Distinguished University Innovator of the Year 2018

Dr. Mingyan Liu

U-M Tech Transfer
IMPACT REPORT

UNIVERSITY OF MICHIGAN

It's my pleasure to share our report on the exciting impact of technology commercialization at the University of Michigan in 2018. Our innovators continue to inspire us, developing research discoveries that have the potential to change the world, save lives, enhance societal well-being, and drive economic growth.

Since joining the University of Michigan in early 2018, the Tech Transfer team and I have made significant progress in charting the future course for U-M's technology commercialization efforts. Working collaboratively with our internal and external stakeholders, we have completed a comprehensive review of our office's mission, vision, and values. And we have created a strategic plan that is an authentic and actionable expression of our vision, hope, and aspirations for technology commercialization at U-M.

We have worked together to augment our office's infrastructure, to enhance the services we provide to our U-M innovators, and to improve our relationships and connectivity with our region's entrepreneurial ecosystem. We are always striving to improve the service that we provide to our innovators, and to ensure we are leveraging every resource available to increase the impact of U-M research discoveries. If you are interested in working with us, please know that our door is always open.

We are inspired to redefine how world-class university research can fuel a region and solve the world's greatest challenges. We have a legacy worthy of celebration, and the best is yet to come.

KELLY B. SEXTON, PhD
Associate Vice President for Research,
Technology Transfer and Innovation Partnerships
University of Michigan

PROFESSOR MINGYAN LIU
2018 Distinguished University Innovator

For over a decade, **MINGYAN LIU** worked primarily on resource allocation problems in mobile, ad hoc, and wireless sensor networks. Her focus changed in 2013 when she assisted a colleague by devising approaches for modeling a set of Internet measurement data able to capture spam, phishing, and other malicious activities. Ultimately, by aggregating the malicious data along organizational boundaries, Liu and her team were able to determine the likelihood of a data breach with 90 percent accuracy. In 2014, they launched QuadMetrics, a start-up that offered services for gauging an organization's overall cybersecurity, provided companies with decision support tools for planning security budgets, and enabled cyber insurance providers to determine premium levels. Within 18 months, QuadMetrics was acquired by FICO, a California-based software analytics company that specializes in measuring consumer credit risk. Using the QuadMetrics core technology, the company has since gone on to launch an enterprise security score.

"As Chair of Electrical and Computer Engineering, my goal is to stress the importance and imperative of innovation, to build new collaborative opportunities with other U-M units, and to encourage students and faculty to take creative risks and adopt new and novel methods when searching for solutions. ECE is both broad and fundamental, a natural bridge into many other areas and disciplines. A lot of interesting things happen when people with different backgrounds are driven together by common objectives of social utility and impact."

— MINGYAN LIU, PhD
Peter and Evelyn Fuss Chair of Electrical and Computer Engineering (ECE)
Principal Investigator, U-M Multidisciplinary Research Initiative Program (MURI)

Censys founders Brian Kelly and Alex Halderman

CENSYS
Leveling the Playing Field for Organizational Defenders

For decades, malicious actors have used illegal means to scan the Internet and pinpoint potential targets, driving up the annual global cost of cybercrime to $2 trillion. Until recently, corporate security teams lacked global visibility to help them spot vulnerable areas and secure their assets. That changed in 2013, when U-M Computer Engineering professor **ALEX HALDERMAN** and **ZAKIR DURUMERIC** introduced ZMap, a free, open-source Internet scanning tool that enabled scientists and cybersecurity professionals to proactively identify vulnerable infrastructure and defend against potential threats. In 2017, the two teamed up with graduate student **DAVID ADRIAN** and entrepreneurs **BRIAN KELLY** and **DAVID CORCORAN** to launch Censys, a commercial version of their Internet security data service.

"Our goal is to level the playing field, to change the way security operates by making it more quantitative, more precise, and more accurate. With Censys, corporate security teams finally have the tools they need to make efficient connections among massive amounts of data and see what they have connected to the Internet. Armed with this information, they can locate potential security gaps, hunt for threats and malware, and proactively prevent phishing attacks and brand impersonation."

— ALEX HALDERMAN
Professor, Computer Science and Engineering

2018 IN REVIEW
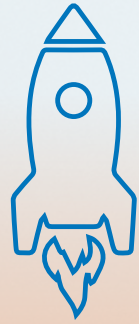
21 NEW BUSINESS STARTUPS

Akadeum
Censys
Fifth Eye
Hantong Technology Company
Kinetica
MPhasics
May Mobility
NeuroLight Technologies
New Vital Signs
NS Nanotech
Omniscent

Oncopia Therapeutics
Optofluidic Bioassay
Parabricks
Phenomics Health
PreDxion Bio
RITMO
Rydberg Technologies
SEMA Labs
STEL Technologies
WhyFit

484 INVENTION REPORTS

MEDICAL SCHOOL	ENGINEERING	LSA	OTHER
235	204	36	93

Subtotal of invention by college is higher than the overall total due to interdisciplinary collaboration involving multiple colleges giving rise to a single invention.

