

University of Nebraska
System Science Collaboration Initiative

The primary purpose of the **Collaboration Initiative** is to strengthen the University of Nebraska's research competitiveness by fully leveraging its multi-campus intellectual capacity and research resources. The **System Science Collaboration Initiative** is designed to facilitate and strengthen research collaborations among faculty in engineering, and/or quantitative/data-science with other disciplines, leading to competitive proposals for external funding.

Research Topic Examples

- Improve human wellbeing by modeling, efficacy testing, and implementing demographically targeted policy, educational, and lifestyle interventions designed to alter detrimental/destructive human behaviors (individuals, organizations, government):
 - Develop new data, computational and/or quantitative approaches and methods that will facilitate a better understanding of human and societal systems
 - Predict the impact and efficacy of public policy and/or educational initiatives
 - Predict and mitigate terroristic radicalization and violent extremism
 - Improve and validate system-level climate change models; better predict impacts of mitigation strategies
 - Increase exercise/activity
 - Improve nutritional status
 - Improve understanding of complex scientific issues
 - Improve chronic disease management
 - Reduce addictive behaviors
 - Improve healthcare monitoring
- Restore or improve human function, mobility, and independent living by developing improved tissues, implants, devices, and rehabilitative strategies:
 - Further improve the basic scientific understanding of human mobility and function
 - Develop new devices that improve lost functions in humans
 - Develop new materials or transplants that replace biological constructs in humans
- Improve food - water sustainability and security by developing predictive and optimization models of plant and animal growth in integrated natural and agricultural systems:
 - Understand the role of microbiomes (across water, soil, plants, animals) in integrated natural and agricultural systems
 - Understand and model the environmental consequences of agricultural practices; develop and validate system-level models that predict the impact of practice modifications; develop models for optimized food production systems applicable to Nebraska and the world
 - Combine molecular genetics, traditional breeding, synthetic biology and phenotyping in laboratory, greenhouse, and field settings to improve crop yields and end-product traits under current and/or future climate conditions
- Improve human and animal health by engineering and developing new tools and techniques to speed diagnoses of naturally-occurring and engineered diseases through the development of novel treatment options:
 - Improve the basic understanding of biological systems (including brain and nervous systems, digestive systems, immune systems, etc.) and how they relate to mental and physical health
 - Develop novel vaccines (including production pipelines) and other treatment options for communicable and non-communicable diseases and conditions; including brain-related diseases and conditions
 - Develop new tools, devices, or technologies for human and/or animal imaging and disease/health diagnoses
 - Develop new approaches and strategies to reach/provide health services to currently underserved populations
 - Develop models that will help ensure healthy human-animal systems ("one-health")
- Improve transportation systems:
 - Improve system-level transportation and community design efficiency models that consider infrastructure, financial, environmental, time, quality of life, and other parameters
 - Better model infrastructure deterioration and develop tools to prioritize investments