Emel Demircan

Department of Mechanical and Aerospace Engineering
Department of Biomedical Engineering
California State University, Long Beach
1250 Bellflower Boulevard, ECS-645, Long Beach, CA
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RESEARCH INTERESTS

Cyber-physical systems, musculoskeletal dynamics and control, modeling and simulation of the neuro-musculoskeletal system, machine learning-based biomechanical modeling, experimental and computational approaches to study human movement, rehabilitation robotics, human movement understanding, human augmentation, sports biomechanics.

EDUCATION

Stanford University, Stanford, CA
PhD., Mechanical Engineering, September 2012
Dissertation: Robotics-based Reconstruction and Synthesis of Human Motion
Committee: Oussama Khatib, Scott Delp, Mark Cutkosky, Kenneth Salisbury

Stanford University, Stanford, CA
MS, Mechanical Engineering, June 2007

Bogazici University, Istanbul, Turkey
BS (Double-Major), Mechanical Engineering, June 2006 (with Honors) and
Industrial Engineering, June 2006 (with Honors)

PROFESSIONAL/RESEARCH EXPERIENCE

Sept/2016-present	**Assistant Professor** Department of Biomedical Engineering California State University, Long Beach, USA
Sept/2015-present	**Assistant Professor** Department of Mechanical and Aerospace Engineering California State University, Long Beach, USA
Jan/2014-Apr/2015	**Project Assistant Professor** Department of Mechano-Informatics Graduate School of Information Science and Technology The University of Tokyo, Japan
June/2014-Apr/2015	**Research Scientist** Lucile Salter Packard Children's Hospital Department of Orthopeadic Surgery,Stanford University, USA
Oct/2012–Jan/2014	**Post-Doctoral Scholar** Computer Science, Stanford University, USA
Apr/2010–June/2010	**Visiting Researcher** LIRMM, Universite de Montpellier II, France
Apr/2007–Oct/2012	**Graduate Research Assistant** Computer Science, Stanford University, USA
June/2004–Aug/2004	**Research Intern** PCI Process-Conception-Ingenierie Peugeot-Citroen Automobiles, Paris, France

RESEARCH GRANTS

- **Title:** A Wearable Cyber-Physical System for Musculoskeletal Modeling and Gait Retraining
  Sponsor: American Honda Foundation Grant
  Amount: $50,000; **Period:** 2019-2020
  PI: E. Demircan
- **Title:** CRII: CHS: Constraint Consistent, Task-Based Musculoskeletal Control Framework for Human Motion Synthesis and Immediate Feedback
  Sponsor: National Science Foundation (NSF)
  Amount: $174,777; **Period:** 2017-2019
  PI: E. Demircan
- **Title:** Small Equipment Grant
  Sponsor: National Institute of Health BUILD
  Amount: $10,000; **Period:** 2018
  PI: E. Demircan
- **Title:** MRI: Acquisition of Dynamic Immersive Virtual Environment for Research in Human-Machine Interaction
  Sponsor: National Science Foundation (NSF)
  Amount: $381,000; **Period:** 2016-2018
  co-PI: E. Demircan
- **Title:** Novel Driver Interface to Increase Driver Confidence by the Integration of Clear and Fast Response from the Haptic and Visual elements
  Sponsor: Denso North America Foundation
  Amount: $50,000; **Period:** 2015-2016
  PI: E. Demircan
- **Title:** Human-Centered Robotics for Physical Assistance
  Sponsor: National Institute of Health
  Amount: $10,000; **Period:** 2015
  PI: E. Demircan

TEACHING EXPERIENCE

California State University, Long Beach, CA

Graduate Courses:

- MAE 590: Experimental Robotics (Fall 2017), *new course developed*
- MAE 577: Biomechanics of Human Movement (Spring 2016, Fall 2017, Spring 2019), *new course developed*
- MAE 575: Robot Modeling and Control (Spring 2017, Spring 2019)