183 U.S. PATENT APPLICATIONS

169 U.S. PATENTS ISSUED

218 LICENSE/OPTION AGREEMENTS

FEATURING **296** DISTINCT TECHNOLOGIES

3,758 TECHNOLOGIES UNDER MANAGEMENT

LICENSE/OPTION AGREEMENTS

2013	2014	2015	2016	2017	2018
108	148	164	173	173	218
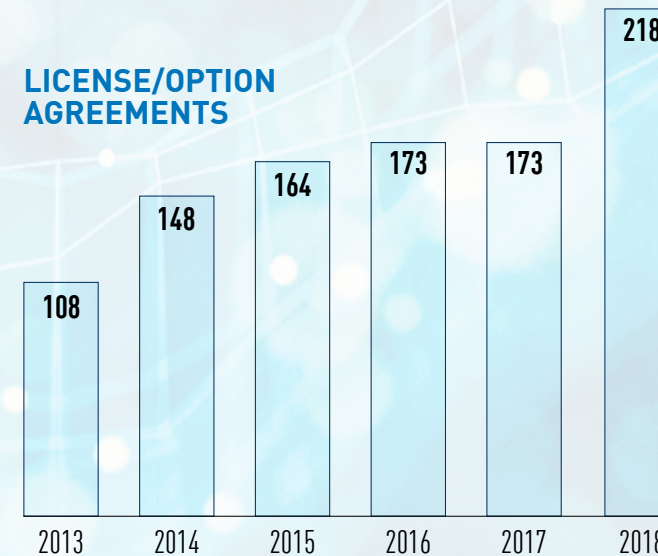
$363M RAISED BY U-M STARTUPS

3 U-M STARTUP EXITS
ACQUISITIONS & IPOs

$11.8M FY 2018 LICENSING REVENUE

18 COMPANIES IN VENTURE ACCELERATOR

Inmatech
ONL Therapeutics
HygraTek
Mountain Pass Solutions
STEL Technologies
CubeWorks
Endectra
PhasiQ
Arborsense
Elegus Technologies
Global Health Management Research Core
Mekanistic Therapeutics
MoxyTech
Opsidio
Cartox
MPhasics
iReprogram
GreenMark Biomedical

PHENOMICS HEALTH, INC.
Increasing the Safety and Efficacy of Precision Medicine Through Next-Generation Clinical Decision Support Tools

For decades, pharmacogenomic researchers have pursued drug-gene testing as a way of reducing medication side effects. Despite advances, the tests have been limited in their predictive ability. In 2017, a U-M team led by **BRIAN D. ATHEY** (left) developed a breakthrough technique for determining how individual genes are impacted by specific drugs in combination with external factors such as ethnicity and environment. The result is a highly predictive profile of a patient's unique drug response. Working with Tech Transfer, Athey and biotechnology entrepreneur **JAMES S. BURNS** evaluated the potential applications of the software, and created a plan that would both see the technology protected and move the technology forward. The two launched Phenomics Health, Inc. in 2018. Validation studies for their patent-pending Pharmacophenomic Clinical Decision Support Platform will soon be underway.

"**Every year, millions of people suffer inadequate outcomes or severe side effects from inappropriate medications. By providing an exhaustive analysis of gene networks and how their behaviors are regulated in response to specific drugs, our Clinical Treatment Drug Decision Support Platform can increase the precision of drug prescribing across multiple healthcare areas, disease categories, and medical disorders. Ultimately, this discovery has the potential to streamline patient care, avoid adverse events and drug reactions, and enable medical practitioners to deliver better healthcare.**"

— BRIAN ATHEY, PhD
Michael Savageau Collegiate Professor
Chair, Department of Computational Medicine and Bioinformatics
Director, Data Science Initiative

U-M TECH TRANSFER TEAM, 2018
Front Row (l-r): Ed Pagani, Jeremy Nelson, Anne Juggernauth, Abha Wiersba, Diane Rice, Carmen Atkins, Kelly Sexton, Luana King, Meera Vijan, Lisa Johnson, Debbie Watkins, Jodie Richardson; **Second Row:** Steve Maser, Rick Brandon, Richard Greeley, Kendra Walter, Kristen Wolff, Janani Ramaswamy, Dave Repp, Chuck Cole, Mark Maynard, Tammy Swickerath, Joohee Kim; **3rd Row:** Bryce Pilz, Tiefei Dong, Kate Remus, Bruce Markham, Dave Gregorka, David Olson, Doug Finch, Jena Ault, Dave Hartmann; **Back Row:** Keith Hughes, Greg Choiniere, John Corthell, Mike Psarouthakis, Drew Bennett, Bruce Auerbach

Not Pictured: Stefan Koehler, Hui Chen, Don Manfredi

THE JESSICA SOULLIERE OUTSTANDING SERVICE AWARD

This annual report is dedicated to our departed friend and colleague Jessica Soulliere. Jessica's memory will continue to live on at U-M Tech Transfer through the Jessica Soulliere Outstanding Service Award, which recognizes staff members in U-M Tech Transfer for exceptional customer service, performance, and responsiveness.

TECH TRANSFER
UNIVERSITY OF MICHIGAN

THIS YEAR, UNIVERSITY OF MICHIGAN RESEARCHERS DISCOVERED 484 WAYS TO MAKE THE WORLD BETTER

IMAGE ABOVE: Graduate Research Assistant Xiaozhou Che holds an organic tandem photovoltaic cell designed by Electrical Engineering and Computer Science professor Stephen Forrest's research group.

Aerospace Engineering
A-Supervisory Model Predictive Controller for Diesel Engine Emissions Control
Active Aero Device to Attenuate Wind Throb
ADtive: A Computational Fluid Dynamics Solver
Autonomous Vehicle Failure Detection System
Flexible Stretchable Sensor
Nanoparticle Fiber Sizings
pyAerostructure: A Solver for Coupled Aerodynamics and Structural Problems
pyOptSparse: A Common Python Wrapper for Numerical Optimization Software
Simulation Framework for a Complete and Predictive Electric Propulsion Model
Structured Shape Changing Polymers

Anesthesiology
Choking-Resistant Vascular Access Tubing Protector
Fixed Flowmeter for Tracheal Insufflation
Tooth Specific Multi-Sensor Design to Assess Pulp Vitality
Video Cricothyroidotomy

Architecture & Urban Planning
Additive Manufacturing of Nonwoven Textiles
Kinaesthetic Interface for Engaged Learning and Social Interaction
Method for Mass-Customization and Multi-Axial Motion with a Knit-Constrained Actuator
Mobile Fabric Water Tower
Monolithic Thermocasting of Polymer Mixtures for Architectural Applications
Smartphone-Based Automated Ergonomic Risk Assessment

