

Dana Solav

Address: Dan Kahn 406, Technion city, Haifa 3200003, Israel

Phone: +972-77-8875494

Email: danas@technion.ac.il

Web: <https://www.solavlab.com/>

Academic degrees

- 10/2010 – 12/2016: **Ph.D. (direct track)**
Faculty of Mechanical Engineering
Technion – Israel Institute of Technology, Haifa, Israel
Thesis: “Non-Rigid Kinematic Analysis in Various Biomechanical Applications Using Cosserat Point Theory”
- 10/2003 – 01/2006: **B.Sc., *cum laude*, GPA: 92/100**
Geophysics and Planetary Sciences, Faculty of Exact Sciences
Tel Aviv University, Tel Aviv, Israel

Academic Appointments

- 08/2020 – present: **Assistant Professor**
Jacques Leviner Career Advancement Chair
Faculty of Mechanical Engineering
Technion – Israel Institute of Technology, Haifa, Israel
- 01/2019 – 04/2020: **Research Scientist**
MIT Media Lab, Biomechatronics group
Massachusetts Institute of Technology, Cambridge, MA, USA
- 01/2017 – 12/2018: **Postdoctoral Research Associate**
MIT Media Lab, Biomechatronics group
Massachusetts Institute of Technology, Cambridge, MA, USA

Research areas

Human biomechanics, movement and gait analysis, computational biomechanics, experimental (bio)mechanics, finite element analysis, digital image correlation, image-based modeling, additive manufacturing, generative design, design optimization, medical devices.

Professional Experience

- 01/2017 – 04/2020: **Researcher**
MIT Media Lab, Biomechatronics group
Massachusetts Institute of Technology, Cambridge, MA, USA
- Designed and built a complete system (software and hardware) for measuring the dynamic shape and full-field deformation of residual limbs of amputees to improve prosthetic socket design.

- Developed an experimental and computational framework for estimating the soft tissue mechanical properties of residual limbs in-vivo using inverse finite element analysis and digital image correlation of indentation tests.
- Participated in the development of a framework for automated data-driven design, optimization, and evaluation of patient-specific prosthetic sockets.
- Designed and conducted experiments with transtibial amputees as a part of an NIH clinical trial (R01EB024531), including MRI, DIC, gait analysis, thermal imaging, and pressure sensing.

10/2010 – 12/2016:

Graduate Research Assistant

Biorobotics and Biomechanics Lab, Faculty of Mechanical Engineering
Technion – Israel Institute of Technology, Haifa, Israel

- Developed a novel methodology to evaluate and compensate for soft tissue artifacts in non-invasive human motion capture systems based on the continuum mechanical theory of Cosserat points.
- Collected and analyzed kinematics data from passive (Vicon) and active (CodaMotion) marker-based motion capture systems, as well as from bi-plane fluoroscopy.
- Analyzed in-vivo clinical human motion capture data, collected from lower limbs during gait (N=19), as well as chest wall motion during breathing on healthy and neuromuscular patients (N=29).

Teaching and mentoring Experience

01/2017 – 02/2020:

Research Advisor

Undergraduate Research Opportunity Program (UROP)
MIT Media Lab, Biomechatronics group
Massachusetts Institute of Technology, Cambridge, MA, USA

- Developed semester-long research projects for undergraduate students.
- Advised 13 undergraduate students on their research projects in Biomechatronics.

10/2011 – 02/2016:

Teaching Assistant, Solid Mechanics 2

Faculty of Mechanical Engineering
Technion – Israel Institute of Technology, Haifa, Israel

- Taught classes of 20-70 students.
- Wrote assignments and exam problems.
- Managed a team of up to four teaching assistants

10/2014 – 02/2015:

Teaching Assistant, Creative Introduction to Mechanical Engineering

Faculty of Mechanical Engineering
Technion – Israel Institute of Technology, Haifa, Israel

- Taught classes of 60 students and supervised laboratory assignments
- Designed and evaluated new projects for home assignments

Professional activities

Reviewer for scientific journals

- Nature Scientific Reports

- IEEE Access
- Prosthetics & Orthotics International
- Journal of Open Source Software
- IEEE Transactions on Neural Systems & Rehabilitation Engineering
- ASME Journal of Mechanisms and Robotics
- IEEE Transactions on Biomedical Engineering

Professional Affiliations

2018 – 2019 IEEE Engineering in Medicine and Biology Society
2018 – 2019 The International Association of Computational Mechanics
2012 – 2018 The International Society of Biomechanics
2012 – 2016 The European Society of Biomechanics

Professional development

2018 Kaufman Teaching Certificate Program, Massachusetts Institute of Technology
2017 Mozilla Working Open Workshop, Massachusetts Institute of Technology
2017 Path of Professorship Workshop, Massachusetts Institute of Technology

