

**congratulations**  
**class of 2015**

***A HUGE thank you to all my friends and family who were so patient and support. Well, guys, I'm FINALLY a graduate.***

**Sailaja Abburi**



***Thank you Mom and Dad!***

**Pradyothan Adamala**



***Thanks to my family! I couldn't have gotten through school without my parents, brother and sister.***

**Nafisah Noor Ahmad**





*Thank you so much for taking the time to come to my graduation ceremony! Words can't express how happy I am to see you sitting there.*

**Safiullah Ahmadzai**



*Dear Family & Friends,*

*You guys are THE FORCE, which was always with me.  
Thank you for everything !*

*Love,  
Gopi*

**Gopal Krishna Akella**



***Thank you to my Mom, Dad, and my beautiful wife for supporting and sustaining me through the years. I wouldn't be here if not for you! :) Love, Travis***

**Travis Andrew Alexander**



*thanks to every one tough  
me and support me to  
achieve my goal.*

**Saud Jaza F Almutairi**



***Thanks mom for your support.  
Thanks my wife for every thing.  
I will never forget it.***

**Ahmed Abdulrahman M Alofi**



*All the thanks to my family and my friends whom supported me to finish my degree. Without them, I would not be here today.*

**Mohammed Abdulrahman Altraiki**





*I take this opportunity to thank my  
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**Chetan Ambi**



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**Meenakshi Ananthapadmanabhan**





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**Aravindh**



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**Melissa Elizabeth Archer**



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**Prateek Arora**



*As a new journey begins, I thank my family and friends for their kindness, support and prayers. Thank You for joining me on this special day.*

**Mrinmaya Atre**



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### Modeling and Simulation of Cow Delivery (Electro)

Sindhu V V Kollam, Ji Mahalingam  
School of Biological & Health Systems Engineering, Arizona State University



### ANALYSIS

## BioManufacturing Platform and

Mentors: Dr. Vincent Pizziconi, Dr. Christine Pizziconi  
School of Biological and Health Systems Engineering



### Background

Personalized medicine is a new chapter in health care that has the potential to revolutionize the way health care is delivered and patient outcomes. An emerging field, known as regenerative medicine, is engineering personalized medicine in regenerative medicine. Underlying tissue engineering related enabling technologies that are envisioned to provide more effective therapeutic alternatives for treatment of diverse human pathologies. By their very nature, tissue engineering processes are capable of engineering patient specific biological specifications into the product. Personalized 3D tissue and solid organ products for that same recipient. Once tissue engineering processes are validated, the development of precision biomufacturing platforms that meet current good manufacturing practices will be needed to support the safe and reliable production of high value but low volume personalized medicine of biomufacturing. The development of key bioprinting operations that will represent the fully integrated manufacturing process flow from raw materials to finished complex three dimensional tissue or organ system ready for implantation. Key bioprinting operations include non-invasive monitoring and microintegrated-based process, and microintegrated tissue and organ systems and active tissue and organ decellularization and regenerative processes on biodegradable, as well as personalized 3D synthesis, bioprinting, and related quality assurance testing methods to assure patient safety, biocompatibility, among others. The main objective of this applied project is to provide a complete process flow diagram of the key bioprinting operations envisioned for a regenerative medicine biomufacturing platform that is compliant with current good manufacturing practices (cGMP), a topic cost analysis, and a preliminary engineering economic analysis was conducted for each bioprinting operation, as well as, for a fully integrated, automated biomufacturing platform. Preliminary results obtained thus far represent the feasibility of proof of concept feasibility of a decentralized biomufacturing platform for regenerative medicine.

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### Manual Platform



## Applied Project

***Mom, Dad, Sis, Massi, Manyu, Saumay,  
Lipi, Anupam, Shanti, Cadi, JD, Daddy,  
Mia, Akki, Kakani, Lina, Chacha, Pankit  
& Vinuta -Thank You All. Once a dream  
is reality now***

**Piyush Awasthi**



***Thanks God***  
***Thanks Dad***  
***Thanks Mom***  
***Thanks my wife***

**Mohammed Hassan A Baaoum**





*My two years at ASU during my masters program is the time during which I had some of the best experiences in my life.*

**Vinit Anil Badrike**



*I dedicate this to my parents who themselves never set foot in a university but gave me the life lessons no institute in this world can !*

*Love  
Shiva*

**Shiva Balasubramanian**



*I want to thank my whole Family  
specially big brother, without  
your support this wouldn't  
possible.*

**Piyush Bandil**



***Thank you to my family and  
friends for the support!***

**Hyo Jeong Bang**



*Thanks to my family for all the support  
and believing in me.*

*Thanks to ASU for those sleepless  
nights with friends.*

*Congrats to all graduates!!*

**Nishant Bansal**



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**Mudit Bareja**





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**Siddharth Hiren Batavia**





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**Satish Annasaheb Bhadgaonkar**



*Thank you Mom for all your support. Nothing would be possible without you. I owe my success to you*

**Sonali J. Bhat**



*Today as I Graduate, there are so many I must honor.*

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and above all HP*

**Karan Bhatia**



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**Raviteja Bhavirisetty**



*Dear Mom and Dad,*

*I would like to thank you for encouraging me. Without your support I would not be here. Thank You and I love you.*

*Mahesh Bhole*

**MAHESH BHOLE**



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*Thank you to my family for their support and especially to my wife, Kimmy Bodington, for always being there when I needed her. Love you all.*

**Matthew Bodington**





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**Mayank Bothra**



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***Love,  
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***Curt Casey Carboni***



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**Ernesto Alonso Celaya**



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**Pradeep Pundlik Chaudhari**