Art & Design
A Simple Tabletop Device to Assist Those with a Hand Tremor Often Associated with Parkinson's Disease

Biologic and Materials Science
Antibiotic Adjuvants for Biofilm Treatment
Cell Reprogramming

Biological Chemistry
Enhanced Expression Strains of E. coli Based on Chromosomal Insertion Locations
Methods for Quantifying Polyphosphate in Biological Samples
Mice Deficient in Phosphorylation of Eukaryotic Translation Initiation Factor 2 Alpha
Polyphosphate and Polyphosphate Derivatives
Programmable RNA Cleavage and Recognition by a CRISPR-Cas9 System

Biomedical Engineering
Biomedical Engineering Course Design
Method for Blunting the Immunosensitivity of Innate Immune Cells Using Nanoparticles
Carbon Fiber in Silicone Nerve Interface Array
Cellular Reprogramming Using Nanoparticles
Fiber-Reinforced Hydrogel Composites for Modeling the Extracellular Matrix
Hydrogel Guidance Tubes for Aligned Tissue Regeneration
Injectable Drug in Colloidal Crystal Gels for Localized Antibiotic Therapy
Kidney Stone Proximity Sensor for Automated Trigger of Laser Lithotripsy
MEMS-Based Single Axis Confocal Endomicroscope
Nanoparticle-Loaded Deformable Microparticles as a Two-Stage Delivery Vehicle for Vascular-Targeting of Therapeutics in Human Diseases
Neonatal Secument Device for Inter-Hospital Transport
Process for Converting Lignocellulosic Biomass to Fumaric and Lactic Acids by Synthetic Fungal Consortia
Oxygen Sensing Microbead
Poly-β-amino Particles as a Novel Acute Lung Injury via Rapid Blocking Neutrophils Migration in the Lungs
Porous Scaffolds to Improve Differentiation of Pluripotent Stem Cells to Beta Cells during 3D Culture
Set-Administered Molecular Imaging Probes for Early Diagnosis and Treatment Monitoring
Simultaneous Imaging And Energy Harvesting Pixel Structure for the Self-Sustained CMOS Image Sensor
Sub-Diffraction/Super-Resolution Imaging, Coding and Decoding of Non-Bleaching Scatterers
Methods and Compositions for Targeting Specific Inflammatory Cells Using Unmodified Poly(lactide-co-glycolide) Materials

Cardiac Surgery
Cardiovascular Perfusion Registry

Cell and Developmental Biology
Chromagnetic Optical Media and Light Modulation Using Chromagnetic Nanoparticles under Ambient Conditions
Anti-Counterfeiting Security Labels with Overt and Covert QR Code
Hexaarylbimidazoles as Efficient Radical Polymerization Photoinhibitors
High Activity Catalysts for Low Temperature Ammonia Synthesis
Hydrogel Materials as Rheometer Tooling for the Transient Delivery of Additives During Mechanical Rheometry
Improved Deadzones for Continuous 3D Printing
Intersecting Multi-Color Irradiation Patterns for Ultra-Rapid 3D Printing
Microfluidic Valve for Irrigation Applications
Methods and Compositions for Improving Fire Retardant Properties of Coatings
Solvent-Based Regeneration Process for Beaded Activated Carbon
Thin Multi-Layer Cell Structures for High-Performance Thermophotovoltaics
Improving Vehicle-to-Infrastructure Network Performance via Redundant, Multipath Transmission
Integrated On-Board Data Collection

Chemistry
Compositions of Polyethylene Glycol as a Universal Nanocarrier for Photodynamic Therapy and Magnetic Resonance Imaging
Dendrimeric Metallacrowns With Unique Optical Properties for Imaging Applications
Difluoromethylene Transfer Reagents
Electrophoretic Concentration and Surface Capture of Dilute Analytes
Infusion of Nitric Oxide Donor Solutions to Enhance Performance of Insulin Infusion Cannula and Integrated Cannula-Sensor Devices
KCNQ Agonist Therapies with 1-Aminonorbornane-Based Scaffolds
Radiolysis Formation by Amphiphilic Polymethacrylate Copolymers
Metal-Organic Framework Materials
Method for Aromatic Fluorination 1
Method for Aromatic Fluorination 2
Mild Nucleophilic Aromatic Fluorination of Aryl Fluorosulfonates
Polymer Nanodiscs Tolerant to pH and Metal Ions
Compositions of 5-Nitrosothiol-Based Nitric Oxide Release Materials for Topical Applications
Succinate Dehydrogenase Inhibitors Containing 1-Aminonorbornanes
SecondLook Organic Chemistry I Mobile Application
Nucleophilic Aromatic Fluoration of Phenolic Derivatives
Tumor Inhibition Using Folate Binding Protein

Civil and Environmental Engineering
Carbon Dioxide Removal System for Heavy Duty Vehicle Exhaust
Dynamic Ice Adaptive Feature Transform
Electroimpedance Spectroscopy of Piezoelectric Actuated Osseointegrated Prostheses for Assessment of Healing and Damage in the Bone-Prosthesis System
Esquirius Water Risk Index
Generalized Resolution Correlative Scan Matching: An Algorithm for Registering Point Clouds to Models, Maps, or Other Point Clouds
High Surface Area Biofilm Structure with Multiple-Pass Recirculation for Biological Treatment
Method for Non-Intrusive Determination of Human Comfort Using Low-Cost Thermographic Cameras
Method for Striating Steel Fibers
Monitoring Systems
Engineered Cementitious Composites for High Tensile Ductility and Photocatalytic Properties
Multistage Bioreactor with Fixed Biofilm Growth for Biological Treatment
Pipe Inspection Path Finding Using Heuristic Optimization
Production of Immune-Response-Stimulating Aerosols by Non-Thermal Plasma Treatment of Airborne Pathogens
Statistical Modeling of Drinking Water System Pipe Breaks in the Absence of System Data
Striated Steel Fibers
Urbano Wireless Sensing Architecture for Smart City Sensor Networks
Vehicle-to-Vehicle Power Transfer: Unleashing a Sharing Economy for Electric Vehicle Charging to Boost Efficiency and Slash Costs