Undergraduate Courses:

- BIOME 490B: Biomedical Engineering Capstone II (Spring 2019)
- BIOME 490A: Biomedical Engineering Capstone I (Fall 2018)
- BIOME 311: Biomechanics II (Spring 2018, Fall 2018)
- BIOME 211: Biomechanics I (Fall 2017)
- MAE 205: Computer Methods in Mechanical and Aerospace Engineering (Fall 2016)
- MAE 371: Analytical Mechanics II, Dynamics (Fall 2015, Spring 2016, Fall 2016)

University of Tokyo, Tokyo, Japan

Graduate and Undergraduate Courses:

- Mechanical Engineering Seminar, Special Lecture on Mechano-Informatics II (Summer 2014). Created and taught a new bioengineering course *Biomechanics of Human Movement* for Mechanical Engineering undergraduate and Mechano-Informatics graduate students.

Stanford University, CA

Graduate Courses (Teaching Assistant):

- CS 327: Advanced Robotics, Computer Science and Mechanical Engineering (Spring 2010)
- CS 225A: Experimental Robotics, Computer Science and Mechanical Engineering (Spring 2008)

AWARDS AND HONORS

- NSF Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII) award (2017)
- California State University, Long Beach ORSP Multi-Disciplinary Faculty Award (2016)
- HOGAR (Hispanic Opportunities for Graduate Access and Retention) Faculty Award (2015)
- California State University, Long Beach Alumni Award (2015)
- California State University, Long Beach ORSP Small Faculty Award (2015)
- National Center for Simulation in Rehabilitation Research, OpenSim Fellow (2014-present)
- Global Creative Leader's Program Project Assistant Professor (2014-2015)
- Stanford University Bio-X Travel Awardee (2010)
- Honors in Bachelor of Science Double-Major (2006)

PUBLICATIONS

Note: * Asterisk indicates corresponding author. Underline indicates graduate students advised. †Dagger indicates undergraduate students advised.

Journal Articles:

Submitted/Under Review:

9. **E. Demircan***, Elliot Recinos, John Abella, I-Hung Khoo, Hsiang-Ling Teng, Willbur Wu, Understanding Human Perception for the Development of a Portable Vibrotactile Haptic Suit for Performance Improvement, *Frontiers in Neurorobotics*.

8. **E. Demircan***, Denny Oetomo, Vincent de Sapio, Jaeuheung Park, and Oussama Khatib (eds.), Special Issue: Human Movement Understanding in Robotics, *Robotics and Autonomous Systems*.

7. **E. Demircan***, S. Yung, †M. Choi, J. Rodriguez, †S. Stuart, †J. Baschi, and †B. Ngyuen, The Effect of Robotic Assistance on Human Muscular Effort in Manipulation Tasks, *Robotics and Autonomous Systems*.

Published:

6. E. Lashgari* and **E. Demircan**, Electromyography Pattern Classification with Laplacian Eigenmaps in Human Running, International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering, 11(4), pp: 383-388, 2017.

5. †K. Nishimi, †M, Choi, †J. Park, and **E. Demircan***, The Effect of Surface Incline on Running Biomechanics, *Annals of Sports Medicine and Research* 3(6): 1080, 2016.

4. D. Kulic*, G. Venture, K. Yamane **E. Demircan**, I. Mizuuchi, and K. Mombaur, Anthropomorphic movement analysis and synthesis: A survey of methods and applications, *IEEE Transactions on Robotics*, 2016.

3. **E. Demircan***, D. Kulic, D. Oetomo, M. Hayashibe, Human Movement Understanding, *IEEE Robotics & Automation Magazine*, pp. 2224, September 2015.

2. S. Cotton*, M. Vanoncini, P. Fraisse, N. Ramdani, **E. Demircan**, A.P. Murray, T. Keller, Estimation of the centre of mass from motion capture and force plate recordings: a study on the elderly, *Applied Bionics and Biomechanics*, 8(1), pp. 67-84, 2011.