***I would like to thank my Parents  
and ASU for supporting me all  
the way through. Proud to be a  
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**Nishanth Chava**



***It is not the destination but the  
journey that matters the most!  
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**George Chen**



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**Shuna Chen**



*Love you mom and dad. An amazing journey has finally come to an end. The two years that I have spent at ASU have been the most memorable days in my life*

**Srinivas Cherukuvada**





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**Akash Chigurupati**



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your support and unwavering  
love. I am here because of you.***

**Saurabh Choudhary**



***Thank you, Mom, Dad,  
Anna, Josh & Bindy!***

**Kari Christie**



***Thank you Mom, Dad and  
Professors !!***

**Mansoorali Mohamadi Companywala**



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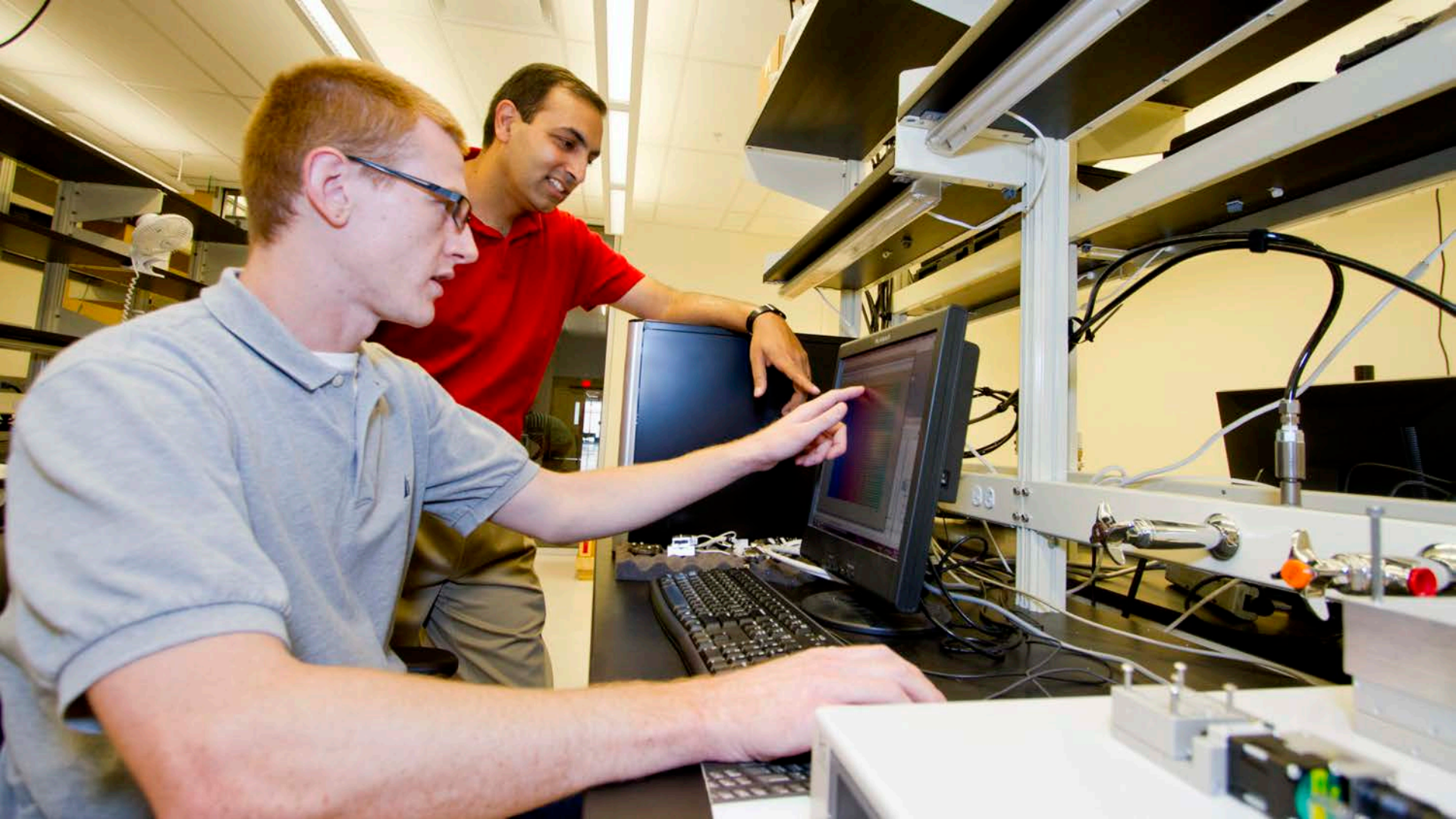


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***I have had the best learning  
experience in my Life***

**Pranay Sai Dadi**



***Thank You to my parents who  
made this dream possible.***

***Thank You to all my friends who  
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**Pranav Pranesh Datar**



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**Moksha Hiten Doshi**





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guys rock!***

**Julia Angeline Dyer**



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family and friends that because  
of them I'm here today*

**Ghazi Saad A Elawi**



***I would like to thank my family and friends who encouraged me. A special thank you to my mother, who has always been there to support me.***

**Jesus Esquivel**



***ASU is the BEST!***

**Yiling Fan**



*I would like to thank my  
entire family and friends for  
their support. Thanks a lot!*

**Namitha Ganapa**



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***A big thanks to my parents,  
for enabling me to reach so  
far.***

**Prateek Garg**



*Thank You Amit Garg for your support and guidance, words can't express my respect and love for you. Thank you Mom, Daddy , Timsy & Dada*

**Shivam Garg**



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my best friend for life! I  
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**Anupam Goel**



