Carnegie Mellon University

Manufacturing Futures Initiative (MFI) Postdoctoral Fellowship Program

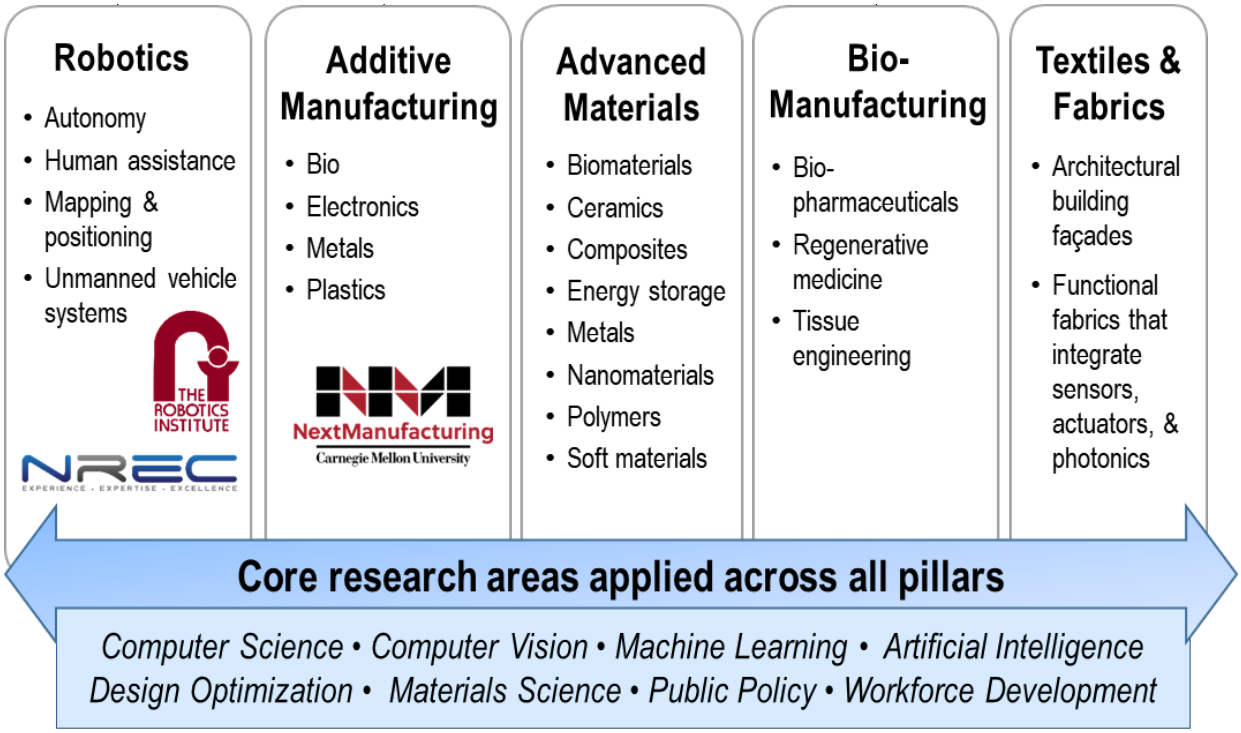
I. About the MFI Postdoctoral Fellowship Program

The MFI Postdoctoral Fellowship Program seeks candidates that will support the vision of MFI by demonstrating leadership in advanced manufacturing technologies, artificial intelligence, integrated design and entrepreneurship, the science of learning, technology policy, and the addressing challenges that cross multiple disciplines.

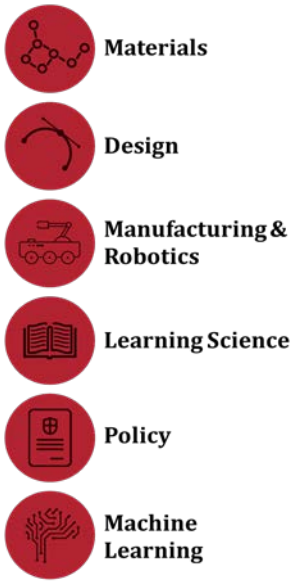
Proposed research must demonstrate a clear fit with the mission, research pillars and areas of academic inquiry and translational opportunity of MFI. Both internal and external applicants will be considered. **Applicants will need confirmed commitment from a CMU faculty mentor** to be considered. Fellowship appointments will be for one year with the option for renewal, subject to annual review and consideration.

