Business Opportunities and Collaborations in Engineering for One Health

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Fitbit, apple watch, wearables



Investments into venture-backed biopharma, medical device and Dx/Tools companies

31% 2016 to 2017 increase Source: Silicon Valley Bank, PwC

Device M&A activity continued at a steady pace, with a focus on minimally invasive devices and next-gen visualization/imaging



Rising biopharma investing



Source: Silicon Valley Bank; L. Suennen, 2018, UC Berkeley

Popular Biotech Categories



Source: Silicon Valley Bank L. Suennen, UC Berkeley

Positive drivers in Biotechnology



Source: Lisa Suenen, 2018. UCBerkeley Haas School of Business

STARTUP ECOSYSTEM SEA BENCHMARK

"The region's startups pulled in US\$7.86 billion from investors last year, an over threefold rise from 2016's US\$2.52 billion."



Engineers are key players in this industry

> Joning Jortunity in Lare devices, digital health, pharma, hospital systems.

Pain Points in Healthcare with Engineering solutions





Waiting time for procedures



Accurate quantification of blood loss (childbirth, surgery, etc)

~1200

~1000



Incubator for premature babies



Wound dressing

Nanotechnology



Top Patient Safety Concerns for 2019



Diagnostic stewardship and test result management through EHRs

PHYSICIAN BURNOUT





59% of doctors wouldn't recommend a career in medicine to their children.³

1. Mayo Clinic 2014.

VITAL WorkLife & Cejka Search Physician Stress and Burnout Survey 2015.
Jackson Healthcare; 2013 Physician Outlook and Practice Trends.



Detecting Changes in Patient Condition



Modeling nurse-patient assignments considering patient acuity and travel distance metrics



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RESEARCH OBJECTIVES

measure the perceived level of importance of each workload measure

identify nurse workload measures specific to a hospital unit's unique characteristics,

> develop mathematical models for the construction of balanced nurse-patient assignments.

CAR T cells

ProMab Biotechnologies, Inc.



Replacing the Nanowire motors (2010):

Bubble-Propelled Microrockets

Catalytic concial microtube engines with an inner catalytic platinum layer. Oxygen bubbles, generated by the catalytic decomposition of the hydrogen peroxide fuel at the inner platinum surface, are released from the larger openings.



Advantages for Biomedical Applications:

- Propel Efficiently in biological fluids
- Possess a large towing force
- Can be readily functionalized with a specific receptor

J Wang, 2019, University of California San Diego



Figure 1: Bioprinting can be defined as additive three-dimensional fabrication of tissues or organs using cells, biomaterials and biological molecules. Various types of tissue constituents are positioned in spatially defined locations to generate tissue and organ constructs.

3D Bioprinting



3D Bioprinting

Seol, Y. J., Kang, H. W., Lee, S. J., Atala, A., & Yoo, J. J. (2014). Bioprinting technology and its applications. *European Journal of Cardio-Thoracic Surgery*, *46*(3), 342–348



Bioprinting applications



Collaborations between Engineering and Health



10 month

Clinicals

sional،

⊿MS



n.stanford.edu/programs/stanford-courses.html



http://biodesign.stanford.edu/programs/stanford-courses/medical-device-innovation.html

Stanford's Biodesign program



Stanford's Biodesign Process

Biodesign Teams





Overview: Innovation and Economic Leadership



In 1994 the net benefit from knowledge transferred from the University was about \$50 million per year



University of Utah collaborated with 3M to begin developing Health Evaluation through Logical Processing (HELP)

> Electronic Health Recorc Market

Electronic Health Record Market

\$23,592 minitian

\$33,294 million in 2023





UNIVERSITY OF TORONTO

Team of mechanical engineer and medical doctor

Handheld 3D Bioprinter - can print skin to heal deep wounds with patient's own cells



FUJIFILM VISUALSONICS

Designs and manufactures ultra high frequency in vivo imaging systems

Seeing More Matters

3-15 MHz 20cm human fetus

CONVENTIONAL ULTRASOUND 200-300 µm resolution 15-50 MHz 3cm mouse fetus

ULTRA HIGH-FREQUENCY ULTRASOUND 30 µm resolution

Sr operates in more K than 30 countries inst.

FUJIFILM VISUALSONICS

Dr. Stuart Foster, an engineer and physicist

acquired for **\$67.9 M**

Seeing More Matters

Philippines Success Story



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FOUNDER & CEO

Omar has been in the IT industry for 11 years with experience on finance, ERP, and airline industry. He has worked with small startup companies to large multi-national companies.

More than those, he has been an entrepreneur at heart. With Stash, he wants to improve the healthcare delivery in the Philippines.



CO-FOUNDER & COO

Joyce found her niche in the design of beauty, simplicity and functionality in user interfaces. She is a currently a Senior User Experience Analyst with 7 years experience on mobile, web and desktop platforms.

She believes that mobile products should start, continue and end with the user in mind and that understanding the user's needs is the beginning of true design wisdom.





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