JOSEPH D. KERN

Materials and Computer Science Engineer, proficient in Arabic

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May 2025 (expected)	PhD in Materials Science & Eng.	GPA 4.0	Georgia Institute of Technology
May 2021 (expected)	Certificate in Public Policy	GPA 4.0	Georgia Institute of Technology
May 2020	BS in Materials Science & Eng.	GPA 3.8	U. of Wisconsin-Madison
May 2020	BS in Computer Science	GPA 3.8	U. of Wisconsin-Madison
Mar 2016	Associate degree in Arabic	GPA 3.9	Defense Language Institute, Monterey, CA
May 2014	Associate degree in Math & Physics	GPA 4.0	Normandale Community College, Bloomington, MN

RESEARCH

Georgia Institute of Technology

Aug 2020-present

As a graduate research assistant in Prof. Rampi Ramprasad's lab, I:

- design a website frontend and backend for experimental data upload, storage, and analysis via React, Flask and PostgreSQL,
- create neural networks (Tensor Flow) and random forest classifiers (Scikit-Learn) to predict the solubility of polymers in solvents,
- utilized genetic algorithm and kernel ridge regression machine learning models to create over 50,000 hypothetical polymers for high-temperature capacitor applications,
- refactored genetic algorithm, implemented migration-based capabilities, and reduced runtime by a factor of five,
- designed and deployed backend interface for polymer retrosynthetic planning via Flask,
- refactored polymer fingerprinting, implemented co-polymer fingerprinting, and reduced runtime by a factor of two,
- designed Qt5 based graphic user interface to automatically graph dozens of Crystal 16 datasheets for chemists.

University of Wisconsin-Madison

May 2019-May 2020

As an undergraduate research assistant in Prof. Dane Morgan's lab, I:

- created graphic user interface to facilitate utilization of machine learning algorithms for three other users,
- increased the speed of data cleaning projects from a week to an hour by developing Python programs,
- generated tens of thousands of hypothetical perovskites with Python and Pymatgen,
- predicted bandgaps of hypothetical perovskites using gradient boosted, kernel ridge, and random forest regression.

Mar 2017-May 2020

As an undergraduate research assistant in Prof. Kumar Sridharan's lab, I:

- programmed a multifunctional data mapping application in MATLAB to analyze EDS data,

- took hundreds of high-resolution SEM images of superalloys,
- quantified elemental makeup of dozens of samples using EDS,
- performed nanoindentation on materials to characterize hardness of oxide patches and intermetallic compounds,
- utilized FIB to cross section micron sized oxide patches,
- took AFM images to quantify roughness of wear patches and oxidized superalloys,
- performed GDOES to quantify elemental depth compositions in surface treated superalloys.

SCIENTIFIC PUBLICATIONS

J. Kern, L. Chen, C. Kim, and R. Ramprasad, "Design of polymers for energy storage capacitors using machine learning and evolutionary algorithms," *J Mater Sci*, Sep. 2021, doi: 10.1007/s10853-021-06520-x.

J. Kern, V. Pauly, M. Clark, D. Grierson, and K. Sridharan, "Effects of Aluminization Via Thermo-Chemical Diffusion on the Wear Behavior of Structural Materials for High-Temperature Gas-Cooled Reactors," *Metall Mater Trans A*, Apr. 2021, doi: 10.1007/s11661-021-06236-2.

L. Chen, **J. Kern**, J. P. Lightstone, and R. Ramprasad, "Data-assisted polymer retrosynthesis planning," *Applied Physics Reviews*, p. 25, 2021. doi: 10.1063/5.0052962

V. Pauly, **J. Kern**, M. Clark, D. S. Grierson, and K. Sridharan, "Wear Performance of incoloy 800HT and inconel 617 in various surface conditions for high-temperature gas-cooled reactor components," *Tribology International*, vol. 154, p. 106715, Feb. 2021, doi: 10.1016/j.triboint.2020.106715.

V. Pauly et al., "High-temperature tribological behavior of structural materials after conditioning in impure-helium environments for high-temperature gas-cooled reactor applications," *J. Nucl. Mater.*, vol. 522, pp. 311–323, 2019.

HONORS & AWARDS

National Defense Science and Engineering Graduate Fellowship (2021)
Competitive fellowship with roughly 5% award rate.

Georgia Institute of Technology President's Fellowship
Competitive fellowship awarded to top 10% of the graduate student applicant at Georgia Tech.

University of Wisconsin-Madison Theodore Herfurth Award: Comprehensive Undergraduate Excellence Honorable Mention
Awarded for founding a club dedicated to the analysis of ethics in materials science, excelling in academics, and for two speeches in given front of committee members.

Army Achievement Medals
- for highest language score possible upon graduating from the Defense Language Institute,
- for graduating with a 95% grade point average, achieving top physical training test results, and excelling before a board of noncommissioned officers at advanced individual military training,
- for leading 59 soldiers at basic combat training.

Distinguished Graduate at Military Basic Combat Training
Acted as platoon guide of 59 other soldiers and achieved a perfect score on the army physical fitness test.

Normandale Community College 2014 Mathematics Scholastic Award
Presented annually to a single student who has excelled in mathematics and physics.

LEADERSHIP

Georgia Institute of Technology

Aug 2021-present	Member of Diversity, Equity, and Inclusion (DEI) Council
Mar 2021-present	Founder and Head of Diversity Initiative for the Graduate Student Advisory Council
May 2021-present	Graduate Mentor for undergraduate and graduate students
Aug 2020-present	Founder and Head of Data Analytics Section of Citizens Climate Lobby

University of Wisconsin-Madison

Apr 2019-May 2020	Founder and Head of Materials Ethics Club
Aug 2019-May 2020	Member of Student Leadership Advisory Council

TECHNICAL SKILLS

I have extensive experience with:

- programming languages C, MATLAB, HTML/CSS, TypeScript/JavaScript, and Python,
- website frontends (React), website backends (Flask), and databases (PostgreSQL),
- machine learning frameworks (Tensor Flow, Scikit-Learn),
- scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Spectroscopy (EDS).

I have intermediate experience with:

- Qt5 and OpenCV,
- focused Ion Beam (FIB), Nanoindentation, Glow Discharge Optical Emission Spectroscopy (GDOES), and Atomic Force Microscopy (AFM).

MILITARY EXPERIENCE

Minnesota National Guard, Bloomington, MN

Nov 2013-Nov 2019 — As a cryptological linguist, I:

- achieved native-like proficiency in Modern Standard Arabic,
- led squad of four soldiers,
- taught signals analysis to soldiers and commanders in platoon.