Climate and Space Science
Method for Energy and Matter Delivery
Probability Distribution Function Model to Predict Solar Wind Speed
Spacecraft Orbital Characterization Kit

Computational Medicine and Bioinformatics
A Method to Determine the Effect Size of Epigenome Regulatory Variation and Predict Novel Drug Targets and Configure Pharmacogenomic Diagnostics
Abdominopelvic and Chest Bone Segmentation in CT of CT Volumes
Automated Method to Calculate the Optic Nerve Sheath Diameter
Automatic Filter Pruning Technique for Convolutional Neural Networks
Cardiac Event Prediction System
Computational Framework Utilizing Coalition Game Theory for False Alarm Reduction
Kidney Segmentation for Traumatic Abdominopelvic Injury
Liver Segmentation via Probabilistic Atlas
Localization of the Abdominal Cavity in Axial CT Images
Method and Apparatus for Analysis of Chromatin Interaction Data
Midline Shift Detection in Traumatic Brain Injury
Roulette Transform for Signal Processing
Segmentation of Hematoma in Acute Traumatic Brain Injury
Segmentation of Subdural Hematoma
Spleen Segmentation in Axial CT Volumes via 3D Active Contours

C.W. Mott Administration
Woodson App

Dermatology
Animal Models for Autoimmune Diseases
Disposable Modular Bandage System
Fibroblast Culture Model of Dysregulated Collagen Homeostasis in Aged Human Skin: Identification of Natural Compounds with Restorative Activity
Patch-Based Drug Delivery for Treatment of Basal Cell Carcinoma

Electrical Engineering and Computer Science
A Hand-Held, Directional, Multi-Frequency Probe for Spinal Needle Placement
A Method for Randomized Load Balancing
A Side Channel Attack Immune Secure Measurement Unit
A Workflow and Method for Collective Curation of Conversational Context
Adjusting Donor-Acceptor Group Distances to Reduce the Energy Loss in Organic Solar Cells
Automated Software Bugs Localization
Automatic Speech-Based Longitudinal Emotion and Mood Recognition for Mental Health Monitoring and Treatment
Automotive Radar Scene Simulator
Bi-Level Identification of Web Service Defects
Brushless, Self-Excited Synchronous Field-Winding Machine
Compact and Low Cost Integrated Solid State On-Chip LIDAR System for Mobility Applications
Composite Electrode Structure Providing Global and Local Conductivity and Devices Made Thereof
Compound Metasyntics for Amplitude and Phase Control of Wavefronts
Current Collector Clad with Li-Ion Solid Electrolyte
DetiNN: Addressing Bottlenecks for DNN Execution on GPUs via Synapse Vector Elimination and Near-Compute Data Fission
Method of Detecting and Disclosing Near-Field Occlusions Detected by Cameras and Sensors
Digital Stability Test for Total Hip Arthroplasty: New Concept for Next Generation of Computer Assisted Surgery
Displaced and Dilated Address Space
Distributed Amplifier Architecture
Dynamic Interactive Software Refactoring
Dynamic Watermarking Using Seeded Randomized Pixel Values to Embed GPS Data
Dynamic Watermarking Using Seeded Randomized Pixels to Embed Time Stamp and Date Values with Verification and Validation for Camera Based Sensors
Efficient P-Type Conduction of AlGaN
Electromechanically Actuated Phase Shifter at Sub-Terahertz Frequencies
Encapsulation Approaches for Magnetoelastic Resonators in Intraluminal Prosthesis Monitoring Systems
Ensembles of Moving Target Defenses
Environmental Emotion Sensing
ESGM Stereo Vision
GenAx: A Genome Sequencing Accelerator
General-Purpose Compute-SRAM for In-Memory Compute Applications
High Efficiency Micro-Architecture for Mixing Latency Critical and Throughput Applications in the Presence Long Latency Memory Stalls
High Efficiency Tandem Organic Solar Cell Combining Vacuum-Deposited Front Cell and Solution-Processed Non-Fullerene Back Cell
High Efficiency Tandem Solar Cells Based on Vacuum- and Solution-Processed Sub-Cells
Highly Efficient Organic Ternary Solar Cells by Vacuum-Deposited Method
Highly Reliable Stacked White Organic Light-Emitting Device
Improving End-Of-Turn Detection in Spoken Dialogues by Detecting Speaker Intentions
Improving Vehicle-to-Infrastructure Network Performance via Redundant, Multipath Transmission
Integrated On-Board Data Collection

