Elijah Cobb

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🎓 EDUCATION

Doctor of Philosophy, Computer Science　　　　Jan 2022 – present
Michigan Technological University 🔗

Bachelor's of Science, Computer Science　　　　Aug 2018 – Dec 2021
Michigan Technological University 🔗　　　　　　Houghton, USA

💼 PROFESSIONAL EXPERIENCE

Graduate Researcher　　　　　　　　　　　　Jan 2022 – present
Planetary Surface Technology Development Lab 🔗　　Houghton, USA

NASA - LuSTR 🔗
Development of a mobility platform and implementation of test procedures for adapting a percussive cone penetrometer, ground-penetrating radar, and an active Z-stage provided by HoneyBee robotics for NASA. LuSTR aims to develop a thermal model to characterize the lunar subsurface in search of water ice.
Skills: C++, ROS, Concurrent Programming, OpenCV, Python, NodeJS, WebSockets, ReactJS, TypeScript, SCSS, Academic Writing, Testing

PSTDL - HOPLITE Rover 🔗
Development of control, communication, power, mobility, sensors, vision, and autonomy software for the Heavy Onboard Platform for Lunar ISRU and Terrain Excavation (HOPLITE). Developed with C++ and ROS. Its mission control software uses the ASTRA (see below) mission control software library. Presented HOPLITE at LSIC 21.
Skills: C++, ROS, Concurrent Programming, OpenCV, Python, NodeJS, WebSockets, ReactJS, TypeScript, SCSS, Testing

NASA - Watts on the Moon - W^5 🔗
Developing concepts of operations for delivering and storing energy for beneficiation and electrolysis facilities on the lunar surface. Received the grand prize for Phase I and currently designing Phase II submissions.

ASTRA 🔗
Development of a software framework providing all necessary functionality for mission ground control software actively used by NASA T-REX, PSTDL IRGO, and PSTDL HOPLITE for the NASA LuSTR project.
Skills: TypeScript, ReactJS, Design

Undergraduate Research Assistant   May 2020 – Dec 2021
Planetary Surface Technology Development Lab 🔗   Houghton, USA
NASA - T-REX Rover 🔗
Design and development of communication, vision, and control software as
well as designing and following test procedures for the NASA award-winning
rover, the Tethered permanently shadowed Region EXplorer (T-REX). Presented
and won the NASA BIG Idea 2020 Competition.
Skills: C++, NodeJS, TypeScript, ReactJS, UNIX Sockets, ElectronJS, SCSS,
Testing, Academic Writing

PSTDL - IRGO 🔗
Design and development of all software for a 3-axis autonomous gravity
offloading system housed in a lunar simulant chamber. IRGO uses OpenCV with
an infrared LED and camera to continuously provide an upwards force on a
subject to accurately simulate mobility on the lunar surface using the PSTDL's
LHT-01A lunar simulant sandbox.
Skills: C++, OpenCV, Concurrent Programming, Microcontroller Programming

Ph.D. Student and Researcher   Nov 2020 – present
Michigan Technological University 🔗   Houghton, USA
Universal Sensor Definition Schema (USDS) 🔗
Development and validation of a language providing an interface between
sensor data streams using Racket for research supported by the U.S. Navy
through an SBIR (N20A-T010) with Applied Research in Acoustics Inc (ARiA).
Work classified and no further information can be shared.
Skills: TypeScript, NodeJS, Deno, ReactJS.

Undergraduate Research Fellow   Nov 2020 – Dec 2021
Michigan Technological University 🔗   Houghton, USA
Shakudo 🔗
Developed an IDE for undergraduate students to learn the Alloy programming
language. The IDE (named shakudo), allows users to drag and drop discrete
mathematics structures together using Google's Blockly and dynamically edits
the Alloy source code to allow for responsive model simulation.
Skills: TypeScript, ReactJS, ElectronJS, Java, Blockly, Alloy

FEWConscious (FEWCON) Project 🔗
Maintain a Web-App for a research project funded by the National Science
Foundation analyzing the environmental impact. Design and implementation of
a MySQL database linking all project data together. Design of a Web-App for
researchers to access the database in a visual form.
Skills: ReactJS, TypeScript, MySQL, Groovy, NodeJS

Software Engineer Aug 2018 – Feb 2020
Ampel Feedback 🔗 Traverse City, USA
Designed and implemented open-source packages that were used in the backend infrastructure. Consisted of ORM database connectors, REST API generation, authentication, etc. Used packages to develop the entire backend.
Skills: TypeScript, NodeJS, MariaDB, REST API, Database ORM

Frontend Software Engineer Dec 2017 – Aug 2018
Ampel Feedback 🔗 Traverse City, USA
Developed iPad application using a serverless backend that operated as a kiosk collecting in-the-moment feedback from customers at a wide variety of businesses.
Skills: Objective-C, Swift, UIKit, ParsePlatform, NodeJS, JavaScript

