❖ Applied principles such as AGMA gear analysis, roller chain power transmission, and planetary gear design

Heat Exchanger Design and Production

Oct 2019 - Dec 2019

- ❖ Designed 4 different heat exchangers that cools heated gasoline utilizing city water as the cooling medium
- ❖ Complemented a comprehensive understanding of heat transfer, fluid mechanics, and thermodynamics
- ❖ Utilized design principles of double pipe heat exchangers, and shell and tube heat exchangers
- ❖ Presented a comparative performance and cost analysis between the various heat exchangers

Milling Cutter Coolant Piping and Pump Design

Sept 2019 - Oct 2019

- ❖ Designed lubrication system for optimizing cutting operations
- ❖ Required a comprehensive understanding of fluid mechanics and advanced convective heat transfer principles
- ❖ Performed a bid submitted to a company on our optimal design choices for the inexpensive pump and pipe

Finite Element Analysis and Design for Novel TV Stand

Apr 2019 - May 2019

- ❖ Designed and optimized a 3D CAD model for an aesthetic TV stand with consideration for common loads
- ❖ Included a comprehensive understanding of finite element analysis theory for application in Femap software
- ❖ Material and manufacturing analyses between aluminum, lime-soda glass, and wood

Piston and Cylinder Materials Science Analysis Report

Nov 2018 - Dec 2018

- ❖ Created comprehensive review of the materials science and metallurgical manufacturing of pistons and cylinders
- ❖ Comparatively studied the difference between the properties of cast iron and aluminum in the operating conditions
- ❖ Included a consideration of oxidation, heat treatment, lubrication, and material strength analysis in the comparison

Multi-Purpose Miniature Vehicle Design

Mar 2018 – June 2018

- ❖ Built and design a vehicle capable of overcoming 4 obstacles:
 - (1): In 45 seconds travel 3 ft. across an incline. Track width: 1ft
 - (2): Pull at least 15 lbs. across 3 ft
 - (3): Go over randomly spaced "bumps" in 10 seconds
 - (4): Go across 8 ft. within 5 seconds. Track width: 1 ft
- ❖ Restrictions: 6 volt power source, no pre-built kits and an \$80 budget
- ❖ Skills Used: Mechanical Design, Electromechanical Design, Rapid Prototyping, Soldering, Wiring
- ❖ Duties: Electrical lead, and gearbox lead in charge of cooperating with other members of the design group

Terraforming Vehicle 3D Model

Mar 2018 – May 2018

- ❖ Constructed a working 3D model of a vehicle
- ❖ Purpose is to carry a 2000-pound load, navigate and excavate rough terrain
- ❖ Utilized Mechanical Design, CAD modeling, Static Analysis, Strength Analysis, Manufacturing
- ❖ Managed the team of engineers as the main CAD designer and strength analysis lead

Fabricated Aluminum Truck Model

Jan 2018 – Mar 2018

- ❖ Fabricated an aluminum casted truck using the techniques learned from a manufacturing processes class
- ❖ Skills Used: Green Sand Casting, Milling, Lathing, Welding, Plastics Molding, Thermoforming, Drilling and Tapping
- ❖ Other topics: Manufacturing Lean Processing, Automation, CNC, Heat Treatment, Sheet Metal Cutting and Bending

3-Axis Motion Tracking Robotic Arm

May 2017 – Nov 2017

- ❖ Implemented computer vision to a program and emit signals to the motors to allow for the camera to freely move
- ❖ Explored C, C++ and their corresponding libraries
- ❖ Collaborated with the motor programming lead in implementing signals that immediately react to the cameras 30 fps
- ❖ Learned to program in a Linux-based environment (Ubuntu)
- ❖ Used NVIDIA Jetson TX1 and implemented a Blackmagic Dark Crystal capture card to store the live video feed

Mini Rose Float Construction

Jan 2017 – Mar 2017

- ❖ Goal: To make a preliminary rose float design to follow the theme of the Cal Poly Rose Float team
- ❖ Chosen as the class leader and collaborated with the design, mechanical and aesthetic teams of the project
- ❖ Mechanical Design: Run a gearbox that allows a run through the course in 5 minutes
- ❖ 4 Animated Features: Firemen running out of building into hospital; fire; firetruck; ambulance
- ❖ Won the competition at the end of the quarter