1. O. Khatib*, **E. Demircan**, V. DeSapio, L. Sentis, T. Besier, and S. Delp, Robotics-based synthesis of human motion, *Journal of Physiology-Paris*, 103, pp. 211–219, 2009.

Books:

1. **E. Demircan**, H. Dallali, and M. Rastgaar, Adaptive Control Methods in Assistive Technologies, *Biomedical Engineering, Elsevier* (accepted for publication, 2020).

Book Chapters/Collections:

5. **E. Demircan*** and J. Rodriguez, Efficacy of Cardiovascular Activity in Stroke Rehabilitation Therapy, *Converging Clinical and Engineering Research on Neurorehabilitation II*, Springer International, Vol. 15, pp 249-252, 2016.

4. **E. Demircan***, A. Murai, O. Khatib, and Y. Nakamura, Muscular Effort for the Characterization of Human Postural Behaviors, *Springer Tracts in Advanced Robotics: Experimental Robotics*, 2014.

3. **E. Demircan***, O. Khatib, Constraint-Consistent Analysis of Muscle Force Contributions to Human Gait, In J. Lenarcic and M. Husty. *Latest Advances in Robot Kinematics*, Springer, Berlin, Heidelberg, Germany, pp. 301–308, 2012.

2. **E. Demircan***, T. Besier, S. Menon, O. Khatib, Human Motion Reconstruction and Synthesis of Human Skills, In J. Lenarcic and M.M. Stanisic. *Advances in Robot Kinematics*, Springer, Berlin, Heidelberg, Germany, pp. 283–292, 2010.

1. **E. Demircan***, L. Sentis, V. DeSapio, O. Khatib, Human Motion Reconstruction by Direct Control of Marker Trajectories, In J. Lenarcic and P. Wenger. *Advances in Robot Kinematics*, Springer, Berlin, Heidelberg, Germany, pp. 263–272, 2008.

Refereed Conference Articles:

10. John Abella and **E. Demircan***, Towards a Virtual Reality-based Framework for Motion Retraining and Rehabilitation, *submitted, IEEE ICRA 2019.*

9. **E. Demircan***, Elliot Recinos, John Abella, I-Hung Khoo, Hsiang-Ling Teng, Willbur Wu, A Portable Vibrotactile Haptic Suit for Performance Improvement in Walking and Running, *submitted, IEEE ICRA 2019.*

8. D. Chaudhari, K. Bhagat and **E. Demircan***, Understanding and Transform of Human Skills in Robotics using Deep Learning and Musculoskeletal Modeling, *International Conference on Experimental Robotics*, 2018.

7. E. Lashgari* and **E. Demircan**, Electromyography Pattern Classification with Laplacian Eigenmaps in Human Running, *International Conference on Telecommunications and Signal Processing*, 2017.

6. **E. Demircan*** and J. Rodriguez, Efficacy of Cardiovascular Activity in Stroke Rehabilitation Therapy, *International Conference on Neurorehabilitation*, 2016.

5. A. Gonzales*, M. Hayashibe, **E. Demircan**, and P. Fraisse, Center of Mass Estimation for Rehabilitation in a Multi-Contact Environment: A Simulation Study, *Proc. of the IEEE International Conference on Systems, Man, and Cybernetics*, Manchester, UK, October 2013.

4. **E. Demircan***, T. Besier, O. Khatib, Muscle Force Transmission to Operational Space Accelerations During Elite Golf Swings, *Proc. of the IEEE International Conference on Robotics and Automation*, St Paul, MN, USA, 2012.

3. **E. Demircan***, O. Khatib, Robotics-Based Human Dynamic Performance Analysis, Elsevier, Journal of Biomechanics, 43(1). *Proc. of the International Conference on Orthopeadic Surgery, Biomechanics and Clinical Applications*, London, UK, 2010.