Software Engineer Jun 2017 – Dec 2017
Solution Studio 🔗 Traverse City, USA
Developed interactive Facebook Messenger bots for businesses to use in marketing campaigns.
Skills: NodeJS, JavaScript, ManyChat

🎖 AWARDS

NASA BIG Idea 2020 Challenge Finalist & NASA Artemis Award 🔗 Jan 2021
NASA

Undergraduate Fellowship May 2020
Michigan Technological University

📰 PUBLICATIONS

Design and implementation of the Heavy Onboard Platform for Lunar ISRU and Terrain Excavation (HOPLITE) to enable payload development and field testing for lunar and mars applications. Aug 2021
Lunar Surface Innovation Consortium

Testing and Development of the Tethered-permanently shadowed Region EXplorer (T-REX): a rover designed to lay superconducting tether into Lunar PSRs Jun 2021
New Space, Mary Ann Liebert Publishing

Designing Scaffolded Interactive Instruction in Discrete Mathematics Feb 2020

The Tethered permanently shadowed Region EXplorer (T-REX) Jan 2020
NASA BIG Idea

SKILLS

Languages
TypeScript, C/C++, Python, Objective-C, Swift, Rust, Racket, Java, C#

Databases
MySQL, MariaDB, MongoDB, PostgreSQL, ParsePlatform, Firebase

Robotics
ROS, OpenCV, Control Systems, Networking, Systems Programming, Embedded Programming, Systems Engineering

API
REST, WS, GraphQL, Auth

TX
UDP, TCP, HTTP/S, WS/S, I2C, CAN, SPI

Misc
Linux, Ubuntu, NGINX, Firewall, SSH

Web Libraries
ElectronJS, Svelte, ReactJS, React Native, NextJS, Expo

Professional
Git, Academic Writing, Documentation, SCRUM, Agile, Microsoft Office, Google GSuite, Github

PROFESSIONAL SOCIETIES

Lunar Surface Innovation Consortium 🔗
Member of the LSIC mobility subteam. Active with other LSIC events/presentations.

MTU Aerospace Enterprise 🔗
Integration of subsystem software drivers for the "Auris" CubeSat. Auris monitors radio frequencies of satellites while in orbit and is funded by the United States Air Force. The Auris team recently won the AFRL competition and is maturing Auris into a flight-ready model for a launch within the coming years.

First Robotics 🔗
Member of a First Robotics team in high school. Developed software for competition.

PROJECTS

dotmd 🔗
Web-based markdown application that allows users to create and preview Markdown documents on the web. Full markdown/latex support with image uploading, drawing/sketching, virtual file system, etc.
Skills: NextJS, ReactJS, TypeScript, MongoDB, NextAuth

astra 🔗
Set of React components for building robotic control software for ground control stations.
Skills: ReactJS, TypeScript, SASS/SCSS

silicon 🔗
MongoDB ORM written in TypeScript using all advanced features from the TypeScript type system in order to provide safe creation and manipulation of a Mongo database. Used in many of the projects listed here.
Skills: MongoDB, TypeScript, NodeJS

hydrogen 🔗
High-level abstracted type-safe REST API framework. Type-checking and parsing of queries along with functional endpoint building and advanced error handling. This was used in many of the projects listed here.
Skills: NodeJS, TypeScript

oxygen 🔗
Runtime type-checking system enabling type mapping and conditional types in TypeScript. Allows a simple type definition to be passed and recursively verifies any variable against it.
Skills: TypeScript

keybase-bot-builder 🔗
Package aiding in the development of bots for the Keybase platform.
Skills: Keybase, NodeJS, TypeScript.

virtual-choir 🔗
Full-stack Web-App that allows members of a musical group to record video and audio in line with the music. Displays music to users in order for them to sing in time with the group. Created to enable musicians to collaborate during the Covid-19 pandemic.
Skills: TypeScript, NodeJS, MongoDB

pstdl.com 🔗
Skills: NextJS, ReactJS, MongoDB, Markdown, TypeScript, SCSS

vacationvillageelkrapids.com 🔗
Skills: HTML, CSS, SCSS

lessonofthelark.com 🔗
Skills: HTML, CSS, SCSS

🔬 REFERENCES

Dr. Patrick McGarey, *Robotics Engineer*, Jet Propulsion Laboratory
patrick.mcgarey@jpl.nasa.gov

Dr. William Reid, *Robotics Engineer*, Jet Propulsion Laboratory
william.reid@jpl.nasa.gov

Dr. Paul van Susante, *Principal Investigator*, Planetary Surface Technology Development Lab
pjvansus@mtu.edu

Dr. Charles Wallace, *Associate Professor*, Michigan Technological University
wallace@mtu.edu

Craig Einstein, *R&D Scientist and Engineer*, ARiA Acoustics
craig.einstein@ariacoustics.com