



SANTA CLARA UNIVERSITY

School of Engineering

2023 Junior Convocation
Department Breakout Sessions
Department of Bioengineering

Brief Agenda

- Guidelines for selecting your Senior Design projects
- Brief descriptions of Bioengineering faculty research interests

Guidelines for Senior Design project selection

- Identify and meet three professors based on the areas that you are interested in pursuing for your senior design project.
- Do further literature search on the projects to refine your project overview.

Guidelines for Senior Design project selection

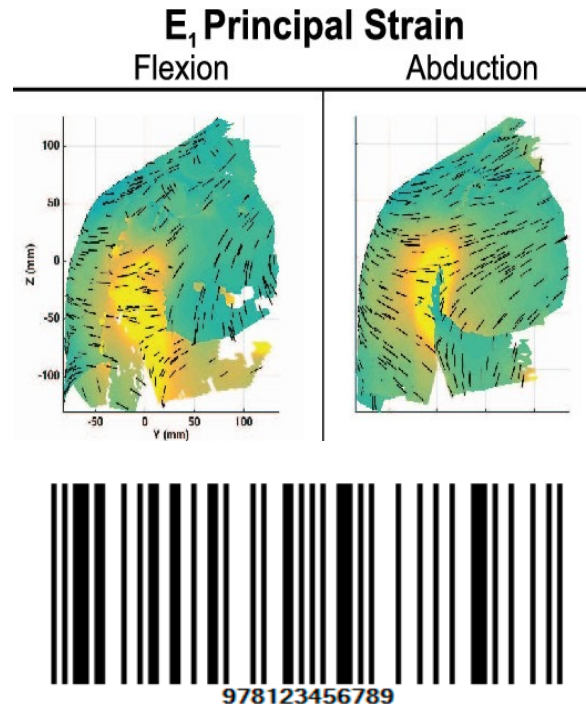
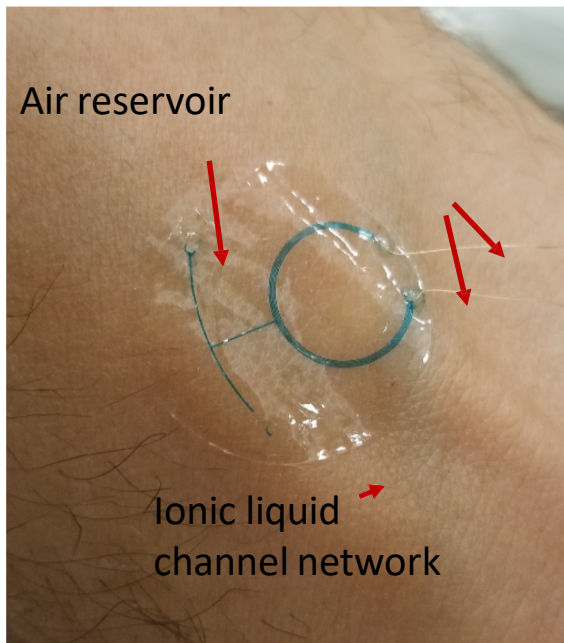
- Draft a brief report that states:
 - a) the objective of the project,
 - b) a general description of the product/system to be designed and built/tested,
 - c) potential opportunities for improvement for the projects,
 - d) Ranking of the projects from most favorable to least favorable.
- Turn in your Interview Summary Form and Customer Needs Report by May 15, 2023.
- Final project assignments will be notified to the students by the end of the Spring quarter.

Guidelines for Senior Design teams

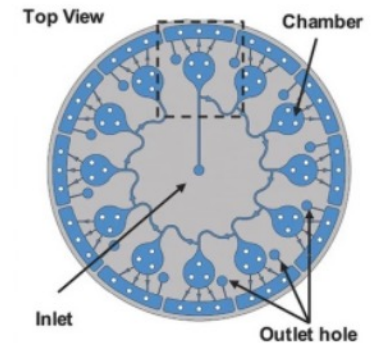
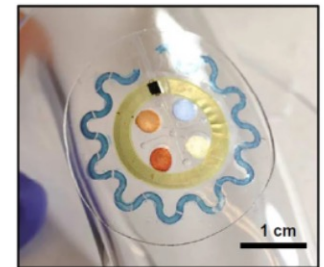
- Ideal team will have two members but depending on the project/PI preferences, larger teams may be considered.
- It is highly recommended that team members should demonstrate their background/motivation for the project during interviews.
- Non-BIOE faculty can be advisors after submitting a form that clarifies the details of the project.