II. About MFI

Carnegie Mellon University's Manufacturing Futures Initiative (MFI) is a campus-wide initiative that seeks to enable the future of manufacturing by bringing about a new era of human-machine collaboration that will advance manufacturing, the workforce, and economic development. MFI will highlight, strengthen, support, and advance five pillars of manufacturing research at CMU:



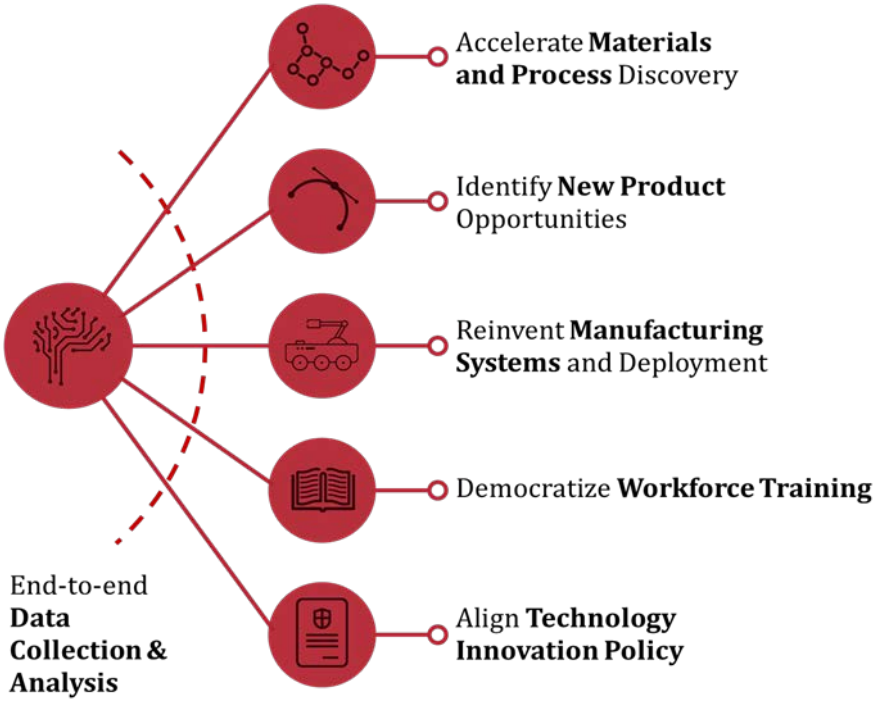
We are working to leverage machine learning, machine vision, and end-to-end data collection and analysis to accelerate the 20-year path from discovery to commercial reality for new materials and processes. We seek to close the loop between materials and process discovery, design of products, workforce training (from scientists and technicians in the lab to designers of products to workers on the shop floor), and the regulation of those new technologies by connecting the algorithms and data between scientists in the lab and the manufacturing shop floor.



Why Carnegie Mellon: Fields pioneered at Carnegie Mellon – additive manufacturing, smart polymers, robotics, and the Internet of things – are among the key technologies transforming production and the future of products. Today, CMU faculty are discovering new advanced-material-based products from self-assembled cellular systems to non-toxic energy generation and storage, to micro-energetic macro-actuators. CMU is a global leader in computer science, boasting nine Turing Award winning-faculty, plus three alumni, having defined the field of machine learning, and having the only machine learning department in the world. CMU has also led the world in computational tools in design, innovation and entrepreneurship: Integrated Product Development set the standard for courses of its kind, and Quantitative Entrepreneurship is one-of-a-kind in its methods. CMU's company spin-out rate is the highest of any U.S. academic institution per federal research dollar invested, with half of CMU spinouts in manufacturing. CMU's Robotics Institute, founded in 1979, is the leading robotics research institute in the world. CMU's Simon Initiative has been transforming education through the science of learning. Finally, CMU is the leader in solving policy problems where the technical details matter. This world leadership in advanced manufacturing technologies, artificial intelligence, integrated design and entrepreneurship, the science of learning, and technology policy, coupled with CMU's unparalleled ability to work problems at disciplinary boundaries, and the generous capital and infrastructure investment of a private donor, are enabling CMU to envision and accelerate the world into the physical and artificial future unlike any other.

