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Faezeh Molaei

Office Address: 234 Forest Resources Building, University Park, PA 16802

EDUCATION

Ph.D. in Agricultural and Biological Engineering, Penn State University, Expected December 2028. GPA: 3.92

- Title of Dissertation: *Individual Tree Delineation, Species Detection, and Above-Ground Biomass Estimation of Mid-Atlantic Mixed Hardwood Forests*

M.Sc. in Mechanical Engineering Applied Design, Isfahan University of Technology, 2018-2021. GPA: 3.44

- Title of Thesis: *Mechanical Design and Analysis of a Grapevine Pruning Robot*

B.Sc. in Biosystems Mechanical Engineering, University of Mohaghegh Ardabili, Ardabil, 2014-2018. GPA: 3.80

HONORS AND AWARDS

- Outstanding Talent Award, University of Mohaghegh Ardabili, 2015, 2016, 2017, and 2018.
- Top 10 Outstanding Student Award, awarded for ranking 1st among the students in the College of Natural Resources, University of Mohaghegh Ardabili, 2016.
- Top 20 Outstanding Student Award, awarded for ranking 1st among the students in the College of Natural Resources, University of Mohaghegh Ardabili, 2015.

GRANT AWARDED

Marc McDill (PI), Jeffrey Catchmark (Co-PI), **Faezeh Molaei (Co-PI)**, "Individual Tree Delineation, Species Detection, and Above-Ground Biomass Estimation of Mid-Atlantic Mixed Hardwood Forests," McIntire-Stennis Capacity Grant, U.S. Dept. Agriculture-National Institute for Food and Agriculture (USDA-NIFA), Nov 20, 2025-Sep 30, 2027, **\$199,756.00**.

- Contributions:

Lead author and primary intellectual contributor

CRedit: Conceptualization, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing,

PUBLICATIONS

1. Y. Yang, P. Mali, L. Arthur, **F. Molaei**, S. Atsyo, J. Geng, L. He, and S. Ghatrehssamani, "Advanced technologies for precision tree fruit disease management: A review," *Comput Electron Agric*, vol. 229, Dec. 2024, <http://doi.org/10.1016/j.compag.2024.109704>
Contributions:
2. **F. Molaei**, P. Mali, S. Ghatrehssamani, "Tractor operators exposure to whole body vibration: An overview," In proceedings of the ASABE annual meeting, ASABE, Anaheim, California July 28-31, 2024, <https://doi.org/10.13031/aim.202401094>.
3. **F. Molaei** and S. Ghatrehssamani, "Mechanical design of a pruning end-effector equipped with a disinfecting mechanism," In proceedings of the 2023 ASABE annual meeting, ASABE, St. Joseph, MI, USA, July 9-12, 2023, <https://doi.org/10.13031/aim.202300157>.
4. **F. Molaei** and S. Ghatrehssamani, "Mechanism design of a vine row-straddling cabin platform for a pruning robotic system," In proceedings of the 2023 ASABE annual meeting, ASABE, St. Joseph, MI, USA, July 9-12, 2023, <https://doi.org/10.13031/aim.202300158>.
5. S. Ghatrehssamani, G. Jha, W. Dutta, **F. Molaei**, F. Nazrul, M. Fortin, S. Bansal, U. Debangshi, J. Neupane, "Artificial intelligence tools and techniques to combat herbicide resistance weed: A review," *Sustainability*, vol. 15, 2023, <https://doi.org/10.3390/su15031843>.
6. **F. Molaei** and S. Ghatrehssamani, "Kinematic-based multi objective design optimization of a grapevine pruning robotic manipulator," *AgriEngineering*, vol. 4, no. 3, pp. 606–625, Jul. 2022, <https://doi.org/10.3390/agriengineering4030040>.
7. G. Shahgholi, T. M. Gundoshmian, **F. Molaei**, and O. Eskandari, "Energy use pattern in production of sugar beet in Western Azerbaijan province of Iran," *Agric. Eng. Int. CIGR J.*, vol. 20, no. 1, pp. 118–127, 2018.

MANUSCRIPTS IN PREPERATION

1. **F. Molaei**, J. M. Catchmark, P. H. Heinemann, D. M. Beyer, B. Withey, S. Ghatrehssamani, "Hyperspectral imaging and broadband determination for mushroom *Lecanicillium fungicola* disease detection and severity level classification", (In preparation for submission to the journal of *Computers and Electronics in Agriculture*).

2. **F. Molaei**, J. M. Catchmark, D. A. Miller, P. H. Heinemann, M. E. McDill, “Pixel-Based Tree Species Detection Using Aerial Hyperspectral Imagery in Mid-Atlantic Mixed Hardwood Forests”, (In preparation for submission to the journal of *GIScience and Remote Sensing*).
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EXPERIENCES

1. Graduate Research Assistant, Penn State University, August 2023 – Present
 - Conducting research on developing a robotic system equipped with spectral imaging for detecting mushroom diseases.
 - Conducting research on Individual Tree Delineation, Species Detection, and Above-Ground Biomass Estimation of Mid-Atlantic Mixed Hardwood Forests.
 2. Teaching Assistant, Forest Management and Planning, Penn State University, spring semester of 2026
 3. Teaching Assistant, Mathematics 1, University of Mohaghegh Ardabili, fall semester of 2014
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CONFERENCE AND PRESENTATIONS