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and close friends for encouraging me all  
the way to pursue my dreams, and to go  
on to do bigger and better things!*

**Jonathan Ty Goggans**



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**Namit Gopal**



***Thank you Sriram!!***

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**Reshma Govindaraju**



**4+1!!!**

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higher education.*

**Xinchen Guo**



***It's not the end, it's the  
beginning...:)***

**Amit Gupta**





***Thank you so much my  
family, friends and my bro  
kartik parate***

**Piyush Gupta**



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# ACTUATING A PROSTHETIC HAND VIA A MULTICHANNEL ELECTROMYOGRAPHY ARRAY

Dr. [Name], [Title] | Committee Members: Dr. [Name], Dr. [Name], Dr. [Name] | School of Biological and Health Systems Engineering, Arizona State University



ARIZONA STATE UNIVERSITY

K4

## Results

Single electrode forearm extension EMG



## Methods

15 Nikotax EXG electrodes were used to take a surface EMG of the subject. The 15 channels of data were multiplexed using three MUX09 multiplexers controlled by an NI-8008 DAQ. 40dB amplification was accomplished using an SRS SR650 amplifier. Data acquisition, demultiplexing and analysis were done in MATLAB using the NI-8008 as the data acquisition device.

## Multiplexing



## Future work for microcontroller implementation

The use of different multiplexers is recommended, due to their ability to work with high supply voltage, switching artifacts, strange timing and several unexpected performance.

## Medical Care Applications

Committee Members:  
Dr. Mark Tzouros, SBHSE, Arizona State University  
Dr. Jeffrey Labadie, SBHSE, Arizona State University  
Dr. Ajay Sain, Mayo Clinic

## Conclusions

The use of different multiplexers is recommended, due to their ability to work with high supply voltage, switching artifacts, strange timing and several unexpected performance.

***Thank you to my beautiful wife  
and my awesome parents. I  
couldn't have done it without  
you!***

**Jason Michael Gutierrez**





***Adversity rises and falls  
sometimes rises at every angle,  
tough times don't last, but  
tough people do.***

**Mike Hadley**





***Thank you Mom and Dad for helping me get through this. Also, I would like to thank my family and friends who made my journey memorable. Andaaz all day!***

**Suhas Athrey Bangalore Harish**



*Mom, Dad and Wakil Uncle, thank you  
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Your love and support means more to  
me than you will ever know. -Shuvo*

**Nazmul Hossain**



***A huge Thank You to John  
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**Sarah Elizabeth Hrabal**



***Thanks my loving parents, Mingyun Hu  
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**Xia Hu**



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**Rama Phaneendra Intipalli**



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**Edgil Nolan Hector IV**



***Thank you Mom and Dad. I would never have achieved this degree without your love and support. Wish you were here! This one is for you. Love you :-\****

**Ashish Iyer**



***Go Sun Devils \m/ !!***

**Nithin Jacob**



***Mom, Dad & Sis - Thank you for always supporting me. Special thanks to my friends & family and to ASU, for an amazing and unforgettable experience.***

**Tanvi Jahagirdar**





***Thank You Jayesh and Manisha for making me what I am today. It would not have been possible without your support.***

***- Rohan***

**Rohan Jain**



***Thank you***

**Sahil Jain**



*I enjoyed by life as a  
graduate student.*

**Prudhupal Jally**



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***Dad you're someone to  
look up to no matter how  
tall I grow. Love you dad!!***

**Venkatesh Thumala Janakiraman**





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**Rohan Narendra Jawali**



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**Karthik Jayaraman**



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Gonna miss it so badly. I hope  
to come back again. PROUD TO  
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**Anuj Jobanputra**



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**Sierra Ruthina Johnson**



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**Sagar Kamat**





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**Mary Kariuki**



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**- SAGAR REDDY**

**Sagar Karri**



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**Vikas Kasu**



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**Aniket Katyayan**





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**Dominic Sebastian Kedelty**