Integrated Window and Light Source
Java Antipatterns Detection
JavaScript Antipatterns Detection
HideScreen: Method for Privacy Protection of Mobile Device Screen
Low-Power, Long-Range RF Localization Algorithm and System
Memory Processing Unit
Method and Apparatus for Selective Segment Replacement in HAS Video Streaming Adaptation
Method of Spacing Emission Layer and Metal Cathode
Methods for Lowering the Hot-Pressing Temperatures of Garnet Structured Ionic Conductors
Mobile Device Batteries as Ambient Thermometers
Multimodal Sensing of Thermal Comfort for Adaptive Climate Control in Vehicles and Buildings
Multiple Access Wireless Power Transfer
Numerical Representations of Internet Hosts and Network Signatures
Organic Photovoltaic Device Having a Lateral Charge Transport Channel
Pipelining the Molecular Beam Epitaxy Growth Technique for Increased System Throughput
Production Systems Engineering Toolbox
Programmable Manufacturing Advisor for Smart Production Systems
Real-Time Biometric and Motion Monitoring and Feedback for Athletes in Motion and Their Coaches
Refactoring Effort Reduction via Clustering-Based Multi-Objective Search
Ring Oscillator Based All-Digital Bluetooth Low Energy Transmitter
Risk Stratification Tool for Healthcare Associated Infections
Sea of Electrode Arrays: Scalable 3D High-Density High-Aspect-Ratio High-Electrode-Count Micro-Probe Array for Neural Recording and Stimulation
Seeded Value Dynamic Watermarking Injection for Camera Sensor
Self-Oscillating Switched-Capacitor DC-DC Converter
Spoof Surface Plasmon Resonant Tunneling Mode with High Quality and Purcell Factors
System and Method for Highway Vehicle Lane Change Prediction using Structural Recurrent Neural Networks
Systems and Methods for Cost-Aware Classifiers
Theoretical Limit of the Semitransparent Organic Multi-Junction Photovoltaics
TurnsMap: Inferring Left-Turns Information via Mobile Crowdsensing
Two-Level, Fine-Grained Programmable Architecture to Accelerate Deep Learning Workloads
Ultra-Thin Flexible Substrate for Organic Light Emitting Devices with Enhanced Light Extraction Efficiencies
Ultrathin Doping for Triplet Diffusion Emission in Organic Light Emitting Devices
Verdict: Interactive-Speed, Resource-Efficient Query Processor
Voltage-Tunable Variable Polarizer-Analyzer Insert for Microscopes
Wearable Cooler: Application to Seat Cooling and Heating
Web Service Antipatterns Detection
Web Service Quality Prediction
Optimization of Regression Testing for Refactoring

Emergency Medicine
Cousteau - Cohort Discovery Tool
Emergency Critical Care Center
Grounding Day - Real Time Data Simulator
Intracranial Pressure Monitor Enhancement for Cerebral Hemodynamic Monitoring
Motion Artifact and Reduction in a Portable Piezoelectric Based Ring for Non-Invasive Hemodynamic Monitoring
Noninvasive Negative Pressure Ventilation
On Body Procedure Tool Organizer
Project IntEReact
Quantitative Pupillary Light Response: Acquisition and Adjustment
Inpatient and Outpatient Evaluation and Management of Congestive Heart Failure Patients

Environmental Health Sciences
Facile Colorimetric Detection of Ambient Aerosol
Sustainable Food Choices Made Easy: A Comparison of Environmental and Nutritional Impacts and Benefits
Therapeutic Use of an Ammonium-Oxidation-To-Nitrogen Enzyme for Hyperammonemia
Use of an Ammonium-Oxidation-To-Nitrogen Gene and Its Product For Biological Nitrogen Removal

Epidemiology
A Minimally Invasive Approach to Image Oral Biofilms in 3D Over Time Under Environmentally Germane Conditions

Graduate School
Customized Pricing of Digital Contents Business Model
Push Assist Endoscopic Accessory

Graduate Student Assistant (GSA) Administration
Composition and Use of Cancer Targeting Sustained-Release Iron-Chelators as Chemotherapeutic Agents
Aldehyde Dehydrogenase Peptide(s)-Dendritic Cell Vaccine
Michigan Bariatric Surgery Mobile App
Smart Artificial Lung and Perfusion Systems
Synthetic Inhibitors of the F1Fo ATP Synthase for Cancer Therapies

Health Management & Policy
Healthy Minds Survey

Health Management Research Center
Health Management Research Center Cost Predictor Tool

Industrial & Operations Engineering
Method and System to Optimize Community-Based Car Sharing
Design of On-Demand Multimodal Transit System
Driver Mobile App for RITMO Transit
Mobility Tracking Mobile Application
Operating On-Demand Multimodal Transit System
Optimization-Based Differential Privacy
Optimizing Pipe Inspection Paths Using Exact Optimization Algorithms
Real-Time Trip Selection
RITMO Transit Rider App
Stochastic Fleet Sizing
Transit Travel Demand Forecasting
Web-Based Accommodation Models for Evaluating Wheelchair Access

Institute for Social Research
eWrapper: Integrating Strategies to Increase Engagement in a Self-Monitoring Dietary Intake Intervention

Internal Medicine – Cardiology
1000HeartSounds
Delivery Systems and Devices to Facilitate Left Atrial Appendage Exclusion
Dynamic Microfluidic Biocellular Marker for Chronic Disease Detection and Monitoring
Implantable Device Within the Coronary Sinus for Pacing, Measuring and Monitoring of Flow, Pressure, Rhythm, Impedance and Temperature
Methods of Rescuing Inefficient Guide RNA and Reducing Off-Target Effects of CRISPR/Cas9
mi-CRISPR: An Improved Method for Genome Editing
Mobile Device-Based Congestion Prediction for Reducing Heart Failure Hospitalizations
Stochastic Pacing Therapy for Prevention of Fibrillation
Viral Proprotein Convertase Subtilisin/Kexin Type 9 Overexpression in Sickle Cell Disease

Internal Medicine – Gastroenterology
An Engineered Flavivirus Protein with Broad Activity Against Multiple Flaviviruses
Automated Assessment of Bowel Damage in Intestinal Diseases
Bacteria that Suppress Colitis Infection
BCL Inhibitors For Anti-Fibrotic Activity
FODMAP Index Score
Endoscopic Ligation Device to Aid in Resection of Pedunculated Polyps
Self-Inflating Anorectal Expulsion Device
Structural Design for Peptide Heterodimer
Ultra-Compact Microsystems-Based Confocal Endomicroscope