Raspberry Pi-Bot

Sep 2016 – Dec 2016

- ❖ Assembled hardware of a robot kit and gearbox with small tools and soldering that's programmed in Arduino
- ❖ Implemented light and ultrasonic sensors to navigate a maze
- ❖ Involved Hands on experience with robotics and calculations for mechanical design

Plastics Injection Mold Design

May 2016 – Sep 2016

- ❖ Collaborated directly with the engineering manager and engineering team to design a mold
- ❖ Utilized CATIA V5/V6 CAD to design the part and mold
- ❖ Learned about the components of an injection mold: Cavity, core, runner system, cooling system, ejection pins, slides
- ❖ Applied key design principles for injection molded parts and the mechanism of the injection molding machine

RELEVANT COURSES

❖ Stress Analysis	❖ Engineering Dynamics	❖ Engineering Economics
❖ Engineering Materials	❖ Mechanical Design and Lab	❖ Math Minor Courses
❖ Mechanics of Materials I+II	❖ Thermodynamics I+II	❖ System Dynamics
❖ Materials Science Lab	❖ Programming - MatLab I, VBA	❖ Thermal Systems Design
❖ Machine Design and Lab	❖ Advanced Programming - MatLab II+III	❖ Measurement of Systems
❖ Fluid Mechanics I+II+Lab	❖ Computer Aided Design	❖ Control of Mech Systems
❖ Finite Element Analysis	❖ Manufacturing Processes	❖ Fund of Elec Eng and Lab
❖ Heat Transfer	❖ Manufacturing Processes Lab	❖ Engineering Ethics
❖ Engineering Statics	❖ Statistics for Engineers	❖ Alternative Energy Systems

RELEVANT SKILLS

❖ Programming - MatLab	❖ FEA - FEMAP	❖ Welding (MIG, TIG, Stick)
❖ Programming - VBA	❖ FEA - NASTRAN	❖ Instron Materials Testing
❖ Programming - C/ C++	❖ Mac OS	❖ Scanning Electron Microscopy
❖ Programming - Java	❖ Windows OS	❖ Material Synthesis
❖ CAD - CATIA V5/V6	❖ Linux OS (Ubuntu, Debian)	❖ High Performance Liquid Chromatography
❖ CAD - Solidworks	❖ Linux Terminal	❖ Mechanical Testing
❖ FEA - Autodesk MoldFlow	❖ Milling (CNC, Manual)	❖ Material Characterization
❖ FEA - ANSYS Workbench	❖ Lathing	

PRESENTATIONS

Southern California Conference of Undergraduate Research 2019	<i>Oral Presentation</i>
Annual U-M Summer Research Opportunity Program Research Symposium	<i>Poster Presentation</i>
Cal Poly Pomona 2019 Engineering Symposium	<i>Oral Presentation</i>
Cal Poly Pomona Student Research, Scholarship & Creative Activities Conference	<i>Oral Presentation</i>
9th Annual UCSC Physical and Biological Sciences Summer Research Symposium	<i>Poster Presentation</i>

AWARDS

Tau Beta Pi Engineering Honors Society Fellowship	<i>Awarded May 2020</i>
Rackham Merit Fellowship	<i>Awarded Feb 2020</i>
Tau Beta Pi Engineering Honors Society Scholarship	<i>Awarded May 2019</i>
Boeing Mechanical Engineering Scholarship	<i>Awarded Mar 2019</i>
CSU-LSAMP PROUD Scholarship	<i>Awarded Mar 2019</i>
Sigma Phi Epsilon Balanced Leadership Scholarship	<i>Awarded Mar 2019</i>
NSF CSU-LSAMP Research Fellowship	<i>Awarded Aug 2018</i>
Give and Grow Foundation Scholarship (3-Time Recipient)	<i>Awarded Aug 2016/17/18</i>

CERTIFICATIONS

Microsoft Office Specialist - Excel Specialist 2016	<i>Issued Jun 2017</i>
CATIA V5/V6 Testing Certifications	<i>Issued Aug 2016</i>
Microsoft Office Specialist - Access Specialist 2013	<i>Issued Jul 2016</i>