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**Nagendra Ketineni**



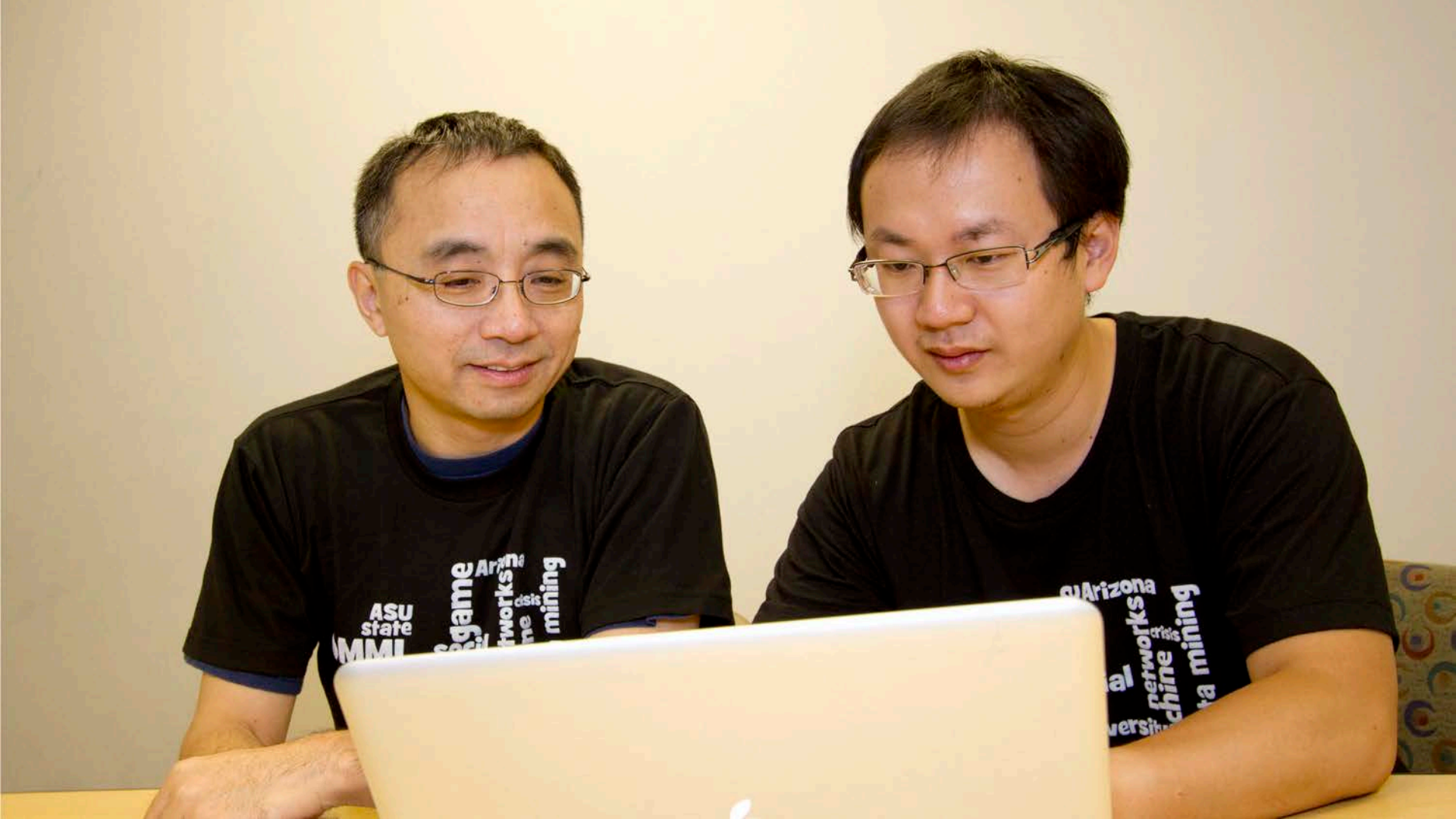
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*I love you guys.. Thank you  
so much for coming - Chait*  
<3

**Chaitali Rajan Kharangate**





*I wouldn't be here today if it wasn't for my parents' hard work and support. Thank you so much for having faith in my abilities.*

**Rohit Kharat**





***Look, up here! Round Two!  
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for all the help along the way!  
Love***

**Timothy Ryan Kilfoy**



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**Lakshmi Ujvala Koduri**



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**Anirudh Koka**



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**Jeena James Kulangara**





***Thank you ASU for support  
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**Nimish Nandkumar Kulkarni**



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***"Stay hungry. Stay foolish."***

**Sujith Ravi Kumar**



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Ralston!*

**Adam Michael Lay**



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***I want to thank my parents for inspiring me to pursue a higher education and Jaiden and Victor for putting up with those long nights of studying!***

**Regina M. Leverette**



***Eyes on the Prize: The only obstacle that one sees in when they take their eyes off of their goal.***

**Delrik Lindsey-Bennett**



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**Ying Liu**



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**Yuan Liu**



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**BOUBOU BAIDY LO**



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**Jennifer Diane Luna**



*Am I smart yet? Nope*

Colten Bryce Lybbert





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**Sylvia Maassen**



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**Uday Kumar Macherla**



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Preethi, Rizwan, Teja*

**Aakash reddy Malladi**





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***Love you!***

**Vinil Mamaniya**





*I thank my mom and my brother for their unending support throughout my life.*

**Vijay Ganapathy Manavalan**



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***"Mom-Dad, Family &  
Friends"  
Thank You.***

**Pavanchandra Mandava**



*Thank you Appa & Amma for believing in me. I am forever grateful for your support.*

**Dhanyatha Manjunath**





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**Madhu Manjunath**





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**Vijeyta Sharma Manjunath**



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you enough for everything you have done  
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Love,***

**Chelsea Lynn Mann**



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**James Charles Edwin Mertens**





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**Christopher Miranda**



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**Parth Mistry**



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abhi & my roommates for all their  
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**Aiswarya Mohan**



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*In loving memory of my mom - Iris Morales. Dad, Mario and Lily - couldn't have done it without you! To my family - thank you for your endless support!*

**Seth Benjamin Morales**





*I can do all things through Jesus who gave me strength. I love you Son. I love you MOM, DAD, Rochelle, Bessie, Daniel, Nephews and Nieces. #cielo777*

**Fernando Manfred Moreno**



*ASU gave me everything I  
needed from a Masters program.  
I was able to groom myself into a  
well-rounded person.*

**Narasimhan Murali**



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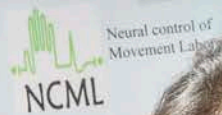
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# HUMAN-HUMAN JOINT ACTION: EFFECTS OF TRANSCRANIAL DIRECT CURRENT STIMULATION OVER POSTERIOR PARIETAL CORTEX ON PHYSICAL COOPERATION

Manasa Parthasharathy, Pranav Parikh, Keivan Mojtahedi, Marco Santello

Neural Control of Movement Laboratory, School of Biological and Health Systems Engineering, Arizona State University.