Dr. I. Emre Araci

Storing movement data in microfluidic skin patches



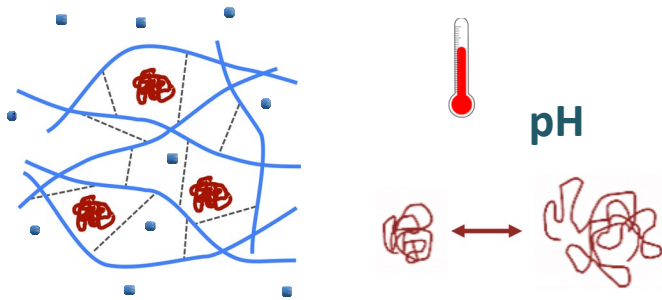
Human movement driven capillaric sweat biosensor patch



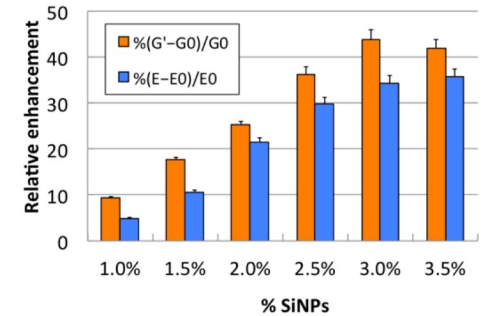
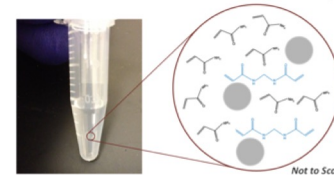
Wearable/portable microfluidic devices for enhanced human interfacing for health monitoring

Dr. Prashanth Asuri

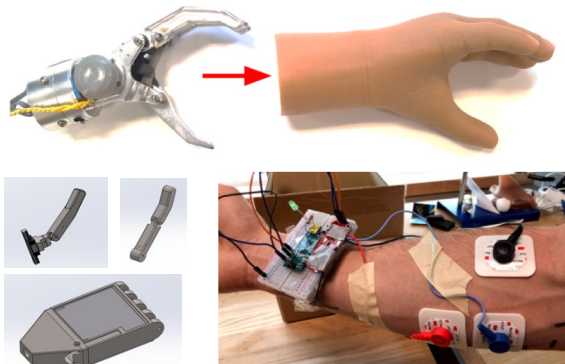
Hydrogel-based delivery of therapeutics



Enhanced properties of hydrogel composites

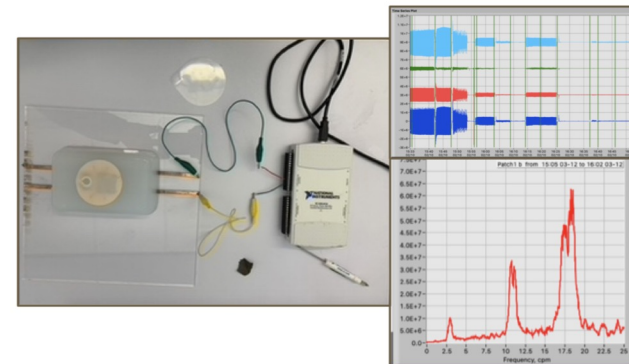


Human-centered Electric Prosthetic



Co-advisor: Dr. Kitts

Phantoms for testing biowearables



Co-advisors: Dr. Araci and Dr. Krishnan

Engineer in vitro platforms to understand and influence complex in vivo phenomena

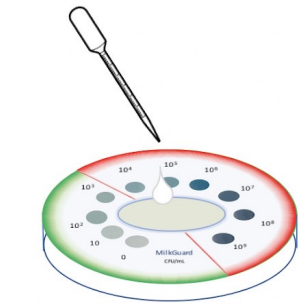
Dr. Ashley Kim

MilkGuard: Low-cost Sensor for the detection of *E. coli* in donated human breast milk