Internal Medicine – Hematology/Oncology
Analysis of Biomolecules from Single Cells and Subcellular Compartments
Aqueous Two-Phase Systems for Concentration of Dilute Analytes from Biofluids
Bacterial Consortium that Suppresses Colon Tumorigenesis
BET Bromodomain Protein Degraders With Cleavable Linkers
Digital Detection of Single Molecules
Dual Src-Ip38 Kinase Inhibitors for the Treatment of Solid Tumors
Fused 1,4-Diazepines as BET Bromodomain Inhibitors
Hydrophobic Autalkylidene Surfaces for Stable Surface Capture of Analytes in Fluorescence Microscopy
Imidazo[4,5-C]Pyridine Compounds as LSD-1 Inhibitors
Intramolecular Transition Kinetic Probes for Specific Detection of Single Molecular Analytes
Nanoparticle Vaccine Targeting Anthrax Lethal Factor
Nanoparticle Vaccine Targeting Anthrax Protective Antigen
Selective Inhibitors of AXL Kinase
Small-Molecule Covalent Inhibitors of Menin for Treatment of Cancer
Small-Molecule Degraders of Androgen Receptor
Small-Molecule Degraders of BET Bromodomain Proteins
Small-Molecule Degraders of Menin
Small-Molecule Degraders of MDM2
Small-Molecule Degraders of STAT3
Small-Molecule Reversible Inhibitors of Menin for Treatment of Cancer
Staphylococcal Toxin Vaccines
Tissue Sorbitol Dehydrogenase as a Novel Target for Immune Mediated Diseases and Therapies
Tumor Metastasis Diagnostic

Internal Medicine – Infectious Diseases
Genetically Modified Malaysian Banana Lectin
H84T BanLec for Use in Cancer
High Purity Resistant Starch

Internal Medicine – Nephrology
Fluidic Biomimetic Cell Culture Device

Internal Medicine – Pulmonary and Critical Care Medicine
Stable A549 Cell Lines Generated by CRISPR-Cas9 Genome Editing

Internal Medicine – Rheumatology
Adenosine 2A Receptor Agonism as a Treatment for Venous Thrombosis
An Antibody for the Treatment of Lupus and Atherosclerosis
Anti-CD6 Ligand CD6L 3A1I Derived From Joint and Epithelial Tissues
Anti-KIR Antibodies in the Treatment of Lupus
Scleroderma Anatomical Skin Model for Training Medical Professionals to Perform Rodnan Skin Score
Treatment of Autoimmune Diseases by Blockade of Interactions Between CD6 and CD318

Internal Medicine Department
A Small Molecular Compound for Arthritis and Bone Erosion Treatment
PrRP Variants for the Non-Aversive Suppression of Feeding and the Treatment of Obesity

Life Sciences Institute
Humanized Drosophila Blood-Brain-Barrier Model

Macromolecular Science and Engineering
Long Lasting Antimicrobial Surfaces Based on the Crosslinking of Natural Oils Within Polymer Networks
Thin Film Ceramics that Offer Electric and Electrochemical Properties Using Nanopowders of Controlled Compositions

Materials Science and Engineering
A Specimen Holder for In-Situ Transmission Electron Microscopy with Double Tilt Stage, Scanning Tunneling Microscope and Optical Information Functions
Conducting Polymer Based Transparent Electrode Fabricated Via Photopolymerization
Kirigami Chiroptical Modulators in Circular Dichroism Measurements in Terahertz and Other Parts of Electromagnetic Spectrum
Process and Apparatus for Creating Pharmaceutical Cocrystals
Caspase Selective Tellomic Thermoelectric Materials and Methods of Fabrication
Thermoelectric II Line Warmers to Address Disseminated Intravascular Coagulation and to Improve Patient Comfort for Cold Injectables
Thermoelectric Stethoscope

Mechanical Engineering
A Collision Imminent Steering Algorithm
A Valve Design for Adaptive Control of Blood to Control Shear Stress Related Injury in Small-For-Size Syndrome
Anesthesia Room Medication Optimization and Error Reduction Device
Asymmetric Slylet Tip for Biopsy to Improve Needle Deployment Accuracy
Atomic Layer Deposition of Li3BO3-Li2CO3 Solid Electrolytes
Automated Extracranial Internal Carotid Artery Ultrasound Sensor for Traumatic Brain Injury
Canopy Wick for Extreme Heat Transfer
Dental Implant with Functionally Graded Properties and Sensing
Electrode Diagnostics for Lithium Ion Battery
Harmonic Pressurized Balloon Angioplasty for Treatment of Calcified Vascular Lesions
High Confidence Detection of Internal Short Circuit in Lithium Ion Batteries
High Resolution Capillary Based Calorimetry for Measuring Heat Output from Biological Systems
I-Witness: A Wearable Camera System for Crash Detection
Iterative Shooting for Optimal Control of Energy Storage in a Vehicle with Multiple Power Sources
Machine Learning Algorithms for Fast Prediction of Material Properties
Mathematical Models for Automotive Polymer Electrolyte Membrane Fuel Cells
Method and Apparatus for Measuring Urine Flow Rate, Volume and Temperature
Method of Forming a 3D Article, Distortion-Less Silicone 3D Printing
Method of Online Stress Measurement Residual During Laser Additive Manufacturing
Microfluidic Optimization of Boundary Layer Effect Fluidic Pump
Mixed Ionic and Electronic Conductor for Solid State Battery
Multi-Channel Electrohydrodynamic Jet Printhead for Preventing Nozzle Clogging Issues
Multi-Path Cam-Follower Transmission for Wearable Robotics
Nature-Inspired Smart Solar Concentrators by 4D Printing
New Materials for Thermal Energy Storage
New Solid Electrolytes for Solid-State Batteries Via Disorder Tuning
Hydrogel Functionalized Membrane for Water Treatment
Ogive Bullet Extrusion: Reduced Process Scrap from Charge Weld Removal
Optical Visualization Cell for Operando Battery Analysis
Origami Sonic Barrier for Traffic Noise Mitigation
Phase Correction for Single Pixel Camera in a Lissajous Pattern
Plant Leaf-Mimetic Smart Wind Turbine Blades by 4D Printing
Quantum Dot-Based Paint for the Arts
Rapidly Wetted Pin Style Electrohydrodynamic Jet Printhead
Rubbing-Induced Site-Selective Growth of Device Patterns
SmartSock for Orthotic and Prosthetic Scanning
Solid-State Battery Electrolyte Having Increased Stability Towards Cathode Materials
Statistical-Based Combustion Feedback Control Systems
X-Ray Retractable Tag with Floating Beads