## Abstract

Transcranial Direct Current Stimulation (tDCS) is a noninvasive technique developed to treat various neurological disorders. A small direct current is delivered to the targeted cortical region, which can either increase or decrease cognitive performance depending on the type and region of the tDCS electrodes, the neuronal excitability of the stimulated area. Based on the research conducted in the Posterior Parietal Cortex (PPC) to improve anticipatory motor preparation and planning, this project aims to determine the effects of cathodal tDCS on the performance of a motor task that requires physical coordination between two subjects to balance an object. Cathodal tDCS should impair the ability of one subject (the 'leader', based on our pilot data, the leader is defined as the subject who exerts the largest share of total moment) to balance an object and correct errors. In a study, two human subjects were recruited to balance a U-shaped object on a table. The force and position data are acquired using LabVIEW software and analyzed using MATLAB. When cathodal tDCS is provided to the leader, his/her ability to balance the object and correct errors decreases. The force and position data are determined using MATLAB. When cathodal tDCS is provided to the follower, his/her ability to balance the object and correct errors decreases. The hypothesis that cathodal tDCS to posterior parietal cortex will cause a decrease in the leader's ability to balance the object and correct errors is supported. The hypothesis that cathodal tDCS to posterior parietal cortex will cause a decrease in the follower's ability to balance the object and correct errors is not supported. The results of this study suggest that cathodal tDCS to posterior parietal cortex can impair the ability of the leader to balance the object and correct errors, but not the ability of the follower to do so.

## Introduction

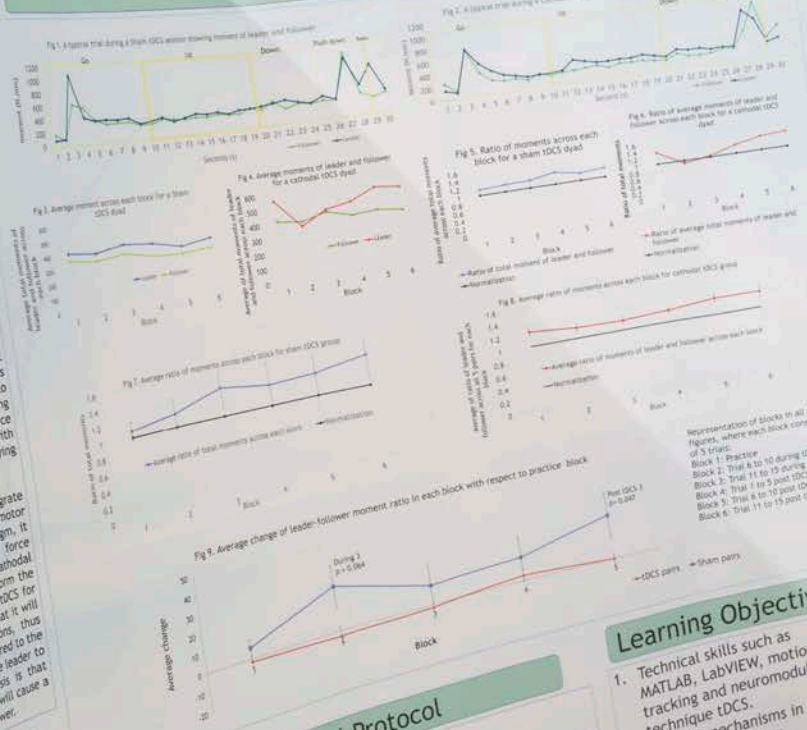
Human coordination plays a significant role during activities of daily living (ADL), such as moving a table. However, the underlying neural mechanisms are unknown. Santello and colleagues have developed a behavioral paradigm to understand the underlying mechanisms underlying manipulation of an object by two subjects or a dyad. In this behavioral paradigm, a dyad consists of two subjects or a dyad. They found that one of the subjects exerts a U-shaped grip device on the object as compared to the other. Digit force analysis indicated that the subject exerting greater total moment, labelled as the 'leader', made more force corrections based on sensory feedback when compared with the other subject, labelled as the 'follower'. However, the underlying neural mechanisms are unknown.

The posterior parietal cortex (PPC) is an area that is known to integrate multisensory feedback signals for the generation of accurate motor commands.<sup>11</sup> Thus, in our human-human coordination paradigm, it is likely that PPC is important to perform appropriate force corrections so as to balance the U-shaped object. We used cathodal tDCS to reduce the excitability of PPC while subjects perform the above mentioned task. Specifically, we delivered cathodal tDCS for 20 minutes over PPC in the leader with the expectation that it will impair his/her ability to perform digit force corrections, thus affecting the ability to exerted greater moment as compared to the follower. Thus, now the follower must compensate for the leader to balance the object and correct errors. Our hypothesis is that cathodal tDCS to the posterior parietal cortex in the leader will cause a decrease in the leader's ability to balance the object and correct errors, but not the ability of the follower to do so.

## Experimental Protocol

The experimental protocol consists of three blocks: Block C1 (Practice), Block C2 (tDCS sham), and Block C3 (tDCS cathodal). Each block consists of 5 trials. The practice block is used to familiarize the subjects with the task. The tDCS sham block is used to control for the effects of the tDCS procedure. The tDCS cathodal block is used to test the hypothesis that cathodal tDCS to the leader will impair his/her ability to balance the object and correct errors.

## Results



## Discussion

We aimed to answer the following project:

- How does cathodal tDCS vs sham tDCS affect the ability of the dyad to exert moment?
- Is there a role reversal (follower will become leader) if cathodal tDCS is delivered to the leader?

Cathodal tDCS is known to decrease motor excitability in the targeted region. The cathodal electrode inhibits the excitability of GABAergic and glutamate synapses with the postsynaptic neuron, which causes an influx of negatively charged ions into the neuron, leading to potential generation. There is a Long Term Depression (LTD) effect on cathodal tDCS.

