

RESUME

April 2022

1. PERSONAL DETAILS

Full Name: Shlomi Laufer
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2. ACADEMIC DEGREES

2012 - Ph.D. School of Computer Science and Engineering,
Hebrew University, Jerusalem, Israel

2004 – B.Sc. (*Summa Cum Laude*) Faculty of Electrical Engineering, Israel Institute
Technology, Technion, Haifa

3. ACADEMIC APPOINTMENTS

2018 Senior Lecturer, Faculty of Industrial Engineering and
Management, Technion, Israel Institute of Technology, Haifa,
Israel

2016-2017 Assistant Scientist, Simulation and Engineering for Surgical
Education (SEnSE) Lab, Department of Surgery, University of
Wisconsin-Madison

2013-2016 Research Associate, Simulation and Engineering for Surgical
Education (SEnSE) Lab, Department of Surgery, University of
Wisconsin-Madison

2013- 2016 Honorary Research Associate, Bio-Signal Processing Lab,
Department of Electrical and Computer Engineering, University of
Wisconsin-Madison

2012 Researcher at Golldyne Savad Institute of Gene Therapy, MRI
Animal Laboratory, Hadassah University Medical Center,
Jerusalem, Israel

2009 Visiting scholar, Memorial Sloan Kettering Cancer Center, NYC, NY

4. PROFESSIONAL EXPERIENCE (outside academia)

2005-2006 Member of the Computer Vision
Algorithm Group
Mobileye, Jerusalem,
Israel.(www.mobileye.com)

2003-2004 Member of Design Automation Team
developing VLSI CAD tools, Intel,
Haifa Israel

5. RESEARCH INTERESTS

My research focuses on the use of advanced sensor- and video-technologies, as well as data-analysis techniques to measure human performance and work study. A special emphasis is given to automatic assessment and measurement of clinical and surgical proficiency.

6. TEACHING EXPERIENCE

Methods in Industrial Engineering, course design, teacher in charge, undergraduate.

Internet of Things, course design, teacher in charge, undergraduate and graduate.

Surgical Data Science (seminar), course design, teacher in charge, undergraduate and graduate.

7. TECHNION ACTIVITIES

2020 – Now System Engineering Committee

8. DEPARTMENTAL ACTIVITIES

N/A

9. PUBLIC PROFESSIONAL ACTIVITIES

2021-now Associate Editors - Journal of Computer Assisted Surgery

Ad hoc reviewer for: International Journal of Nanomedicine, IET Science, Measurement & Technology, Medical Engineering & Physics, PLoS ONE, Physiological Measurement.

ISF grant review

10. MEMBERSHIP IN PROFESSIONAL SOCIETIES

Institute of Electrical and Electronics Engineers (IEEE) member

12. GRADUATE STUDENTS

Completed PhD theses

N/A

Completed MSc theses

Sapir Gershov, (Autonomous systems), 2021, “Autonomic system for medical simulations”

PhD theses in progress

- Adam Goldbraikh, (Applied Mathematics) 2019, “Deep Neural Network Algorithms for Open Surgery”
- Sapir Gershov, (Autonomous systems), 2021, “Autonomic system for medical simulations”
- Fadi Mahameed, 2022" Utilization of Artificial intelligence for mapping anesthesiologists behavior in the operating room"

MSc theses in progress

- Yochai Weissman, (Autonomous systems),2020, “Frailty State Estimation for Adaptive Autonomous Homes”
- Kristina Basiev ,2020,”Analysis of Multi-Camera systems in Surgery”
- Or Berman 2021,”Next frame prediction and self-supervised learning for action recognition on surgical activities “
- Liran Halperin, 2021,”Deep neural network algorithms for performance evaluation of the intracorporeal suture exercise”
- Lezer Aviad, 2021,” Automatic evaluation of laparoscopic skills in the task of peg transfer”
- Eddie Bkheet , 2021,” Surgical activity recognition using hand pose estimation in rgb video
- Robert Spektor, 2021, TBD

15. PUBLICATIONS

Theses

Ph.D. dissertation “Raw Data Analysis of Electrical Impedance Spectroscopy Measurements” , Supervisor: Boris Rubinsky.

