BRIGHT MINDS, BRILLIANT CITIES

STRATEGIC VISION

Maseeh College of Engineering and Computer Science
PORTLAND STATE UNIVERSITY
A Strategic Vision for a Changing World

In the Maseeh College, we recognize that it is our job to prepare engineers, computer scientists, and citizens not only for the world of today, but also for the world that will be. We must develop and apply new technologies to address complex challenges that are known now and that will doubtless arise. We must rethink cities to be beyond smart, to be brilliant cities that integrate technology for the promotion of improved education, human health, environmental health, resiliency, quality of life, and equity.

In the fall of 2018, the Maseeh College community came together to chart a new strategic vision. In doing so we defined a set of core values that will transcend everything that we do. We defined five major thematic pillars that cut across our academic departments and extend to other colleges at Portland State University as well as to our external partners. We also defined one cross-cutting theme that connects all of our pillars. These major components of our strategic vision are intended as a roadmap for bold actions that will inform future faculty hiring, curriculum reform, the development of new partnerships, investments in teaching and research infrastructure, and extracurricular activities that involve our students, staff and faculty. We strive to be a community of scholars recognized for our deep core values and their effective implementation in all that we do, a recognized national leader in transforming undergraduate engineering and computer science education, and regional to national leaders in solving complex challenges in an ever-changing world.
The need for a greater and more diverse engineering workforce to tackle complex technical challenges while serving as agents of social change requires a reimagining of how engineers are educated. There are tremendous opportunities for advancing engineering education, and in the process to inspire graduates to think beyond traditional engineering paradigms.

The Maseeh College has a reputation for innovation and entrepreneurial thinking, and will lead the advancement of engineering education around these opportunities:

» emphasizing early development of skills and attitudes that go beyond subject mastery, e.g., critical thinking, designing, problem-solving, lifelong learning

» reconstructing curricula to reflect core engineering ideas, practices, and interdisciplinary collaborations

» empowering students to know they can and should be agents of social change

» instilling invention engineering approaches to address societal needs

» designing a welcoming community that will attract non-traditional and under-represented students

» developing a culture of engaged and thoughtful learning
Densification of the built environment provides important challenges and opportunities related to human health. At the same time, the concentration of people in cities provides untapped opportunities for improving human health and well-being.

The Maseeh College of Engineering and Computer Science is well positioned to address these issues and to lead a wide range of efforts aimed at healthier built environments. We will address questions such as:

» How do we protect populations from the spread of infectious agents with environmental pathways, or the well-documented health effects of transportation-related pollutants?

» How can we make the built environment a place of higher quality of life for those with disabilities?

» What new technologies can we develop and apply to monitor human health in such a way that we better understand the effects of the built environment on health, and in doing so change the built environment to make cities healthier?

» Can we develop new platforms for the collection, storage and analysis of health-related data?
Transform the Resiliency of Physical and Cyber Systems

The physical and virtual fabrics of society have become inextricably connected, and that connection will become stronger in the coming decades. This connection leads to tremendous opportunities for improved societal functioning, but also to risk of significant disruption of, and destruction to, human and environmental systems from extraordinary natural and cyber events. These risks necessitate answers to several important questions.

Scholars in the Maseeh College will engage in multi-disciplinary efforts to address these questions and more to enhance the resiliency of built environments:

» How can we improve the design and operation of physical infrastructure such that it returns to pre-event operation as soon as possible after an extraordinary event?

» How do we enhance modeling and analytical approaches to better forecast the expected magnitude and timing of extraordinary events?

» How do we develop more robust cyber-security techniques to thwart, mitigate, and respond to cyber-attacks?

» How can we effectively address evacuation routes and planning for extraordinary events?
PILLAR

Innovate to Improve Planetary Health

The increasingly volatile and unpredictable climate necessitates careful consideration of engineered approaches to lowering the impact of energy production and distribution, energy conservation, and development of novel ways to better understand the environmental impact of engineered systems. The protection of planetary health requires the development and application of new technologies that can serve with widespread applications.

The Maseeh College community will engage in multi-disciplinary efforts to advance these technologies, methods, and strategies, as well as other questions relevant to planetary health:
- How can we innovate for design of lower-impact energy systems?
- How can buildings be better designed to promote both energy conservation and occupant health?
- How can we best advance and use systems for environmental sensing, monitoring and decision-making?
- How can we develop improved methods to mitigate harm to natural ecosystems and create environments that support human well-being?
PILLAR
Weave the Computational Fabric from Sensors to Decisions

The ubiquity of technology for gathering information to drive both individual and city-scale understanding, decision-making, and policy provides great promise for enhancing the quality of urban living. To do so effectively, it is important to ensure that the data collection to decision making process is not biased towards or along social or ethnic boundaries, and that all citizens are provided security, privacy, and fairness with respect to data collected about them.

The Maseeh College is positioned to answer these and other questions related to the harnessing of sensors and associated data for decision making that improves society:

» How do we improve the design and security of devices and technologies that are used for city-scale data collection and decision making?
» Can we develop techniques to ensure the electronic privacy and security of data collected about citizens?
» How do we best develop techniques for deployment and processing of data that are robust to implicit biases?
» What research must be conducted to efficiently and effectively deploy sensors in physical and virtual infrastructures?
CROSS-CUTTING THEME

Data Science and Machine Learning

Extraction of knowledge from seas of data, often in vastly different formats, provenance, and quality is important across all of the thematic pillars described above. To do so will require taking advantage of recent and ongoing advances in data science and machine learning. Getting the maximum value out of data from urban-scale systems requires bringing together disparate sources, carrying out analyses at scale, and presenting results in forms understandable to researchers, decision-makers and citizens.

Effective data science and machine learning will allow Maseeh College researchers to evolve as leaders around each pillar:

» How do we best develop techniques to detect and cope with gaps, noise, and biases in datasets and learned models?
» How do we optimally guarantee availability, privacy and integrity of the data and computations involved?
» What are the rigorous theoretical underpinnings needed to ensure the techniques are methodologically sound?
» How do we ensure techniques that are robust to adversarial attack?
» How do we best develop scalable technologies to gain knowledge from cyber-physical systems?
CORE VALUES

Our shared values are the foundation of our vision and underlie all that we do as a Maseeh College community. As we strive for excellence in all aspects of our mission, we choose to do so with honesty, transparency and integrity, and with respect for others and the value of their contributions. We are strongly committed to social equity and expanding opportunities for social mobility for our students and the communities that we serve. The Maseeh College is an open and safe place and we welcome and foster diversity in people and ideas.

We value being an access university, serving nontraditional & underserved communities, providing opportunities for learning outside of the classroom and supporting students to be innovators. Our graduates are remarkably resilient, socially-aware lifelong learners. Our research is characterized by engagement with the engineering community, service to the Oregon economy, and collaborative partnerships.