We found that following sham tDCS over the PPC, there was a significant increase in the contribution of the leader to the total moment exerted on the object when compared to the sham tDCS condition. Following cathodal tDCS over PPC, the contribution of the leader to the total moment during and following sham tDCS can be used to improve practice.

Further study is needed to understand underlying neural mechanisms of human-human coordination.

## Learning Objectives

1. Technical skills such as MATLAB, LabVIEW, motion tracking and neuromodulation technique tDCS.
2. Cortical mechanisms in human-human coordination and analysis in the context of human-human coordination.

***Thank you mom and dad  
for everything.***

**Nitin Chandra Muthegowda**





***Dedicated to my parents!  
And, thank you ASU. Proud  
to be a Sun Devil!***

**Hari Hara Sudhen Naagaraajan**



***Dedicated to my parents.***

**Adarsh Nagarajan**



***Thank you ASU for these  
wonderful two years!***

**Vinay Kumar Nair**



***Welcome Mr.Namekumar &  
family***

**Adesh Namekumar**



*I got 99 problems but this  
degree ain't one.*

**Rakesh Nandyala**





*A special thanks to my parents  
and all my teachers who  
helped me reach this stage*

**Sravya Narala**



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FRIENDS for making me  
what I am today!***

**Prasanna Narendran**



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A big Thank you to my Family &  
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**Viswajith Hanasoge Nataraja**



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**Sai Kiran Neelakantam**



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**Kyle David Ness**





***Bruce, Emily, Nathan, and  
Kaden MOM LOVES YOU!!  
Phuong you rock. Thank you for  
all the love and support.***

**Kimberly Hau Nguyen**



***Thank you amma, nanna and  
annaya! Love you all.***

***Go devils!***

**Ananth Nibhanupudi**



***Muchas gracias a mi familia  
y amigos por todo, sin su  
ayuda no estaria aqui.***

**Oscar Solache Nishizaki**



*Special thanks to my family back home and my new family here. I would never achieve this without your support. to my father to make him proud of me!*

**Ali Farooq Nsaif**



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PING

INSTRON

Approximate weight for insertion by  
operator. Do not exceed the  
weight of the grips.

Approximate weight for insertion by  
operator. Do not exceed the  
weight of the grips.

***Tuty, M.I. & MFco. This was  
for you. Thanks! Love,  
Papito.***

**Magdiel F Galan Oliveras**



***My cup of joy is full and  
overflow, thank you Jesus  
for today.***

**Ramoni Dare Oluwo**



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Cho for always being there.  
This one is for you.*

**Shikha Komath Padmakshan**



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their continuous support.***

**Amardeep Reddy Paluru**





***The Devil graduates. Thank you Mom and Dad, you guys are the best! My dear fellow Devils, you guys rock!***

**Gaurav Pandey**





***Thank you Mumma and  
Papa for giving me the  
wings!***

**Ruchika Pandya**



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*Love you Mum, Dad and Annaya :,)*

**Anirudh Panuganti**



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**Srikanth Reddy Paramaiahgari**



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**Manesha Paramkusam**



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Thank you for making me who I am.***

**Kunal Parikh**





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**Mittal Patel**



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will be forever in your debt.*

**Neel Patel**



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**Priyam Patel**



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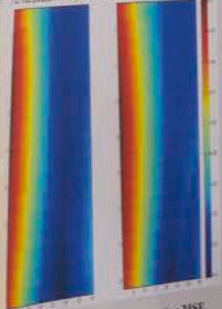
### ity images ASU

K8

$\alpha$  = Divergence Parameter  
 $\lambda$  = Smoothness Parameter

- Test on an (FD) data.  
Order divergence values and measure accuracy of interpolated images by calculating Mean Squared Error (MSE) values against the original reference slice. Debug code and finalize results.

HD interpolation =  $7.71e-05$     DF interpolation =  $1.35e-04$



side plots of interpolated slice indicating MSE in 1-R. Linear MSE =  $2.64e-04$ ,  $7.71e-05$ , Divergence-Free MSE =  $1.36e-04$ .  
is lower than the Horn-Schunck interpolated image of the same slice which served as the ground-truth image.

acknowledgments

### REAL-TIME ANIMATION FOR VISUOMOTOR LEARNING IN A 3D ENVIRONMENT VIA AN OCULUS RIFT

Ammer D. ...  
Dr. Christopher B. ...  
Arizona State University - School of Biological Engineering

ASU

Visual Motor Learning Lab @ ASU

Oculus Rift

Setup



*Thanks mom and dad for believing in me and always being so supportive. I hope I made you proud today and I wish that I continue to do so.*

**Tejas Patel**



***Thank you ASU for the memories and the exposure! I dedicate my degree to my family. I miss you grandpa! I wish you were here. -Forever, Sun Devil.***

**Zeel Patel**





*I would like to thank my parents for believing in my dreams and making it come true today.*

*Had an awesome experience at ASU.  
#Proud to be a Sun Devil*

**Anup Suresh Patil**



***:) Great thanks to professors! I have benefited a lot at ASU. Thank you my parents for supporting me!! Thank you my friends FOR ALL HAPPY MEMORIES!***

**Tianze Peng**



*Thank you to my professors, thesis advisers Dr. V Vittal and Dr. G Heydt, my colleagues and my parents for making this journey easier and fun.*

**Anushree Sanjeev Pethe**





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and dad for always believing in  
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**Eva Madlyn Pettinato**



***Mom, Dad & Family, Thanks for  
being there for me always.***

***Love you so much..!!***

**Praharsha Rao Piduru**



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**Jessica Marie Piper**



***Thank you for  
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**Yohan Plavartala**



***So glad you're here !!  
Thank you :)***

**Shruthi Poloju**





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everything. You are  
amazing. I love you! Venroy***