Refereed papers in professional journals

(In all paper which include a student and a mentor, the student is first and the mentor last)

Published papers

1. **Laufer, S.** and Rubinsky, B. (2009). "Cellular phone enabled non-invasive tissue classifier". *PLoS One*. **4**(4):e5178.
2. **Laufer, S.** and Rubinsky, B. (2009). "Tissue characterization with an electrical spectroscopy SVM classifier." *IEEE Transaction on Biomedical Engineering*. **56**(2):525-8.
3. **Laufer, S.**, Ivorra, A., Reuter, V.E., Rubinsky, B., and Solomon, S.B. (2010). "Electrical impedance characterization of normal and cancerous human hepatic tissue." *Physiological Measurments*. **31**(7):995-1009.
4. *Golberg, A., ***Laufer, S.**, Rabinowitch, H.D., and Rubinsky, B. (2011). "In vivo non-thermal irreversible electroporation impact on rat liver galvanic apparent internal resistance." *Physics in Medicine and Biology*. **56**(4):951-63.
5. Shini, M.A., **Laufer, S.**, and Rubinsky, B. (2011). "SVM for prostate cancer using electrical impedance measurements." *Physiological Measurments*. **32**(9):1373-87.
6. **Laufer, S.**, Solomon, S.B., and Rubinsky, B. (2012). "Tissue characterization using electrical impedance spectroscopy data: a linear algebra approach." *Physiological Measurments*. **33**(6): 997-1013.
7. Mandel, Y., **Laufer, S.**, and Rubinsky, B. (2012). "Measurement of corneal endothelial impedance with non-invasive external electrodes--a theoretical study." *Medical engineering & physics*. **34**(2):195-201.
8. Mandel, Y., **Laufer, S.**, Belkin, M., Rubinsky, B., Pe'er, J., and Frenkel, S. (2013). "Irreversible electroporation of human primary uveal melanoma in enucleated eyes." *PLoS One*. **8**(9):e71789.
9. **Laufer, S.**, Mazuz, A., Nachmansson, N., Fellig, Y., Corn, B.W., Bokstein, F., Bashat, D.B., and Abramovitch, R. (2014). "Monitoring brain tumor vascular hemodynamic

- following anti-angiogenic therapy with advanced magnetic resonance imaging in mice." *PLoS One*. **9**(12):e115093.
10. D'angelo, A.L., Cohen, E.R., Kwan, C., **Laufer, S.**, Greenberg, C., Greenberg, J., Wiegmann, D., and Pugh, C.M. (2015). Use of decision-based simulations to assess resident readiness for operative independence. *American Journal of Surger*. **209**(1):132-9.
 11. D'angelo, A.D., Rutherford, D.N., Ray, R.D., **Laufer, S.**, Kwan, C., Cohen, E.R., Mason, A., and Pugh, C.M. (2015). Idle Time: An Underdeveloped Performance Metric for Assessing Surgical Skill. *American Journal of Surger*. **209**(4):645-651.
 12. **Laufer, S.**, Cohen, E.R., Kwan, C., D'angelo, A.L., Yudkowsky, R., Boulet, J.R., McGaghie, W.C., and Pugh, C. M. (2015). "Sensor technology in assessments of clinical skill." *New England Journal of Medicine*. **372**(8):784-6.
 13. **Laufer, S.**, Ray, D.D., D'Angelo, A.L., Jones, G.F., and Pugh, C.M. (2015) "Use of Simulators to Explore Specialty Recommendation for a Palpable Breast Mass." *American Journal of Surger*. **210**(4):618-623.
 14. Azari, D.P., Pugh, C.M., **Laufer, S.**, Kwan, C., Chen, C.H., Yen, T.Y., Hu, Y.H., and Radwin, R.G.(2015) "Evaluation of simulated hands-on clinical breast exam performance using marker-less video tracking." *Human Factors*. **58**(3):427-440.
 15. D'Angelo, A.L.D., Rutherford, D.N., Ray, D.D., **Laufer, S.**, Mason, A., Pugh, C.M. (2015). "Working volume: Validity evidence for a motion based metric of surgical efficiency." *American Journal of Surgery*. **221**(2):445-450.
 16. Law, K. E., Jenewein, C. G., Gannon, S. J., DiMarco, S. M., Maulson, L. J., **Laufer, S.**, & Pugh, C. M. (2016). "Exploring Hand Coordination as a Measure of Surgical Skill". *Journal of Surgical Research*. **205**(1):192-197.
 17. **Laufer, S.**, D'Angelo, A.L.D., Kwan, C., Ray, R.D., Yudkowsky, R., Boulet, J.R., McGaghie, W.C. and Pugh, C.M., (2016). "Rescuing the Clinical Breast Examination: Advances in Classifying Technique and Assessing Physician Competency." Accepted to *Annals of Surgery*.
 18. **Laufer, S.**, Pugh C.M., and Van Veen, B.D. "Modeling Touch and Palpation Using Autoregressive Models." *IEEE Transactions on Biomedical Engineering* 65, no. 7 (2018): 1585-1594.
 19. Walker, J. L., Nathwani, J. N., Mohamadipannah, H., **Laufer, S.**, Jocewicz, F. F., Gwillim, E., & Pugh, C. M. (2017). "Residents' response to bleeding during a simulated robotic surgery task." *Journal of Surgical Research*, **220**, 385-390.
 20. Nathwani, J. N., Garren, A., **Laufer, S.**, Kwan, C., & Pugh, C. M. (2018). Improving diagnosis in healthcare: Local versus national adoption of recommended guidelines for the clinical breast examination. *The American Journal of Surgery*, 215(6), 995-999.
 21. Danial-Saad, A., Chiari, L., Corzani, M., **Laufer, S.** and Gabyzon, M.E., 2019. Evaluation of hand skills using touchscreen technology in the elderly population. *Gait & Posture*, 74, pp.11-12.
 22. Amiel, I., Anteby, R., Cordoba, M., **Laufer, S.**, Shwaartz, C., Rosin, D., Gutman, M., Ziv, A., Mashiach, R.(2020). "Experienced Surgeons Versus Novice Residents: Validating a Novel Knot Tying Simulator for Vessel Ligation." *Surgery* 167(4) 6990703
 23. Amiel, I., Anteby, R., Cordoba, M., **Laufer, S.**, Shwaartz, C., Rosin, D., Gutman, M., Ziv, A. and Mashiach, R. (2020). "Feedback Based Simulator Training Reduces Superfluous Forces Exerted by Novice Residents Practicing Knot Tying for Vessel Ligation." *The American Journal of Surgery*, 220(1) 100-104.
 24. A. Goldbraikh, A.-L. D'Angelo, C. M. Pugh, and **S. Laufer**, "Video-based fully automatic assessment of open surgery suturing skills," *Int. J. Comput. Assist. Radiol. Surg.*, 2022, doi: 10.1007/s11548-022-02559-6.
 25. A. Goldbraikh, T. Volk, C. M. Pugh, and **S. Laufer**, "Using Open Surgery Simulation Kinematic Data for Tool and Gesture Recognition" Accepted to *Int. J. Comput. Assist. Radiol. Surg.*, 2022