Awards and honors

2020 Jacques Lewiner Career Advancement Chair
2019 IEEE Transactions on Biomedical Engineering- selected for the front cover
2018 IEEE Access Best Multimedia Award
2017 MIT–Technion Postdoctoral Fellowship
2016 Student Presentation Award 2nd place, The 34th Israeli Conference on Mech. Eng.
2016 Student Award Finalist of the European Society of Biomechanics Congress
2015 Aharon and Ephraim Katzir Study Grant, The Israel Academy of Sciences
2015 The Irwin and Joan Jacobs PhD Fellowship
2014 Sylvia and David Fine Excellence Scholarship for PhD Students
2013 Miriam and Aaron Gutwirth Memorial Fellowship
2013 The International Society of Biomechanics Student Congress Travel Grant
2012 Leonard and Diane Sherman Interdisciplinary Graduate School Fellowship
2012 Outstanding Oral Presentation, The 32nd Israeli Conference on Mech. Eng.
2012 – 2016 Excellent Teaching Assistant Prize, Solid Mechanics 2, Technion – 5 times
2004 – 2006 Dean Excellence Award, Tel-Aviv University – 3 times

Research grants

2021 – 2022 Technion Additive Manufacturing Center
Role: Principal Investigator
Amount: 10,000 USD

Publications

Theses

T1. Solav D., “[Non rigid kinematic analysis in various biomechanical applications using Cosserat point theory](#)”. Ph.D. thesis, Technion Israel Institute of Technology, Haifa, Israel, 2016. Advisors: Prof. Alon Wolf and Prof. MB Rubin.

Refereed papers in professional journals

- J1. Rogers, E., Carney, M., Yeon, S., Clites, T., **Solav, D.**, Herr. H., (2020). “[An Ankle-Foot Prosthesis for Rock Climbing Augmentation](#)”. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, E-pub ahead of print. DOI: 10.1109/TNSRE.2020.3033474.
- J2. Sun T.*, Tasnim F.*, McIntosh R., Amiri N., **Solav D.**, Anbarani M., Sadat D., Zhang L., Gu Y., Karami M., Dagdeviren C., (2020). “[Decoding of facial strains via conformable piezoelectric interfaces](#)”. *Nature Biomedical Engineering*, 4, 954-972.
- J3. **Solav, D.**, Moerman, K., Jaeger, A., Herr. H., (2019). “[A Framework for Measuring the Time-varying Shape and Full-field Deformation of Residual Limbs using 3D Digital Image Correlation](#)”. *IEEE Transactions on Biomedical Engineering*, 66(10), 2740-2752.
 - Featured on the cover page of IEEE Transactions on Biomedical Engineering.
- J4. **Solav, D.**, Moerman, K., Jaeger, A., Genovese, K., Herr. H., (2018). “[MultiDIC: a MATLAB Toolbox for Multi-View 3D Digital Image Correlation](#)”. *IEEE Access*, 6, 30520-30535.
 - Selected for IEEE Access Multimedia Award.
- J5. **Solav, D.**, Meric, H., Rubin, M.B., Pradon, D., Lofaso, F., Wolf, A., (2017). “[Chest Wall Kinematics Using Triangular Cosserat Point Elements in Healthy and Neuromuscular Subjects](#)”. *Annals of Biomedical Engineering*, 45(8), 1963-1973.
- J6. **Solav, D.**, Camomilla, V., Cereatti, A., Barré, A., Aminian, K., Wolf, A., (2017). “[Bone Orientation and Position Estimation Errors Using Cosserat Point Elements and Least Squares methods: Application to Gait](#)”. *Journal of Biomechanics*, 62, 110-116.
- J7. Rubin, M.B. and **Solav, D.**, (2016). “[Unphysical Properties of the Rotation Tensor Estimated by Least Squares Optimization with Specific Application to Biomechanics](#)”. *International Journal of Engineering Science*, 103, 11-18.
- J8. **Solav, D.**, Rubin, M.B., Cereatti, A., Camomilla, V., Wolf, A., (2015). “[Bone Pose estimation in the presence of Soft Tissue Artifact using Triangular Cosserat Point Elements](#)”. *Annals of Biomedical Engineering*, 44(4), 1181-1190.
- J9. **Solav, D.**, Rubin, M.B., Wolf, A., (2014). “[Soft Tissue Artifact compensation using Triangular Cosserat Point Elements \(TCPEs\)](#)”. *International Journal of Engineering Science*, 85, 1-9.

Submitted papers

- J10. Moerman, K., **Solav, D.**, Sengeh, D., Herr. H. “[Automated and Data-driven Computational Design of Patient-Specific Transtibial Prosthetic Sockets](#)”. DOI: 10.31224/osf.io/g8h9n.
- J11. Hill, D., Moerman, K., **Solav, D.**, D’Andrea S., Herr. H. “Multi-joint Human Walking Arthrokinematics using Biplanar Fluoroscopy”.
- J12. Farid, M. and **Solav, D.**, “Data-driven sensor placement optimization for accurate and early prediction of stochastic complex systems”.