Breast Milk

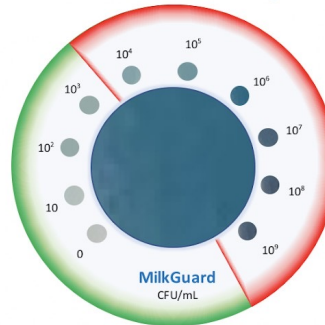


Sample Application onto Sensor



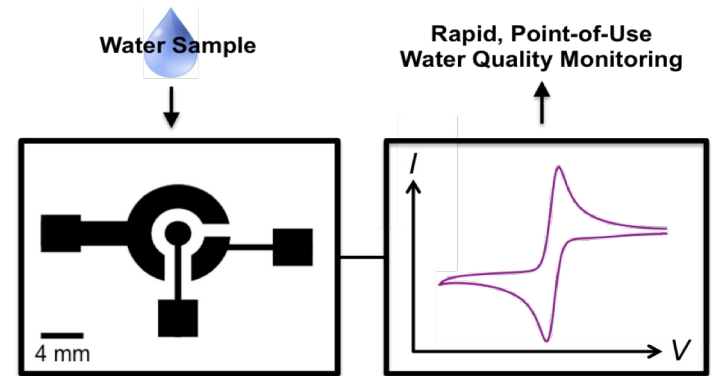
Hydrogel containing substrate

Concentration Reading



This sample of milk has 10^6 CFU *E. coli*/mL milk. This is an unsafe level, so the milk should be discarded.

Detection of arsenic contamination



Low-Cost, Plastic-Based Microfluidic Arsenic Sensor

Hand-Held Electrochemical Analyzer

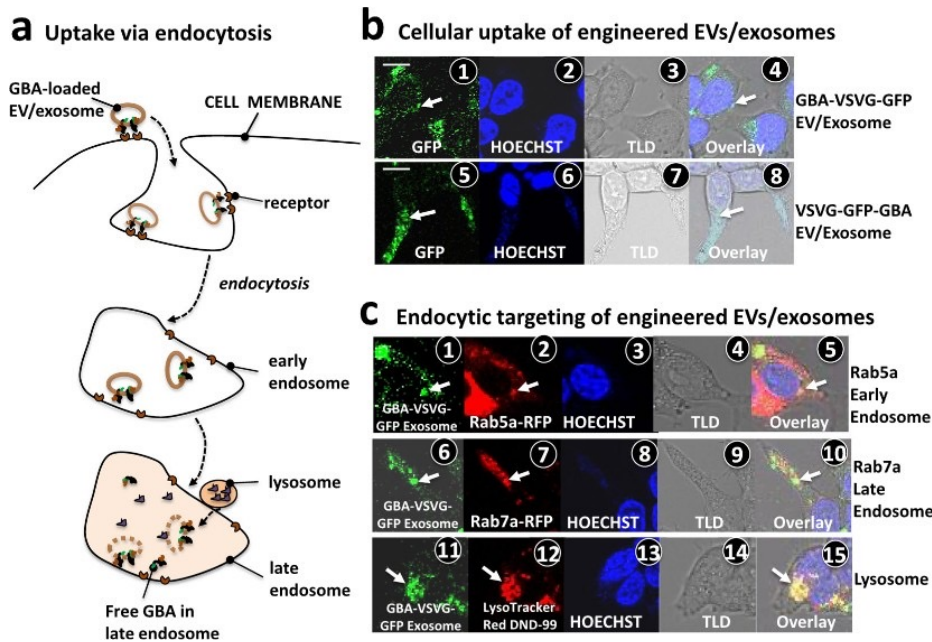
Vital Sign Multi-Sensor Kit for Use with Telemedicine