Refereed papers in conference proceedings

1. **Laufer, S.**, Solomon, S.B., and Rubinsky, B. (2009). "A new linear algebra based mathematical technique for electrical impedance spectroscopy guided biopsy." *World Congress on Medical Physics and Biomedical Engineering*, Munich, Germany, pp. 583-586.
2. **Laufer, S.**, Cohen, E.R., Maag, A.L.D., Kwan, C., Van-Veen, B., and Pugh, C.M. (2013). "Multimodality approach to classifying hand utilization for the clinical breast examination." *Studies in Health Technology and Informatics*. Los-Angeles, California, 196:259-261.
3. Maag, A.L.D., **Laufer, S.**, Kwan, C., Cohen, E.R., Lenhart, R.L, Stork, N.C., and Pugh, C.M. (2013). "Sensor-based assessment of cast placement and removal." *Studies in Health Technology and Informatics*. Los-Angeles, California, 196:259-261.
4. Weyhrauch, P.W., Niehaus, J., Metzger, M., **Laufer, S.**, Kwan, C., and Pugh, C.M., (2013). "Tourniquet master training for junctional and inguinal hemorrhage control (TMT)." *Studies in Health Technology and Informatics*. Los-Angeles, California, 196:457-461.
5. **Laufer S.**, Pugh C.M., and Van Veen, B. "Characterizing touch using pressure data and auto regressive models." (2014). *Engineering in Medicine and Biology Society (EMBC), 36th Annual International Conference of the IEEE*. Chicago, Illinois, pp.1839-1842
6. Azari, D.P., Pugh, C.M., **Laufer, S.**, Cohen, E.R., Kwan, C., Chen, C.E., Yen, T.Y., Hu, Y.H., Ray, R.D., and Radwin R.G. (2014). "Evaluation of hands-on clinical exam performance using marker-less video tracking," *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*. Chicago, Illinois, 58:793-797.
7. Kwan, C., **Laufer, S.**, Contreras, M., Weyhrauch, P. , Niehaus J., Pugh C. (2015) . "Junctional and Inguinal Hemorrhage Simulation: Tourniquet Master Training" *Studies in health technology and informatics*. Los-Angeles, California, 220, 175-178.
8. **Laufer, S.**, Kempton, SJ., Maciolek, K., Terry, A., Ray, RD., Pugh, CM., and Afifi, AM. (2015). "A Multi-layered needle injection simulator." *Studies in health technology and informatics*. Los-Angeles, California, 220, 205-208.
9. **Laufer, S.**, Amiel, I., Nathwani, JN., Mashlach, R., Margalit, R.S., Ray, R.D., Ziv, A., and Pugh, CM. (2015). "A simulator for measuring forces during surgical knots. " *Studies in health technology and informatics*. Los-Angeles, California, 220:199-204.
10. **Laufer, S.**, Rasske, K., Stopfer, L., Kurzynski, C., Abbott, T., Plantner, M., Towles, J., and Pugh, CM.(2015). "Fabric force sensors for the clinical breast examination simulator." *Studies in health technology and informatics*. Los-Angeles, California, 220: 193-198.
11. Mohamadipanah, H., Parthiban, C., Maulson, L., **Laufer, S.**, Rutherford, D., Law, K., DiMarco, S. and Pugh, C., (2016). Is Indecisiveness Linked to Hand Movements in Performing Laparoscopic Ventral Hernia Repair?. In *1th International Workshop on Surgical Data Science*, Heidelberg, Germany.
12. Gershov, S., Ringel, Y., Dvir, E., Tsirlman, T., Zvi, E.B., Braun, S., Raz, A. and **Laufer, S.** "Automatic Speech-Based Checklist for Medical Simulations." In *Proceedings of the Second Workshop on Natural Language Processing for Medical Conversations*, pp. 30-34. 2021.
13. Basiev K, Goldbraikh A, Pugh CM, **Laufer S.** "Open surgery tool classification and hand utilization using a multi-camera system". *The 13th International Conference on Information Processing in Computer- Assisted Interventions*,2022