Medicinal Chemistry
Compounds and Their Use as Inhibitors and Degraders of Sirtuins
Design, Synthesis, and Biological Evaluation of 4-Quinoline Carboxylic Acids as Inhibitors of Dihydroorotate Dehydrogenase
Substituted Oxadiazole and Oxadiazolone as Anti-Cancer Agents
Sulfonyl Prodrugs of Cidofovir and Foscarnet

Metabolism, Endocrinology, and Diabetes
A Novel ACC-TCGA-Derived Molecular Assay to Stratify Adrenocortical Carcinoma and Predict Clinical Outcomes
Method of Treating Graves Eye Disease

[column: Internal Medicine – Hematology/Oncology continued]
Metabolites of Steroidal Therapies in Hormone-Dependent Disease Regulate Response
Mifepristone for the Diagnosis of Adrenal Insufficiency

Michigan Ross
Negotiation Planner App

Microbiology and Immunology
Complementing Cell Line for Growing Adenovirus IVa2 Mutants
Directing Specificity of Humoral Immune Response by Adoptive Transfer of Antigen-Pulsed Epitope-Specific B Cells Into the Host

Molecular Cellular and Developmental Biology
GRASP55 and GRASP65 HeLa and HEK293 Knockout Cell Lines
Compositions for Improvement of Chemotherapy
Stabilization of Biopharmaceuticals During Passage through the Human Gut

Natural Resources
Method for Desalination and Treatment of Brine

Naval Architecture and Marine Engineering
Contact-Less Magnetic Supports for Marine Hydrokinetic Energy Harvesting Using Flow Induced Oscillations
Data-Adaptive, Time-Local Methodology for Numerical Modeling and Reconstruction from Experiments of External Input of Differential Equations Representing Nonautonomous Dynamical Systems
Knowledge-Action-Decision Framework: A Process Model for Knowledge-Based Design

Neurology
Methods for Modulating FMRI Expression
Pro-Regenerative Myeloid Cells and Their Products in the Treatment of Neurological Conditions Characterized by Axonopathy and/or Neuronal Loss
A Cell Line for Probing Mammalian Autophagy

Neurosurgery
Analysis and Remote Interpretation of Optical Histologic Images
Stable Expression of IDH1 Mutants in Human Astrocyte Cells

Nuclear Engineering and Radiological Science
A Compact High-Power Microwave Source
AGREE: Advanced Gas REactor Evaluator
DMCO for Loading Pattern Optimization in Nuclear Power Plants
DOScope: Miniaturized Dosimeter for Therapeutic Radiology
Plasma-Assisted Glow Discharge Electrolysis for Metal Deposition and Surface Modification
Tabletop Neutron Source with Time-of-Flight Capabilities

Nursing
A Tailored Web-Based Psychoeducational Intervention for Cancer Patients and Their Family Caregivers
Clinical Ethnographic Narrative Interview
Health Promotion Model
MKit: A Pilot Study Testing a Life Skills Application to Address Interpersonal Relationships in College
Multifaceted Urinary Tract Infection Quality Improvement Program

Office of New Student Programs
U-M Student Orientation Mobile Application

OMSE Student Services
Optimized Stethoscope Handle for Limited Dexterity Users

Ophthalmology & Visual Science
Amelioration of the Neuroprotective Potential of an Intrinsic Protective Pathway
Compositions and Methods to Derive Mesoderm-Lineage Cells and Mixed Tissue Organoids, from Stem Cells
Glaucoma Symptom and Health Problem Checklist
Ocular Surface Pain Mitigation Methods and Devices for Practicing the Same
Oculomics: A Curated Knowledge Base of Ocular Data
Photomediated Ultrasound Therapy Method and Apparatus
PKC Inhibition to Allow Extended tPA Treatment for Stroke
Reprogramming Photoreceptor Metabolism to Enhance Survival and Prevent Vision Loss
Strabismus Surgical Options Education Application

Orthopedic Surgery
A Multi-Modal Nutritional Supplement to Support Recovery from Total Hip Arthroplasty
HIF2 Alpha: A New Pharmacological Target in Bone Health
MSK Oncology Educational Atlas

Otolaryngology
Composition And Method For Treating Congenital Cytomegalovirus Induced Hearing Loss
EGFR Knock-Out in UM-SCC-92 Squamous Carcinoma Cells
Mandibular Advancement Device
Notch1 Knock-Out in UM-SCC-49 Squamous Carcinoma Cells
Physiologic Sensing Apparel with Embedded Circuitry
PIK3CA Knock-Out in UM-SCC-47 Squamous Carcinoma Cells
Voice Related Quality of Life Measure
Nasal Securement Device

Pathology
Anti-Aging Drugs
Composition for AshIL Inhibitors and Degraders and Method of Use Thereof
Detection of CDK12 Alterations to Predict Prostate Cancer Therapeutic Sensitivity
Detection of Recurrent Urothelial Carcinoma in Urine Samples Using Allele-Specific Real-Time PCR for TERT Promoter Mutations
Frozen Section Chucks with Alphanumeric Identification Codes
InhERIT Inherited Risk Evaluation Tool
Methods and Compositions for Inhibiting the Interaction of Menin And MLL Proteins
MIDIET: Michigan Diabetes Evaluation Tool
Natural Language Data Extraction Pipeline for Qualifying Oncology Cases and Associated AJCC Data Elements
Next Generation Sequencing, Data Analysis, and Visualization Tool
PRC1 Inhibitors and Methods of Treatment Therewith
Purging Pathogenic T Cells by Targeting Kmt2a
Radiation Detection Robot for Predicting Incident Response in Serum
Spatial Registration of Software for Antibody Imaging
Approach to Estimating M-Protein Concentration: Capillary Electrophoresis Quantitative Immunosubtraction