Develop novel microfluidic devices to improve the condition of human health

Co-advisor: Dr. Mobed-Miremadi

Dr. Bill Lu



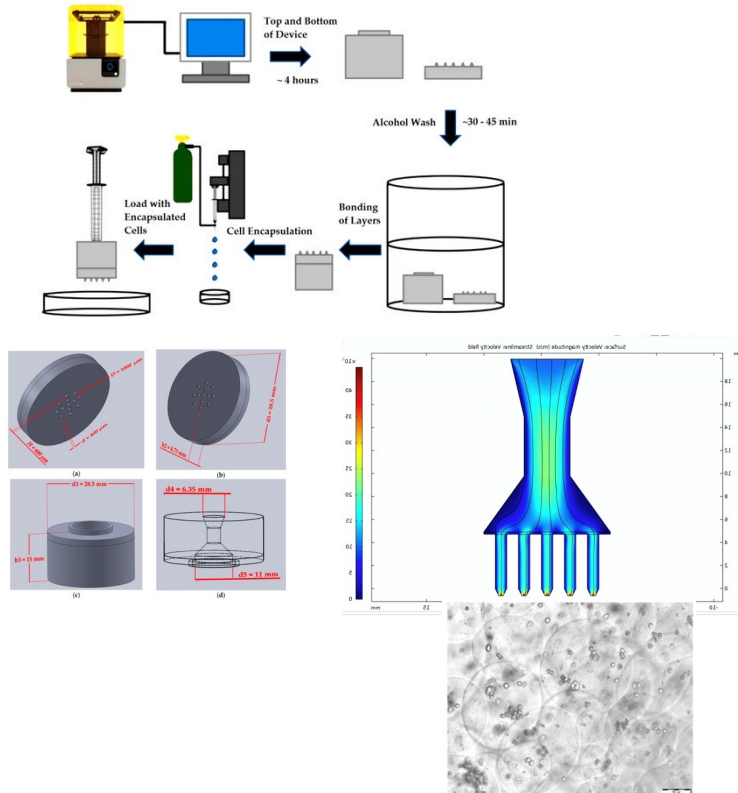
1. Engineering personalized nano-medicine for targeted drug delivery and therapy
2. Developing a new nanoparticle-based vaccination platform for multi-variant prevention
3. *In vivo* engineering of stealth nanoparticles for enhanced drug delivery
4. Conquering blood brain barrier for the treatment of human brain tumors

[Scientific Report 2018](#)

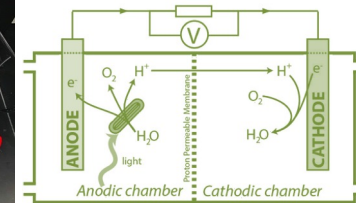
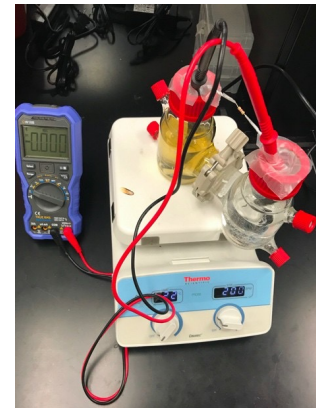
Engineering of human cell-derived nanoparticles for disease treatment

Dr. Maryam Mobed-Miremadi

Flow and viability optimization of extruded cells through 3D printed microneedles