2. **E. Demircan***, O. Khatib, J. Wheeler, S. Delp, Reconstruction and EMG-Informed Control, Simulation and Analysis of Human Movement for Athletics: Performance Improvement and Injury Prevention, *Proc. of 31th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, pp. 6534–6537, Minneapolis, MN, USA, 2009.

1. **E. Demircan***, J. Wheeler, F.C. Anderson, T. Besier, S. Delp, EMG-Informed Computed Muscle Control for Dynamic Simulations of Movement, *Proc. of the XXII Congress of the International Society of Biomechanics*, Cape Town, South Africa, 2009.

JOURNAL EDITORSHIP

- **Guest Editor**, International Journal of Human Factors Modeling and Simulation (2018)
- **Guest Editor**, Robotics and Autonomous Systems (2017)
- **Associate Editor**, IEEE Transactions on Robotics (2016)

PROFESSIONAL SERVICE

- **General Chair**, IEEE International Conference on Advanced Robotics and its Social Impacts, ARSO (2021)
- **Corporate Relations Chair**, IEEE International Conference on Intelligent Robots and Systems, IROS (2020)
- **International Program Committee Member**, 3rd IEEE International Conference on Robotic Computing, IRC (2019)
- **International Program Committee Member**, 14th International Conference on Ubiquitous Robots and Ambient Intelligence, URAI (2017)
- **Editor**, IEEE International Conference on Intelligent Robots and Systems, IROS (2017, 2018)
- **Associate Editor**, IEEE International Conference on Robotics and Automation, ICRA (2017, 2018, 2019)
- **Conferences Committee Member**, IEEE Brain Initiative (2016-present)
- **Co-chair and Co-founder**, IEEE RAS Technical Committee on Human Movement Understanding (2014-present)
- **Co-proposer** of the IEEE RAS Creation of Educational Materials (CEMRA) in Human Movement Understanding and Synthesis (2014, accepted)
- **Co-chair and Local Arrangements** of the First Symposium of Biomechanics of Human Movement, University of Tokyo (2014)
- **Coordinator**, Stanford University Robotics Seminar Series (2013)
- **Local Arrangements, Outreach Youth Event Chair**, IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS (2011)

WORKSHOPS, TUTORIALS, AND ORGANIZED SESSIONS

H. Dallali, **E. Demircan** and M. Rastgaar (Co-Organizers) Full-day Workshop on Adaptive Control Methods in Assistive Technologies, *IEEE International Conference on Intelligent Robots and Systems (IROS)*, Vancouver, Canada, 2017.

E. Demircan, O. Khatib (Co-Organizers) Full-day Workshop on Human Performance and Robotics, *IEEE RAS International Conference on Humanoid Robots (Humanoids)*, Cancun, Mexico, 2016.

E. Demircan, M. Sreenivasa (Co-Organizers) Half-day Workshop on Human Movement Understanding and Robotics, *IEEE International Conference on Intelligent Robots and Systems (IROS)*, Seoul, Korea, 2016.

E. Demircan, D. Kulic (Co-Organizers) Half-day Workshop on Human Locomotion Understanding for the Design and Control of Next Generation of Humanoids and Assistive Devices, *IEEE RAS International Conference on Humanoid Robots (Humanoids)*, Seoul, Korea, 2015.

E. Demircan, M. Hayashibe, P. Fraisse, and O. Khatib (Co-Organizers) Half-day Workshop on Human Motion Modeling and Human-inspired Motor Control accepted for Humanoids, *IEEE RAS International Conference on Humanoid Robots (Humanoids)*, Madrid, Spain, 2014.

E. Demircan, O. Khatib, Y. Nakamura, G. Venture, and D. Oetomo (Co-Organizers) Full-day Workshop on Latest Advanced on Natural Motion Understanding and Human Motion Synthesis, *IEEE International Conference on Robotics and Automation (ICRA)*, Hong Kong, 2014.