16. CONFERENCES

Plenary, keynote or invited talks

1. “Palpation: Use of sensors and video classification to characterize exploratory procedures in medicine” workshop at WorldHaptics, Evanston, Illinois, 2015

Contributed Talks and Posters

1. Mandel, Y., **Laufer, S.**, and Rubinsky, (2008). B. “Assessing corneal endothelial electrical properties by external electrodes: Experimental and finite element model.” *ARVO Annual Meeting*, Fort Lauderdale, Florida.
2. Mandel Y, Frenkel S, **Laufer S**, Rubinsky B, Belkin M, and Pe'er J. (2011). "Treatment Of Uveal Melanoma By Non-thermal Irreversible Electroporation - Mathematical Model, Animal And Preliminary Ex-vivo Human Experiments." *ARVO Annual Meeting*, Fort Lauderdale, Florida.
3. **Laufer, S.**, and Rubinsky B. (2011). “Tissue classification using bioimpedance data.” *23rd Conference of the Society for Medical Innovation and Technology*, Tel Aviv, Israel.
4. Maag, ALD., **Laufer, S.**, Cohen, ER., Kwan, C., and Pugh, CM. (2013). “Use of advanced sensor and motion tracking technology to classify clinical breast examination techniques.” *Association for Women’s Surgeons Conference*.
5. Cohen, ER., Maag, ALD., Kwan, C., **Laufer, S.**, and Pugh, CM. (2014). “Assessing inter-station and cross-task validity evidence for sensor-based performance measures.” *Journal of Surgical Research*, 186(2), 542-543.
6. **Laufer, S.**, Rasske, K., Stopfer, L., Plantner, M., Kurzynski, C., Webster, JG., and Pugh CM. (2014). “Undetectable force sensors for characterizing the clinical breast exam.” *Engineering in Medicine and Biology Society (EMBC), 36th Annual International Conference of the IEEE*. Chicago, Illinois.
7. Kwan, C., Gwillim, EC., **Laufer, S.**, Knoespel, MJ., et. al, (2015). “Novel data collection system for tourniquet master training (TMT).” *Military Health System Research Symposium (MHSRS)*, Fort Lauderdale, Florida.
8. Walker JL, Nathwani JN , **Laufer S** , Jocewicz FF , Pugh1 CM (2017), “Residents’ Response To Bleeding During A Simulated Robotic Surgery Experience”, *Academic Surgical Congress*, Las Vegas, Nevada.
9. Goldbraikh,A., D’Angelo, ALD., Pugh,CM., **Laufer,S.**, “Tool usage in open surgery video data” *Computer Assisted Radiology and Surgery (CARS) 2020*.
10. **Laufer S**, Goldbraikh A, Basiev K, “Surgical tool recognition and workflow analysis”, *ORSIS Annual Meeting 2021*

Participation in organizing conferences

2021 – Best paper committee in the Israeli Industrial Engineering and Management Conference

2020- organizing committee the 9th Israeli Industrial Engineering and Management Research Conference

17. Notes