Pediatric Surgery
Laparoscopic Port Assembly
Pediatric Central Catheter Securement Device

Pediatrics – Cardiology
CHCI - A Data Integration Platform
Time and Motion Data Collector and Analyzer
Ultrasound Detection of Repositionable Endotracheal Tube

Pediatrics – Hematology/Oncology
Chimeric Antigen Receptor Comprised of CD123 Binding Domain and IL-7 Intracellular Signaling Domain; Use of Combination of this with Other Engineered T Cell Therapy

Pediatrics – Neurology
Biking Scroll Wheel: Linking Bicycle Pedaling to Scrolling on Computer

Periodontics and Oral Medicine
3D Probe Tracing System
Extended Field of View Probe
ExtendField of View for Dental Ultrasonography and Computer Aided Diagnosis

Pharmaceutical Science
A Novel CRISPR/Cas9 Reporter System to Monitor Triple Negative Breast Cancer Stem Cells in Real Time
Compositions and Methods for Delivery of STING Agonists
Long-Acting Release FLGA Implants Loaded with 4HPR-PVP-TEAC Amorphous Solid Dispersions for Enhanced Tissue Distribution
Photolytic Generation of Nitric Oxide from Solid Phase Nitric Oxide Donor into Gas Phase for Inhalation Therapy

Pharmacology
Analogs of 12-LOX Inhibitor ML355 for Protection from Heparin-Induced Thrombocytopenia and Thrombosis
DHA-Aspirin Conjugate for Treatment of Cardiovascular Pathology
Stereo-Selective Synthesis of Mixed Disulfide Conjugate of Thienopyridine Compounds

Pharmacy
Aqueous Solution of Polymers
Polysaccharide-Based Structures for Applications in Vaccine and Immunotherapy

Physical Medicine and Rehabilitation
Semi-Passive Rehabilitation Robot for Functional Resistance Training of the Upper-Extremity
Huntington Disease Qualify of Life Measurement System

Physical Therapy
Method and Device to Improve Women's Injury Awareness

Physics
A Device for Moving Drops Using Photoelectrowetting
Asymmetric Quantum Wells for Frequency Comb Generation in Diode Lasers
Atom-Based Electromagnetic Radiation Electric-Field and Power Sensor Using Interference
Low-Momentum-Loss Method for Frequency-Modulated Interferometer
Problem Roulette Assessment Preparation Service

Plastic Surgery
CD47 Activating Peptide to Inhibit Traumatic and Genetic Heterotopic Ossification
Ex-Vivo Device to Prepare Full-Thickness Skin Grafts
Online Toolkit For Opioid Safety and Intervention
TGFB Ligand Trap

Prosthodontics
Acp4 Gene Edited Mouse Model

Psychology
Constructing and Navigating Knowledge Space
Employability Skills Assessment
Neuropia: A Cloud-Based, Fully Customizable, Immersive Education Engine for the Brain Sciences

Radiation Oncology
A Transcription-Based Platform to Predict Therapy Response in Glioblastoma
Combined Radiation Acoustics and Ultrasound for Radiotherapy Guidance and Cancer Targeting
Genomic Signatures to Predict Responsiveness of Patients with Prostate Cancer to Pre-Operative Radiation Therapy
Targeting Chromosomal Rearrangements in Cancer
Targeting the Androgen Receptor in Combination with RT for Brain Tumors

Radiology
A Simple Method to Measure Magnetic Resonance Anisotropic T2 Relaxation Times in Human Knee Cartilage
Absolute Temperature Measurement Using Magnetic Susceptibility MRI
Assessment of Spatial Jacobian for Quantification of Aortic Aneurysm Enlargement
Dual HER and Lipid Kinase Family Inhibitors for the Treatment of Cancer of the Brain
Electromagnetic Coupling Catheter
Ionization Balloon Catheter
Low Profile Collapsible Balloon-Expandable Thermal Ablation Catheter
Nanostructure Platforms for Quantitative MRI Validation
POSS Nanocomposite Hydrogel for 3D Bioprinting
Pre-Shaped Occlusion Balloon Catheter
Protective Sleeve for Catheter Removal During Radioembolization
Regional Histogram-Based Analysis of Spatially Aligned Medical Images
Synthesis of an Image-Able Labeled Cholesterol
Three-Dimensional Stent
Ultrasound Speckle Decorrelation Estimation of Lung Motion and Ventilation

Research on Women & Gender
College Student Life Survey
The ABCs of Home Drug Safety

School of Public Health – Dean's Office
Grant Sprints

School of Information
Augmented Reality Prototyping Tool

Student Inventors
Modified Phone Wallet

Surgery
Distal Bowel Anastomosis Tester

Thoracic Surgery
Cervical Esophagogastric Anastomosis Simulator

UMH H.O. Core Pathology
Brain Cutting Device

UMH Offsite Imaging
A Central Venous Catheter with a Hook and a High Having a Valve Inside
Implantable Central Venous Port with Cuff

UMH Operating Rooms
Internal GPS Location Application

UMH Orthotics & Prosthetics Center
Sequential Compression Brace with Sequential Ankle Movement for Treatment of Deep Vein Thrombosis and Lymphedema

UMH Physical Medicine and Rehabilitation – Administration
Technology Assisted Brace

UMTRI – Human Factors
An Online Algorithm of Driver Distraction Detection
Autonomous Driving Brake Prediction for Rapid World Bicycle Passing Data
Autonomous Driving Path Prediction for Bicycles at Intersections

Urology
Antibody to Human ADAM15 Disintegrin Domain
Anticancer Therapeutics Based on Peptides and Peptidemimetics Derived from the Disintegrin Domains of ADAM Cell Surface Proteins
Low-Pressure Suction Endoscope
Suction Device for Stone Stabilization During Ureteroscopic Laser Lithotripsy
Surgical Video Review Systems