**Venroy Dunkley Porter**



***Mother, mother language, dad and bro -  
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And mom, hope you'll cherish my  
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**Sairamm Prabakar**



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Jayanthi, Puttaswamygowda  
and Suryakanth... Love you all  
~from CK the SunDevil !!!***

**Chandrakanth Kadahalli Puttaswamygowda**



*I will miss this peaceful  
place.*

**Zhuo Qian**



***Thank you very much, my family, to be with me in each and every situation during my academic period.***

**Akhtar Raaz**





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*I wish to thank my family and friends for all the support they have given me through the past two years*

**Ajit Raghunathan**



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whom this would not have been  
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**Vasudevan Ramachandran**





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**Shankar Ramakrishnan**



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and for all your support. I am grateful  
and this would not have been possible  
without you guys!  
Lots of love***

**Shruthi Ramamurthy**



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am not done yet!***

**Arun Ramesh**



***Thank you Mom and Dad  
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Devils!!***

**Nishanth Ramesh**



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***Krishna Teja Rust !***

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***You are THE AWESOMENESS \m/***

***- Buddi budigi***

**Gayathri Ravi**



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*Dear Mom and Dad,  
Thanks for your support and encouragement.  
I dont think I said this many times before, but I  
love you so much.  
Love, Vishal !!*

**Vishal Ruhela**



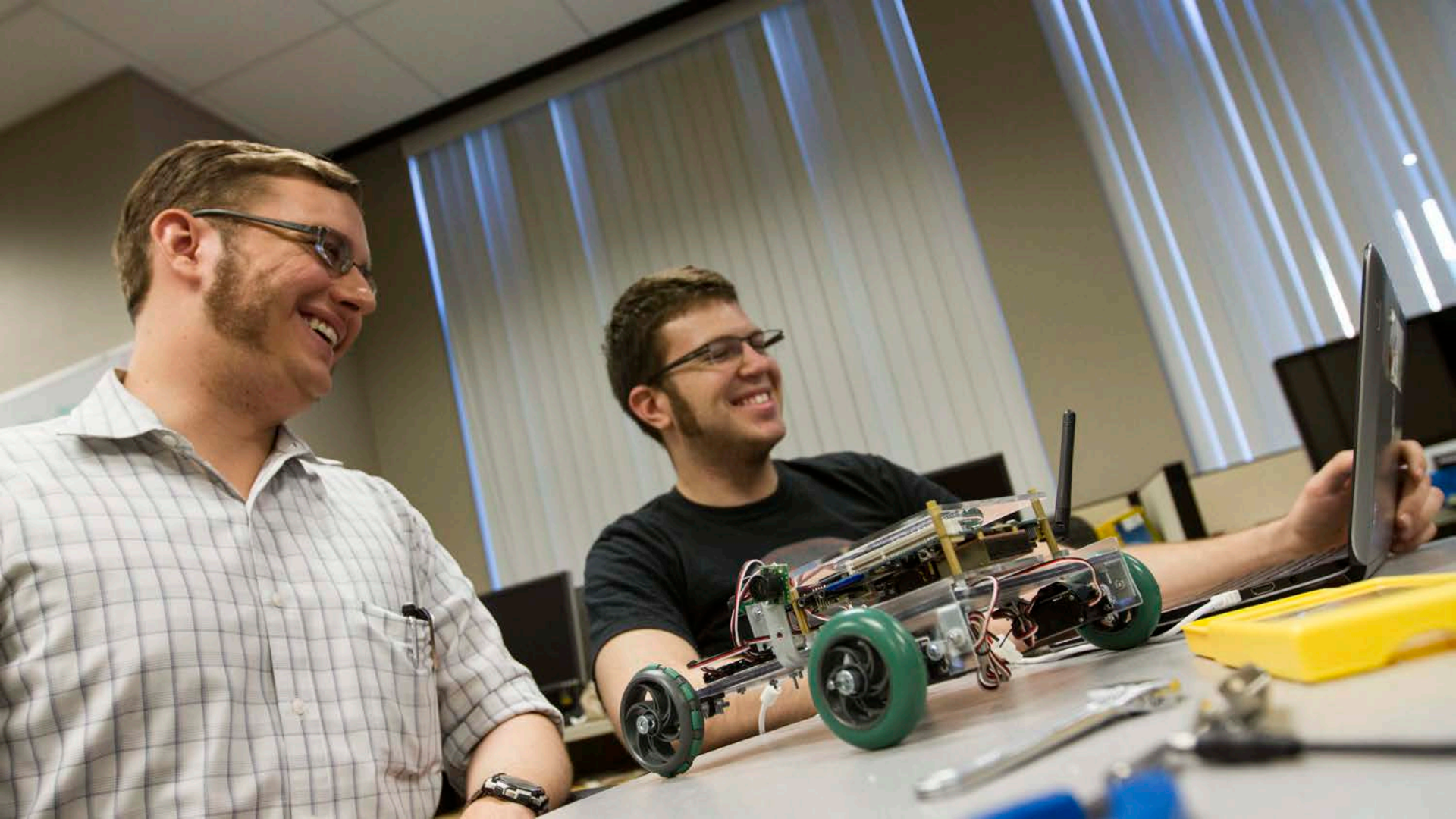
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*Thank you to my family and friends who have supported me these past five years, without your support I would not be the man I am today. Love you all!*

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***Experienced REAL  
ENGINEERING. Thank you  
ASU.***

