

Henry J. Nelson

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EDUCATION

University of Minnesota Minneapolis, MN

August 2017 - Present

PhD in Computer Science

With a focus on 3D reconstruction, vision, and point cloud processing for perception in precision agriculture applications.

Grinnell College Grinnell, IA

August 2013 - May 2017

BA in Physics

INDUSTRY EXPERIENCE

Deere & Company: Sentera

Staff Robotics Engineer

May 2025-present

Development, evaluation, and deployment of machine learning and computer vision algorithms for weed detection, localization, and species classification. Systems supporting both cloud infrastructure and edge devices.

Sentera

Machine Learning Engineer

Computer Vision Engineer

May 2019 - May 2025

Deep learning infrastructure and model development, training and deployment. Algorithm development for automatic analysis and interpretation of drone imagery for applications in precision agriculture. Using both traditional computer vision (3D geometry and image processing) and machine learning approaches.

RESEARCH EXPERIENCE

Center for Distributed Robotics

Graduate Research Assistant

University of Minnesota

May-Aug 2018, Jan 2020-Dec 2023

Various projects including neural implicit representation, sparse shape completion, point cloud segmentation, 3D shape learning, and 3D reconstruction. (PI: Nikolaos Papanikolopoulos, PhD)

Electronic Detector Group

Student Collaborator

Brookhaven National Laboratory

May 2016-Aug 2016

Characterization and measurement of quantum yield for novel scintillating liquids to evaluate their effectiveness as a detection medium for large scale detectors. (PIs: David Jaffe, PhD. Lindsey Bignell, PhD)

Scientific Computing Lab

Research Assistant

University of Minnesota

May-Aug 2014 and 2015

Development and testing of novel machine learning algorithms for pattern recognition in images using wavelets, estimation of large matrix properties, and graph-based dimension reduction methods in an academic research lab. (PI: Yousef Saad, PhD)

Rehabilitation Engineering Research Lab

Research Assistant

Minneapolis VA Hospital

July-August 2014

Software development for interfacing with medical equipment as well as prototype medical device development, eye-tracking systems development, virtual reality graphics programming, and Android app development. (PI: John E. Ferguson, PhD)

TEACHING EXPERIENCE

Department of Computer Science
Teaching Assistant

University of Minnesota
August 2017-December 2019

Preparing and giving weekly lectures, managing other TAs, grading, and office hours. For both undergraduate and graduate level courses. Courses: Automata and Formal Languages; Computer Vision; Artificial Intelligence; and Algorithms and Data Structures.

Department of Computer Science, Department of Physics
Teaching Assistant

Grinnell College
August 2015-May 2017

Instruction of introductory, intermediate, and upper level students in course content, lab preparation, experiment execution, and data analysis in classroom, tutoring, and laboratory settings Courses: Automata, Formal Languages, and Computational Complexity; Mechanics; and Introduction to Electrostatics.

LANGUAGE AND FRAMEWORK PROFICIENCY

Fluent with Python, C/C++, and MATLAB. Extensive experience with Git, PyTorch, Tensorflow, Open3D, OpenCV, NumPy, Numba, and Point Cloud Library (PCL). Working knowledge of Julia, Docker, and AWS (S3, Sagemaker, Batch, DynamoDB).

AWARDS AND LEADERSHIP

Best Agri-Robotics Paper Finalist	IROS	<i>2024</i>
H. George Apostle Prize in Physics	Grinnell College Department of Physics	<i>May 2017</i>
Phi-Beta-Kappa	Grinnell College	<i>May 2017</i>

REFeree SERVICE

IEEE International Conference on Robotics and Automation (ICRA)	<i>2019-2024</i>
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	<i>2019-2023</i>
IEEE Transactions on Intelligent Transportation Systems	<i>2019-2023</i>
IEEE Transactions on Robotics	<i>2024</i>
CVPR Vision for Agriculture	<i>2024-2025</i>

PUBLICATIONS

Ground-Density Clustering for Approximate Agricultural Field Segmentation

Henry J. Nelson and Nikolaos Papanikolopoulos

IROS 2024

Best Agricultural-Robotics Paper Finalist

Robust Plant Localization and Phenotyping in Dense 3D Point Clouds for Precision Agriculture

*Henry J. Nelson, Christopher E. Smith, Athanasios Bacharis,
and Nikolaos Papanikolopoulos*

ICRA 2023

View Planning Using Discrete Optimization for 3D Reconstruction of Row Crops

Athanasios Bacharis, Henry J. Nelson and Nikolaos Papanikolopoulos

IROS 2022

Scalable Methods for Pre-Clustering Point Clouds of Crop Fields

Henry J. Nelson, and Nikolaos Papanikolopoulos

arXiv

Learning Continuous Object Representations from Point Cloud Data

Henry J. Nelson, and Nikolaos Papanikolopoulos

IROS 2020

A Methodology for the Detection of Nitrogen Deficiency in Corn Fields Using High Resolution RGB Imagery

*Dimitris Zermas, Henry J. Nelson, Panagiotis Stanitsas, Vassilios Morellas,
David J. Mulla, and Nikolaos Papanikolopoulos*

TASE 2020

Weed Detection and Classification in High Altitude Aerial Images for Robot-Based Precision Agriculture

Karthik Buddha, Henry J. Nelson, Dimitris Zermas, and Nikolaos Papanikolopoulos

MED 2019

PATENTS

Precision agriculture using pose georeferenced analytics

Andrew Muehlfeld, Henry Nelson, Ryan Nelson, Eric Taipale, Nicholas Witthoeft

Granted

May 2025

TALKS AND PRESENTATIONS

Ground-Density Clustering for Approximate Agricultural Field Segmentation October 2024
Henry J. Nelson and Nikolaos Papanikolopoulos *IROS 2024*

A Methodology for the Detection of Nitrogen Deficiency in Corn Fields Using High Resolution RGB Imagery August 2021
Dimitris Zermas, Henry J. Nelson, Panagiotis Stanitsas, Vassilios Morellas, David J. Mulla, and Nikolaos Papanikolopoulos *CASE 2021*

Learning Continuous Object Representations from Point Cloud Data October 2020
Henry Nelson, Nikolaos Papanikolopoulos *IROS 2020*

Herbicide-Resistant Weed Identification and Classification November 2018
Henry Nelson, Karthik Buddha *IUCRC ROSEHUB Philadelphia*

Weed Identification in Aerial Images of Corn Fields April 2018
Henry Nelson *IUCRC ROSEHUB Minneapolis*