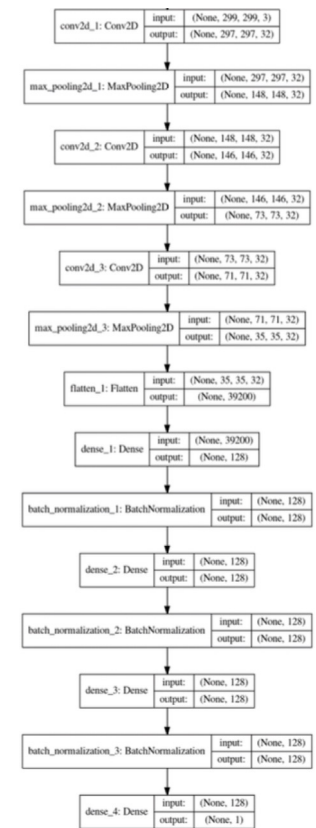
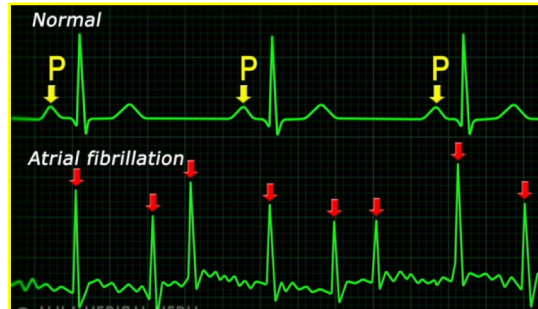
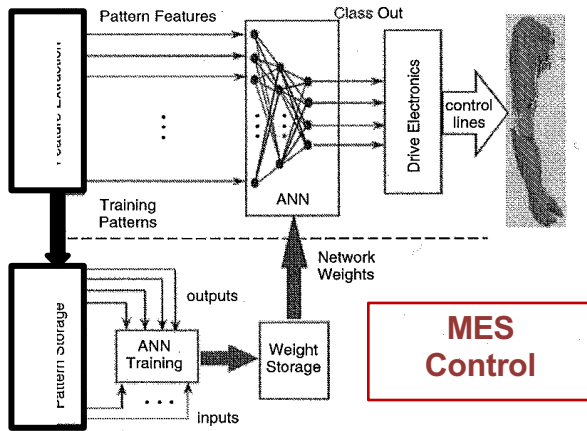
Microbial fuel cells for electrochemical detection of genetic modification



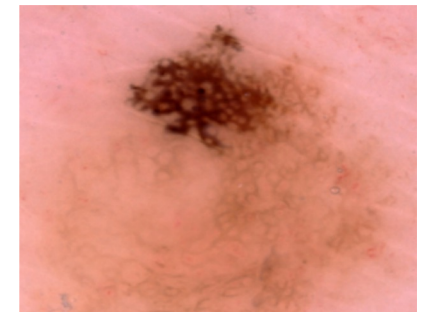
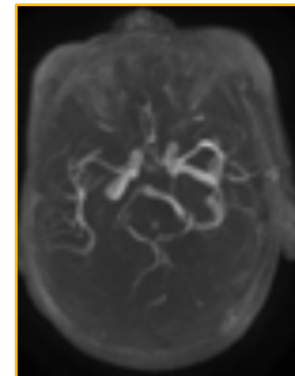
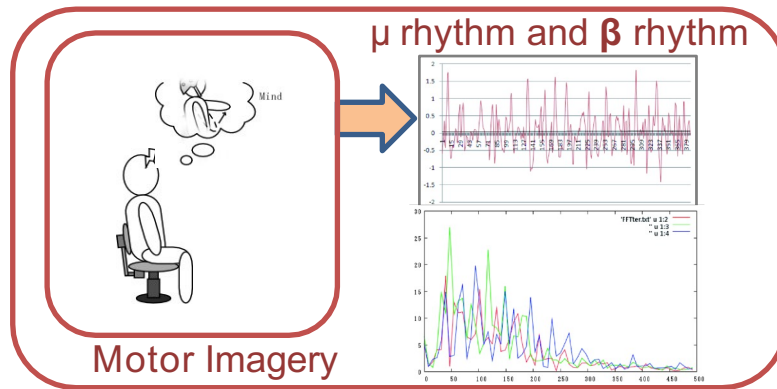
Mathematical modeling and optimization of in vitro platforms for applications in bioengineering