1. Oral Presentation, “Pixel-Based Tree Species Detection Using Aerial Hyperspectral Imagery in Mid-Atlantic Mixed Hardwood Forests,” ForestSat Conference, Gainesville, FL, May4-8, 2026.
 2. Poster Presentation, “Successful detection of Pennsylvania’s Harwood Tree Species via Integrating Aerial Hyperspectral Imagery and AI,” Penn State University Graduate Exhibition, University Park, PA, March 27, 2026.
 3. Oral Presentation, “Tractor Operators Exposure to Whole Body Vibration: An Overview,” ASABE Annual Meeting, Anaheim, California July 28-31, 2024.
 4. Poster Presentation, “NIR Hyperspectral Imaging in Mushroom Disease Detection and Quality Assessment: An Overview,” NABEC Conference, State College, Pennsylvania, July 14-17, 2024.
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PATENTS

Molaei, Faezeh. “An end-effector equipped with a disinfecting mechanism for a robotic grapevine pruning manipulator.” A01G 3/00, 2022.

LANGUAGES

Kurdish (first language)

Persian (native speaker)

English (fluent speaker)

SKILLS

1. Programming & Mathematics Software:

MATLAB (advanced), Python (advanced), Maple (lower intermediate), Lua (beginner)

2. Engineering, GIS, & Data Analysis Software:

SolidWorks (advanced), CoppeliaSim (intermediate), MATLAB Fuzzy Logic Toolbox (advanced), MATLAB Simulink (advanced), MATLAB Machine Learning Toolbox (advanced), Python machine learning and deep learning libraries (advanced), Stella (advanced), QGIS (beginner), Reigl RiScanPro (advanced), LAStools (beginner), ArcGIS (advanced), CloudCompare (intermediate)

3. General Software:

MS Word (advanced), MS PowerPoint (advanced), MS Excel (advanced), Mendeley (advanced).

4. Data acquisition Skills & Sensors:

- Hyperspectral Imaging data acquisition: Specim IQ Camera, Resonon Spectral Imaging Cameras
- Scan planning and data acquisition with laser scanning sensors (lidar sensors): Reigl Terrestrial Laser Scanners

5. Data Analysis Skills:

- Deep learning
- Machine learning
- Heuristic and evolutionary AI algorithms for optimization and control
- Analyzing lidar data
- Analyzing hyperspectral and multispectral data
- Classification and regression model development
- Single objective and multi-objective optimization

6. Engineering skills:

- Mechanism design
- Mechanical design of robotic arms and end-effectors
- Agricultural and forestry machinery design
- Mechanical stress and strain analysis
- Mechanical vibration analysis

- Mechanical dynamics analysis
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PROFESSIONAL AND COMMUNITY SERVICES

1. Science Fair Judge, Pennsylvania Junior Academy of Science (PJAS), 2026.
 2. Founder and Coordinator, Community Carpooling Initiative to Reduce Carbon Emissions, Local Community, 2026, (In Progress).
 3. Mentor, Department of Ecosystem Science and Management Mentoring Program, Penn State University, 2026.
 4. Committee member, College of Agricultural Sciences Graduate Student Advisory Committee, October 2026-Present
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PROFESSIONAL DEVELOPMENT

1. The Business of Science One-Week Bootcamp Entrepreneurship Training Certification, Huck Institute of Life Sciences, Penn State University, June 2026.
 2. Teaching Transferable Skills and Work-Integrated Learning in the College Classroom—A CIRTL Network Training, expected December 2026.
 3. Wilderness First Aid Certification, SOLO Schools, January 2026
 4. Basic CPR/AED-adult and Child CPR Certification, SOLO Schools, January 2026
 5. Shared Voices, Shared Decisions: Sociocracy for Educators and Leaders in Higher Education—A CIRTL Network workshop, December 2025
 6. Overcoming Learning Helpless: Helping Students to Develop Strong Team Skills Through Emotional Intelligence—A 1-part CIRTL Workshop, December 2025
 7. College of Agriculture's Entrepreneurial Springboard Competition finalist, Penn State University, March 2025.
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RESEARCH INTERESTS

- Remote sensing application in forestry
- Digital forestry
- Smart and precision agriculture
- Spectral imaging in forestry and agriculture
- Lidar data in forestry and agriculture
- Machine learning and deep learning in forestry and agriculture

- Classification and estimation modeling in forestry and agriculture
 - Optimization
 - Mechanism design
 - Robotics
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REFERENCES

Dr. Jeffrey Catchmark

- Professor of Agricultural and Biological Engineering, and Bioethics, Penn State University
- Affiliated Faculty of The Rocks Ethics Institute, Penn State University

Email: jmc102@psu.edu

Dr. Marc McDill

- Associate Professor of Forest Management, Penn State University

Email: mmcdill@psu.edu

Dr. Douglas Miller

- Research Professor Emeritus of Landscape Science and Informatics, Penn State University

Email: dam8@psu.edu

Dr. Paul Heinemann

- Professor of Agricultural and Biological Engineering, Penn State University
- Director, Technology in Agriculture and Living Systems Initiative, College of Agricultural Sciences, Penn State University

Email: hzh@psu.edu