E. Demircan, G. Venture (Co-Organizers) Full-day Tutorial on Robotics-based Methods for the Identification, Recognition, and Synthesis of Human Motions, *IEEE International Conference on Intelligent Robots and Systems (IROS)*, Tokyo, Japan, 2013.

E. Demircan, D. Oetomo (Co-Organizers) Organized Session on Latest Advances in Computational Techniques for Human-Centered Motion Reconstruction and Analysis, *IEEE International Conference on Intelligent Robots and Systems (IROS)*, Tokyo, Japan, 2013.

E. Demircan, D. Oetomo, O. Khatib (Co-Organizers), Full-day Workshop in Computational Techniques in Natural Motion Analysis and Reconstruction, *IEEE International Conference on Robotics and Automation (ICRA)*, Karlsruhe, Germany, 2013.

UNIVERSITY SERVICE

Campus:

- *Faculty Mentor*, **National Institute of Health (NIH) BUILD Program**, California State University, Long Beach (2015-present)
- *Faculty Mentor*, **Future Girls @ The Beach Program**, K-12 Outreach and Recruitment Office, California State University, Long Beach (2015-present)
- *Faculty Judge*, **College of Engineering Student Research Competition**, California State University, Long Beach (Fall 2015)

College:

- *Member*, **Lecturer Reviewer Committee**, California State University, Long Beach (Fall 2017-present)
- *Member*, **Grade Appeal Committee**, California State University, Long Beach (Fall 2017-present)
- *Member*, **Awards Committee**, College of Engineering Council, California State University, Long Beach (Spring 2016-present)
- *Member*, **Founding Faculty**, Biomedical Engineering Department, California State University, Long Beach (Spring 2016)

Department:

- *Member*, **Curriculum Development Committee**, Biomedical Engineering, California State University, Long Beach (Fall 2016-present)
- *Member*, **Curriculum Development Committee**, Mechanical and Aerospace Engineering, California State University, Long Beach (Spring 2016-present)

PEER-REVIEW ACTIVITIES

Journals:

- RSJ Advanced Robotics
- IEEE Transactions on Robotics
- Robotics and Autonomous Systems
- Advances in Robot Kinematics
- IEEE Systems, Man and Cybernetics
- Biomedical Signal Processing and Control

Conferences:

- International Conference on Robotics and Automation (ICRA)
- International Conference on Intelligent Robots and Systems (IROS)
- International Conference on Humanoid Robots (Humanoids)
- International Conference on Biomedical Robotics and Biomechatronics (Biorob)

PROPOSAL REVIEWER

- National Science Foundation (2017-pres.)
- Strategic Research Programme, Bruxelles (2017-pres)
- NSERC Discovery Grant, Natural Sciences and Engineering Research Council of Canada (2016-present)

OUTREACH ACTIVITIES

Host, **STEM Girls: Visit to the Human Performance and Robotics Lab (HPRL)**, California State University, Long Beach, CA (Fall 2015-present).

- Hosted high school students and organized a workshop to introduce musculoskeletal modeling and simulation framework and interactive robotics demonstrations.

Host, **Women Engineers at the Beach: Visit to the Human Performance and Robotics Lab (HPRL)**, California State University, Long Beach, CA (Fall 2015-present).

- Hosted high school students and organized a workshop to introduce musculoskeletal modeling and simulation framework and interactive robotics demonstrations.

Host, **NIH BUILD Program: Visit to the Human Performance and Robotics Lab (HPRL)**, California State University, Long Beach, CA (Fall 2015-present).

- Hosted NIH BUILD Program students to introduce musculoskeletal modeling and simulation framework and interactive robotics demonstrations.

Invited Speaker, **NIH BUILD Program**, California State University, Long Beach, CA (Spring 2016).

Faculty Mentor, **Future Girls @ The Beach Program**, K-12 Outreach and Recruitment Office, California State University, Long Beach (2015-present).

Featured, **Quest Magazine**, California State University, Long Beach, CA (Fall 2016).