Dr. Yuling Yan

Arrhythmia detection using ML/DL



MRI image-based detection of brain aneurysm

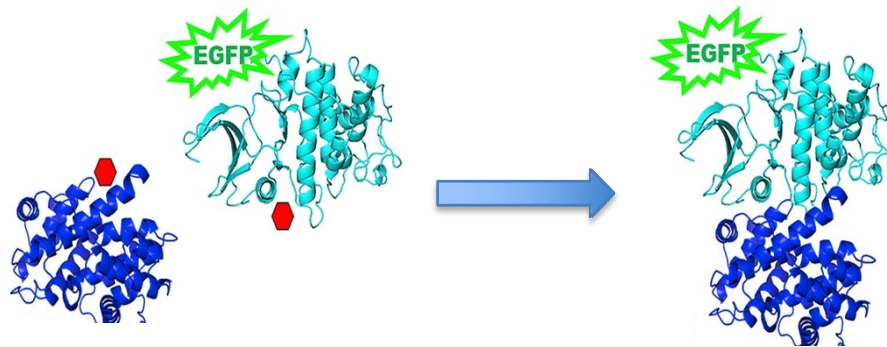


AI-assisted melanoma detection

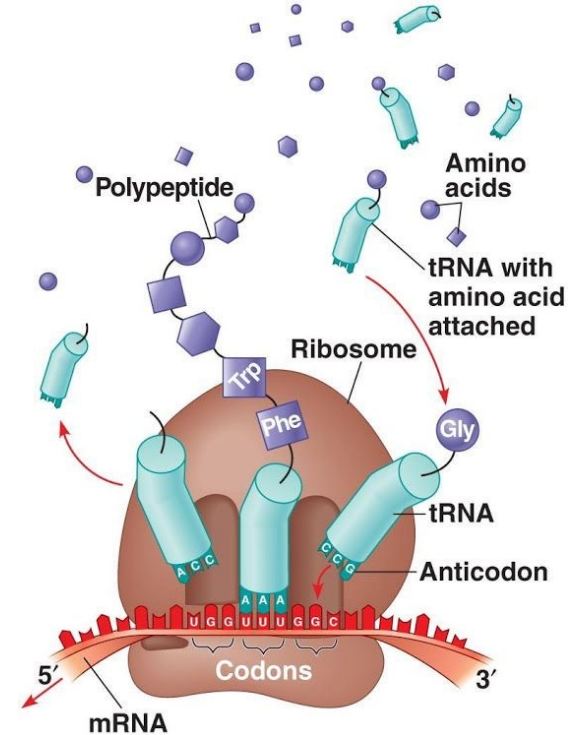
AI-assisted analyses of medical images/biosignals for disease classifications and applications in human-machine interface

Dr. Jonathan Zhang

Post-antibiotics era and *organ-selective anti-infective drug candidates*



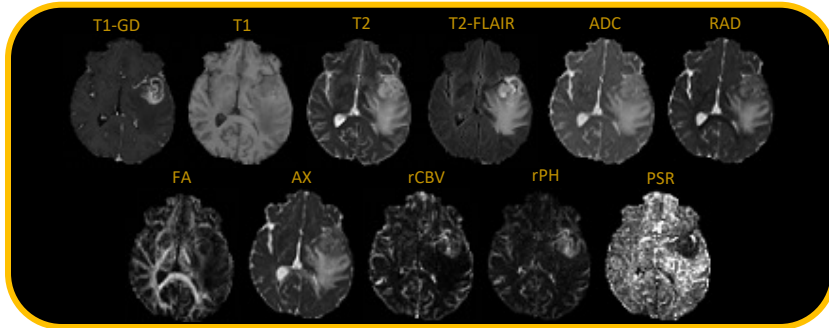
Non-ribosomal protein synthesis *in vivo* - towards antibody-drug conjugation *in vivo*



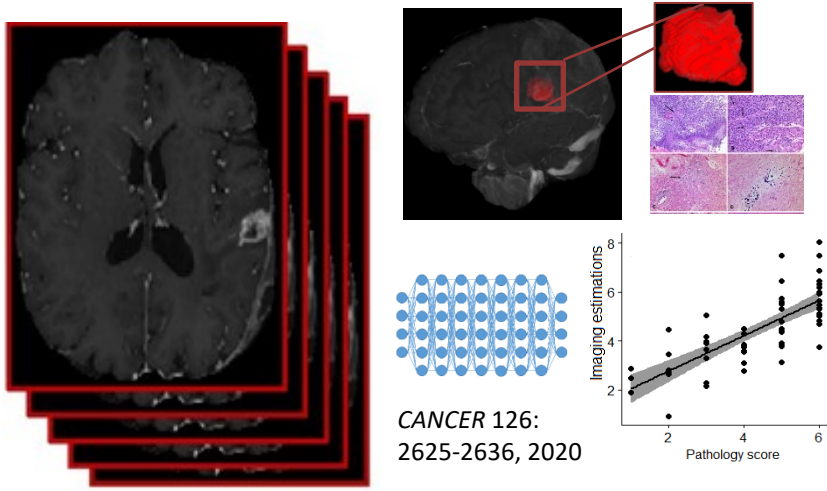
Chemical Biology to study basic mechanistic and medical questions for anti-infective drug discovery

