Zaki Hasnain

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CURRENT POSITION

NASA Jet Propulsion Laboratory
Systems Engineer II, Systems Modeling, Analysis and Architectures (Section 312C)
August 2018-present

EDUCATION

University of Southern California
Ph.D. Mechanical Engineering, 2018 GPA: 3.47
Title: Feature and model based biomedical system characterization of cancer
Award: Viterbi-USC Graduate School PhD Fellowship
Advisor: Dr. Paul K. Newton
M.Sc. Computer Science, 2017 GPA: 3.57
Focus: High performance computing and simulation
Virginia Polytechnic & State University
B.Sc, Engineering Science & Mechanics, 2011 GPA: 3.68

PROJECTS

at NASA Jet Propulsion Laboratory
Institutional Cost Model Validation: Built architecture for cost model validation and performance tracking. Developed interactive web-based dashboard for tracking predicted and actual mission costs. (Section 312C)
Earth Imaging from Agile Spacecraft: Developed algorithms for Earth surface imaging which minimize cloud coverage in satellite imagery, in collaboration with the Artificial Intelligence, Observation Panning and Analysis Group (Section 397K)
4D motion planning - JPL Spontaneous Concepts Award 2020 Geometric motion planners for single/multiple agents in highly-constrained environments. In collaboration with Maritime and Multi-Agent Autonomy Group (Section 347N)
Mars Sample Return Probabilistic Risk Assessment: Project planning and coordination across multiple NASA centers to assess planetary protection and sample return probabilities during entry, descent, and landing at Earth, as a part of the Analysis & Architectures Group (Section 312C).
Europa Clipper Planetary Protection Model: Mathematical modeling and simulation for a probabilistic risk assessment for the proposed Europa Clipper mission, as a part of the Analysis & Architectures Group (Section 312C).
Fast Formation Control for Multiple Autonomous Seaborne Test Vehicles: Modeling and optimality analysis for multi-agent path planning for maritime USVs in the Maritime and Multi-Agent Autonomy Group (Section 347N).
Holographic Examination for Life-like Mobility (HELM): Developing a machine learning pipeline for detecting and classifying micro-scale motility in images, in the Machine Learning and Instrument Autonomy Group (Section 398J).
at University of Southern California
Dynamics of cancer cell shape and motility: Developed geometric, signal processing, and machine learning characterization tools based on spatio-temporal image data.
Classification of patient and warfighter performance: Analyzed human motion using multivariate spatio-temporal data from the Microsoft Kinect.
Long-term outcome prediction of post-cystectomy bladder cancer patients: Built clinically relevant patient-specific machine learning model to predict survival and disease recurrence.

SKILLS

Software: Python, C, C++, MATLAB, R, Mathematica, SQL, LaTeX, scikit-learn, HPC, MPI, OpenMP, Django
Operating Systems: Linux, Mac, Windows

EXPERIENCE

Systems Engineer II — NASA Jet Propulsion Laboratory
August 2018-present — Pasadena, CA
Systems Modeling, Analysis & Architectures Group (Section 312C)

Teaching Assistant — USC
2014-2018 — Los Angeles, CA
Undergraduate dynamics course in department of Aerospace & Mechanical Engineering.

Intern — SAIC
December 2011 - March 2012 — Arlington, VA
Missile defense group in Science Applications International Corporation (SAIC).

Intern — Gibbs & Cox Inc.
May 2011 - August 2011 — Arlington, VA
Provided structural and naval engineering support.

Intern — GeoConcepts Engineering
May 2008 - August 2008 — Ashburn, VA
Provided geotechnical engineering support.

PUBLICATIONS & CONFERENCES

NASA JPL related

- (draft) Hasnain Z., Mason J., Swope J., Vander Hook J., Chien S. (2021). Agile Spacecraft Imaging Algorithms. International Conference on Automated Planning and Scheduling. [conference paper]
- (draft) DiNicola M., Howell S.M.,McCoy K., Burgoyne H., Hasnain Z., Reinholtz K., & Fleischer S. (2021). Resurfacing: An Approach to Planetary Protection for Geologically Active Ocean Worlds. Planetary Science Journal.
- (submitted) Vander Hook, J., Seto, W., Nguyen, V., Hasnain, Z., Gallagher, L., Halpin-Chan, T., ... & Angulo, M. (2019, May).Swarms of Pirates: Red Team Exercises using Autonomous High Speed Maneuvering Surface Vessels. Journal of Field Robotics
- Burgoyne, H. A., DiNicola, M. A., McCoy, K., Hasnain, Z., & Kaushik, I. A. (2019, June). Cratering and Debris Scatter after Inadvertent Impact of Europa Clipper onto an Icy Body. In 2019 Astrobiology Science Conference. AGU. [conference]
- Vander Hook, J., Seto, W., Nguyen, V., Hasnain, Z., Gallagher, L., Halpin-Chan, T., ... & Angulo, M. (2019, May). Autonomous swarms of high speed maneuvering surface vessels for the central test evaluation improvement program. In Unmanned Systems Technology XXI (Vol. 11021, p. 110210M). International Society for Optics and Photonics. [conference]