Conference abstracts and presentations

* Presenters in bold

- C1. **Solav, D.**, Jaeger, A., Moerman, K., Yang, X., Herr, H., “Hyperelastic biomechanical model of a transtibial residuum from in-vivo indentation using inverse finite element analysis and 3D digital image correlation data”, Oral presentation, *The 16th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering*, New York, NY, USA, August 2019.
- C2. **Solav, D.**, Moerman, K., Jaeger, A., Genovese, K., Herr, H., “Residual limb deformation and mechanical properties using Digital Image Correlation and Finite Element Analysis”, Oral presentation, *The 13th World Congress on Computational Mechanics*, New York, NY, USA, July 2018.

- C3. **Solav, D.**, Moerman, K., Jaeger, A., Herr, H., “Measurement of residual limb deformation and mechanical properties using Digital Image Correlation and Finite Element Analysis”, Oral presentation, *The 8th World Congress of Biomechanics*, Dublin, Ireland, July 2018.
- C4. **Solav, D.**, Moerman, K., Genovese, K., Herr, H., “Analysis of residual limb changes using digital image correlation and finite element modelling”, Oral presentation, *The 7th Conference on Mechanics of Biomaterials and Tissues*, Waikoloa, Hawaii, USA, December 2017.
- C5. **Solav, D.**, Meric, H., Rubin, M. B., Pradon, D., Lofaso, F., Wolf, A., “Chest Wall Kinematics Using Triangular Cosserat Point Elements in healthy and neuromuscular subjects”, Oral presentation, *The 34th Israeli Conference on Mechanical Engineering (ICME)*, Haifa, Israel, November 2016.
- C6. **Solav, D.**, Meric, H., Rubin, M. B., Pradon, D., Lofaso, F., Wolf, A., “Chest Wall Kinematics Using Triangular Cosserat Point Elements in healthy and neuromuscular subjects”, Oral presentation, *The 14th International Symposium of Computer Methods in Biomechanics and Biomedical Engineering*, Tel Aviv, Israel, September 2016.
- C7. **Solav, D.**, Meric, H., Rubin, M. B., Pradon, D., Lofaso, F., Wolf, A., “Chest Wall Kinematics Using Triangular Cosserat Point Elements in healthy and neuromuscular subjects”, Oral presentation, *The 22nd Congress of the European Society of Biomechanics*, Lyon, France, July 2016.
- C8. **Solav, D.**, Rubin, M. B., Wolf, A., “Soft Tissue Artifact Description Using Triangular Cosserat Point Elements, for gait and respiratory diagnostics”, Oral presentation, *The 5th Conference on Advanced Technologies in Diagnostics, Rehabilitation, and Medical Care*, Ruppiner Academic Center, Israel, April 2016.
- C9. **Solav, D.**, Rubin, M. B., Cereatti, A., Camomilla, V., Wolf, A., “Soft Tissue Artifact Description Using Triangular Cosserat Point Elements”, Oral presentation, *The XXV Congress of the International Society of Biomechanics*, Glasgow, UK, July 2015.
- C10. **Solav, D.**, Rubin, M. B., Cereatti, A., Camomilla, V., Wolf, A., “Soft Tissue Artifact Description Using Triangular Cosserat Point Elements (TCPEs)”, Oral presentation, *The 33rd Israeli Conference on Mechanical Engineering (ICME)*, Tel Aviv, Israel, March 2015.
- C11. **Solav, D.**, Rubin, M. B., Cereatti, A., Camomilla, V., Wolf, A., “Soft Tissue Artifact Compensation Using Triangular Cosserat Point Elements (TCPEs)”, Poster presentation, *The 13th international symposium on 3D analysis of human movement (3D AHM)*, Lausanne, Switzerland, July 2014.
- C12. **Solav, D.**, Rubin, M. B., Wolf, A., “Soft Tissue Artifact Quantification and Minimization using Cosserat Point Elements”, Oral presentation, *The XXIV Congress of the International Society of Biomechanics*, Natal, Brazil, August 2013.
- C13. **Solav, D.**, Rubin, M. B., Wolf, A., “Estimation of rigid body motion and the soft tissue artifact with Cosserat Point Theory”, Oral presentation, *The 32nd Israeli Conference on Mechanical Engineering*, Tel Aviv, Israel, October 2012.
- C14. **Solav, D.**, Rubin, M. B., Wolf, A., “Estimation of rigid body motion and the soft tissue artifact with Cosserat Point Theory”, Oral presentation, *ESB2012 - The 18th Congress of the European Society of Biomechanics*, Lisbon, Portugal, July 2012.

Patents and patent applications

- P1. Herr, H. M., Moerman, K. M., **Solav, D.**, Ranger, B. J., Steinmeyer, R., Ku, S. L., Dagdeviren, C., Carney, M., Prieto-Gomez, G. A., Zhang, X., Fincke, J. R., Feigin-Almmon, M., Anthony, B. W., Liu, Z., Jaeger, A., Yang, X., (2019). [Quantitative Design and Manufacturing Framework for a Biomechanical Interface Contacting a Biological Body Segment](#). Application No. WO2019157486.
- P2. **Solav, D.**, (2021) Ankle Foot Orthosis Device. Provisional Application No. US 63/254,311.