**Alan Mathews Sam**



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**Shashi Ketan Samal**



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**Benjamin Edward Shaffer**



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Abhinav

Ira A. Fulton Schools of Engineering  
ASU

Nicolas



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***"A thank you to my family  
and friends for their  
constant support "***

**Ishaan Sharma**



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**Varun Siruvoru**



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Dad.***

**Raj Dheepak Sivaprakasam**



***Thank you all for everything you  
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where I am! I could not have  
done it without you!***

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**Danis Burton Smith**





*Ever so grateful to family  
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opportunity*

**Jayesh Sohanlal**



*Dear Mom and Dad,  
I am very thankful for your support and  
confidence in me.*

*Love,  
Annu.*

**Anurag Venkataramana Soothram**



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ator for fluid-flow ve  
anberoglu, Dr. David Frakes  
Engineering (ENME), Arizona State  
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powerful and accurate data processing  
The device allows us to be able to  
within the fluid domain  
Results and Analysis  
CFD simulation at 1.50  
The device allows us to be able to  
within the fluid domain



AL-TIME ANIMATION FOR VISUOMORPHIC LEAP  
TURE SYSTEM ADAPTED FOR AN IMMERSIVE  
OCULUS RIFT  
Armine Dav  
Dr. Christopher Bu  
Arizona State University - School of Biolog

Abstract  
Introduction  
Oculus Rift

**ASU** ARIZONA STATE UNIVERSITY

### A STUDY ON THE MIGRATION OF THE PROSTATE CANCER CELL BASED HYDROGEL AND THE EFFECT OF INHIBITORY DRUGS

Indrani Dasgupta<sup>1</sup>, Taraka Sai Pavan Grandhi<sup>2</sup>, Kaushal J  
Harrington Biomedical Engineering, School of Biological and Health Systems  
<sup>1</sup> Chemical Engineering, School for Engineering of Matter, Transport, and Energy, Arizona S

**ABSTRACT**  
Prostate cancer is the most common solid tumor in American men, affecting 1 in 7 men. The prostate cancer is a common cause of prostate cancer in the United States. In 2012, the prostate cancer was one of the most common and deadly causes of death in men. The prostate cancer is a solid tumor that develops in the prostate gland, which is a small, walnut-sized gland that surrounds the urethra. The prostate gland is located in the male reproductive system, and its main function is to produce and secrete prostatic secretions that help in the transport of sperm out of the body. The prostate cancer is a complex disease, and its treatment is challenging. The main goal of this research is to develop a hydrogel-based drug delivery system for prostate cancer treatment. The hydrogel is a network of polymer chains that can be cross-linked to form a gel. The hydrogel can be loaded with drugs and can release the drugs in a controlled manner. The hydrogel can also be designed to respond to specific stimuli, such as pH or temperature. The hydrogel-based drug delivery system can be used to deliver drugs to the prostate gland, where the cancer cells are located. The hydrogel-based drug delivery system can also be used to deliver drugs to other parts of the body, such as the lungs or the liver. The hydrogel-based drug delivery system can be used to deliver drugs to the prostate gland, where the cancer cells are located. The hydrogel-based drug delivery system can also be used to deliver drugs to other parts of the body, such as the lungs or the liver.

**HYPOTHESIS**  
The migration of the cells on the hydrogel can provide an insight on the mechanism of cell migration. The hydrogel-based drug delivery system can be used to deliver drugs to the prostate gland, where the cancer cells are located. The hydrogel-based drug delivery system can also be used to deliver drugs to other parts of the body, such as the lungs or the liver.

**MATERIALS AND METHODS**  
The hydrogel-based drug delivery system was prepared by cross-linking the hydrogel with the drug. The hydrogel was loaded with the drug and was used to deliver the drug to the prostate gland. The hydrogel-based drug delivery system was used to deliver the drug to the prostate gland, where the cancer cells are located. The hydrogel-based drug delivery system can also be used to deliver drugs to other parts of the body, such as the lungs or the liver.

**RESULTS**  
The hydrogel-based drug delivery system was used to deliver the drug to the prostate gland, where the cancer cells are located. The hydrogel-based drug delivery system can also be used to deliver drugs to other parts of the body, such as the lungs or the liver.

**CONCLUSION**  
The hydrogel-based drug delivery system was used to deliver the drug to the prostate gland, where the cancer cells are located. The hydrogel-based drug delivery system can also be used to deliver drugs to other parts of the body, such as the lungs or the liver.

**ACKNOWLEDGEMENT**  
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**REFERENCES**  
1. Dasgupta, I., Grandhi, T.S.P., and Kaushal, J. (2012). A study on the migration of the prostate cancer cell based hydrogel and the effect of inhibitory drugs. *Journal of Biomedical Engineering Research*, 1(1), 1-10.  
2. Grandhi, T.S.P., Dasgupta, I., and Kaushal, J. (2013). A study on the migration of the prostate cancer cell based hydrogel and the effect of inhibitory drugs. *Journal of Biomedical Engineering Research*, 2(1), 1-10.



***Thanks to God***  
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**Arokia Diana Gene Arokiam Maria Susai**



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**Nabila Syed**



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**Jon William Middleton Thomas**



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**Nitin Tummala**



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**Neelesh Umachandran**



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***Thank you family and friends for  
providing support and having  
faith in me. waaatthhhaaaa  
\*tears of joy\****

**Varun Vasudevan**



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**Jaswanth Bharath Veerapaneni**



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Graduating with lots of memories for  
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**Vandita Venuturapalli**



***Thank you Mom and Dad  
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*Thank you Amma and papa*

**AKSHYA WADHWANI**





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**Fengyu Wang**



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**Jiang Zhu**