Dynamical systems & mathematical modeling

- West, J., Hasnain, Z., Macklin, P., & Newton, P. K. (2016). An evolutionary model of tumor cell kinetics and the emergence of molecular heterogeneity driving gompertzian growth. SIAM Review, 58(4), 716-736.
- West, J., Hasnain, Z., Mason, J., & Newton, P. K. (2016). The prisoner's dilemma as a cancer model. Convergent science physical oncology, 2(3), 035002.
- Hasnain, Z., Lamb, C. A., & Ross, S. D. (2012). Capturing near-Earth asteroids around Earth. Acta Astronautica, 81(2), 523-531.
- Hasnain, Z. Non-stationary Markov chain steady state solution for evolutionary games on graphs. Conference Presentation. NetSci-X. Wroclaw, Poland (2016). [conference]

Machine learning and predictive modeling

- (draft) Hasnain, Z. et al. (2021), Temporal differentiation of phenotypes using a Hidden Markov model of organoid shape dynamics
- Nilanon, Tanachat, et al. "Use of Wearable Activity Tracker in Patients With Cancer Undergoing Chemotherapy: Toward Evaluating Risk of Unplanned Health Care Encounters." JCO Clinical Cancer Informatics 4 (2020): 839-853.
- Hasnain, Zaki, et al. "Quantified Kinematics to Evaluate Patient Chemotherapy Risks in Clinic." JCO Clinical Cancer Informatics 4 (2020): 583-601.
- Hasnain, Z., Fraser, A. K., Georgess, D., Choi, A., Macklin, P., Bader, J. S., ... & Newton, P. K. (2020). OrgDyn: feature-and model-based characterization of spatial and temporal organoid dynamics. Bioinformatics.
- Hasnain, Z., Mason, J., Gill, K., Miranda, G., Gill, I. S., Kuhn, P., & Newton, P. K. (2019). Machine learning models for predicting post-cystectomy recurrence and survival in bladder cancer patients. PloS one, 14(2), e0210976.
- Mason, J. M., Hasnain, Z., Miranda, G., Gill, K., Newton, P. K., Gill, I. S., & Kuhn, P. (2018). Pathways of metastatic bladder cancer from a longitudinal patient data set. Proceedings: AACR Annual Meeting 2018. [conference]
- Hasnain, Zaki, et al. "Low-dimensional dynamical characterization of human performance of cancer patients using motion data." Clinical Biomechanics 56 (2018): 61-69.
- Nguyen, M. N., Hasnain, Z., Li, M., Dorff, T., Quinn, D., Purushotham, S., ... & Shahabi, C. (2017, November). Mining human mobility to quantify performance status. In 2017 IEEE International Conference on Data Mining Workshops (ICDMW)(pp. 1172-1177). IEEE.
- Martin, A. S., Boles, R. W., Nocera, L., Kolatkar, A., May, M., Hasnain, Z., ... & Li, M. (2018). Objective metrics of patient activity: Use of wearable trackers and patient reported outcomes in predicting unexpected healthcare events in cancer patients undergoing highly emetogenic chemotherapy. [conference]

Miscellaneous

- Zellner, P., Renaghan, L., Hasnain, Z., & Agah, M. (2010). A fabrication technology for three-dimensional micro total analysis systems. Journal of Micromechanics and Microengineering, 20(4), 045013.

GRADUATE COURSEWORK

Computer Science:

- Machine learning
- Parallel programming
- Scientific computing and visualization
- Analysis of algorithms
- Methods of computational physics
- Database systems

Mechanical Engineering:

- Advanced engineering dynamics
- Engineering vibrations
- Dynamics of incompressible flow
- Compressible gas dynamics
- Transition to chaos in dynamical systems

Mathematics:

- Applied probability
- Partial differential equations

- Linear algebra, vector analysis, and complex variable theory