Dr. Hamed Akbari

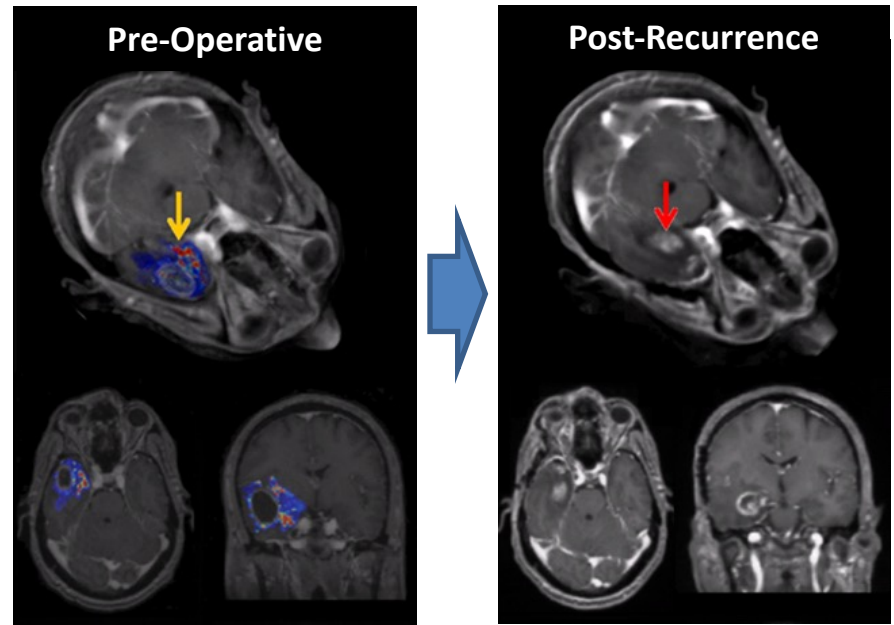
Multiparametric analysis



Tumor progression vs. TRC



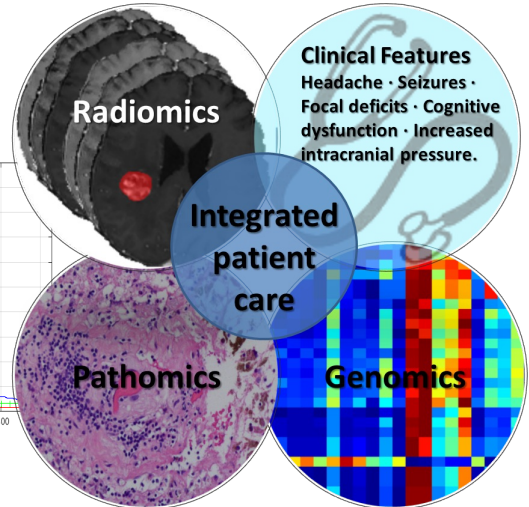
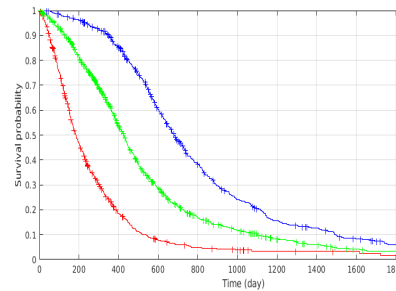
Glioblastoma infiltration and recurrence



Radiology 273 (2), 502-510, 2014

Neurosurgery 78 (4), 572-580, 2016

Survival prediction



AI-based image-guided patient care in neuro-oncology



**Thank you for your
attention!**

Any questions?