Interdisciplinary Collaboration to Ignite the Manufactured Future

Five areas of academic inquiry and translational opportunity – Accelerating materials and process discovery, Identifying new product opportunities, Reinventing manufacturing systems and deployment, Democratizing workforce training, and Aligning technology and innovation policy – form the interdisciplinary scaffold for the Manufacturing Futures Initiative. Synergistically cutting across these five areas are applications of advanced data analytics to recognize linkages and accelerate innovation.



In more detail, these comprise the following activities:

- *Accelerating Materials and Process Discovery:* Leverage psychology, machine learning, machine vision and other computational methods a) to optimize the number and nature of physical experiments informing material and process discovery, b) to automatically identify microstructural imperfections and new forms, and c) to connect these imperfections and new microstructural forms to the sources of and science behind such formations, and inform the creation of new materials themselves.
- *Identifying Product Opportunities:* Leverage design, cognitive science, and machine learning to develop expert-guided algorithms to identify in which components to introduce new advanced manufacturing technologies and their optimal designs.
- *Reinventing Manufacturing Systems and Deployment:* Leverage robotics, machine learning and machine vision for in-situ process monitoring and control that inform micro-structural evaluation

and process revision in real time. Leverage robotics, machine learning and machine vision to develop modular, collaborative robotics for flexible post-processing and assembly.

- *Democratizing Workforce Training:* Develop AI-mediated and personalized expertise transfer that can be accessed from mobile devices anytime, anywhere.
- *Aligning Technology Innovation Policy:* Develop the models and data collection systems needed at the local and national level to enable coordinated technology development and workforce development policies, as well as the analysis of their impact.
- *Closing the Loop between Discovery and Commercialization:* Replace physical part inventory with knowledge inventory throughout the life cycle of the part (production, microstructure, and performance in use), and leverage that knowledge for just-in-time guidance for discovery, repair, next-generation part production, and regulation of that next generation.

III. Eligibility

- Completion of PhD or ScD prior to start date
- No more than two years past the date of the doctoral degree at the time of appointment
- Internal and external candidates will be considered

IV. Application

Applicants are required to submit the following materials. Applications will be judged on the qualifications of the applicant, and the quality and applicability of the proposed research to the mission and goals of the Manufacturing Futures Initiative and its potential impact.

- Thesis abstract – one page
- Research proposal – 700-1,000 words (not including references and citations). Research proposals must be aligned with the mission of MFI and demonstrate a clear fit with MFI research pillars and core research areas crossing the pillars. Proposals should be of high overall technical quality and represent novel, interdisciplinary research. Submissions should also convey the impact of the proposed research, including, as applicable, social, economic, policy, and regional impact as well as the potential of the research to generate additional funding.
- Education and background statement – 500-700 words describing your personal background and contributions to advanced manufacturing through your academic career
- Curriculum vitae including publication list
- Writing sample – sample publication or unpublished paper. Please limit to 35 pages (not including references and citations)

- Two letters of recommendation including one from the applicant's PhD thesis advisor, to be sent directly to CMU-MFI@andrew.cmu.edu, that provide detailed assessments of the applicant's qualifications and potential for innovative, ground-breaking independent research
- Letter of support from the CMU faculty mentor who will advise you during your fellowship appointment addressing:
    - applicant's planned research
    - extent to which the applicant will participate in department and campus activities and programs
    - facilities and resources available to the fellow
    - statement confirming that the faculty mentor's department chair supports the items above

    NOTE: Applicants are encouraged to contact faculty currently funded through MFI as well as faculty with research interests that could support MFI.

V. Tenure

The tenure of the postdoctoral fellowship will be no less than 9 months and no more than 12 months, with tenure beginning no earlier than June 1, 2018 and no later than September 1, 2018. Postdoctoral fellowships may not be deferred or delayed. Appointments may be renewed, subject to annual review and consideration.

VI. Stipend and Benefits

- One-year stipend: $60,000
- Carnegie Mellon University full-time staff benefits
- $10,000 will be provided annually for discretionary research expenses including travel

VII. Submission Procedure

- Due date – all application materials must be submitted by 5:00 pm Eastern on January 29, 2018
- Submission process – application materials must be submitted via the CMU MFI Postdoctoral Program online application form
- Two letters of recommendation including one from the applicant's PhD thesis advisor, to be sent directly to CMU-MFI@andrew.cmu.edu
- Candidates will be notified on or before February 15, 2018
- Formal acceptance of the fellowship must be made in writing no later than March 1, 2018