- Featured as the founding faculty of the newly established Biomedical Engineering Department.

Featured, **California State University, Long Beach Homepage**, California State University, Long Beach, CA (Fall 2016).

- Featured as the founding faculty of the newly established Biomedical Engineering Department.

THESIS COMMITTEES

B.S. University Honors Program Thesis Committees:

- Jared Malabed (Jun. 2018).
- Andre Colacio (Jun. 2018).
- Jared Chafetz (Jun. 2018).

M.S. Thesis Committees:

- John Abella, (Jun. 2019).
- Elliot Recinos (Jun. 2019).
- Joaquin Martinez (Jun. 2019).
- Kunj Bhagat (Dec. 2018).
- Dipti Chaudhari, Understanding and Transform of Human Skills in Robotics using Deep Learning and Musculoskeletal Modeling, Dec. 2017.
- Stephanie Yung, The Effect of Robotic Assistance on Human Muscular Effort, Jun. 2017.
- Joseph Coggins, Modeling Human Gait Cycles with a Robotic Leg to Mitigate the Inaccuracies During Prosthetic Fittings, Jun. 2017.
- Vijay Anandani, Autonomous Vehicle control using Neurosky Mindwave, Sept. 2016.

Ph.D. Dissertation Defense Committees:

- Massoud Saleh, Jun. 2017
- Elnaz Lashgari, Jun. 2020

RESEARCH SUPERVISION

Current:

- Maral Kasiri, Ph.D. Student, Industrial Engineering and Applied Math, CSULB, Long Beach, CA (Jun. 2021).
- Elnaz Lashgari, Ph.D. Student, Industrial Engineering and Applied Math, CSULB, Long Beach, CA (Jun. 2018).
- John Abella, M.S. Student, Mechanical Engineering, CSULB, Long Beach, CA (Jun. 2019).
- Elliot Recinos, M.S. Student, Mechanical Engineering, CSULB, Long Beach, CA (Jun. 2019).
- Joaquin Martinez, M.S. Student, Mechanical Engineering, CSULB, Long Beach, CA (Jun. 2019).
- Kunj Bhagat, M.S. Student, Mechanical Engineering, CSULB, Long Beach, CA (Dec. 2018).
- Javier Rodriguez, Post-Baccalaureate Student, Mechanical Engineering, CSULB, Long Beach, CA (Dec. 2018).

Completed:

- Dipti Chaudhari, M.S. Student, Computer Science, CSULB, Long Beach, CA (Dec. 2017).
- Stephanie Yung, M.S. Student, Mechanical Engineering, CSULB, Long Beach, CA (Jun. 2017).
- Joseph Coggins, M.S. Student, Mechanical Engineering, CSULB, Long Beach, CA (Jun. 2017).
- Vijay Anandani, M.S. Thesis, Electrical Engineering, CSULB, Long Beach, CA (Sept. 2016).
- Jared Chafetz, B.S. Thesis, University Honors Program, Mechanical Engineering, CSULB, Long Beach, CA (Jun. 2016).

INVITED PRESENTATIONS

University of Washington, WA, Feb. 2018.

UT Arlington, TX, Nov. 2017.

Michigan Technological University, MI, Feb. 2017.

University of California, Santa Barbara, CA, Apr. 2015.

Southern Methodist University, Dallas, TX, Sept. 2014.

Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland, Jun. 2013.

Institut des Systemes Intelligents et de Robotique (ISIR), Universite de Marie-Curie, France, May 2013.

University of Tokyo, Japan, Nov. 2013.

Tokyo University of Agriculture and Technology, Japan, Nov. 2013.

Lockheed Martin, CA, 2012.

Universite de Montpellier II (Journee Scientifique DEMAR), France, 2011, 2012.

Workshop on Robotics for Neurology and Rehabilitation (IEEE International Conference on Intelligent Robots and Systems, IROS) San Francisco, CA, 2011.