Shubham Singh

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A roboticist skilled in dynamic locomotion, optimization, estimation, reinforcement learning, & effective communication. Quickly adapts to the needs of the task, enjoys working in a team, likes to lead.

Education

Ongoing	**PhD in Aerospace Engineering**, *Dynamics & Control*, **The University of Texas at Austin**, TX. Relevant Courses: Human Centered Robotics, Optimal Control Theory, Statistical Estimation
2016	**MS in Aerospace Engineering**, *Systems Engineering*, **Purdue University**, West Lafayette, IN. Relevant Courses: Multidisciplinary Design Optimization, System of Systems
2014	**B.Tech in Mechanical Engineering** , *Mechanical Engineering*, **Delhi Technological University**, Delhi, India.

Research/Work Experience

June'20– July'20	**Data Scientist**, *AI Research Lab, Dell, Austin*. - Part of the AI research team as a summer intern - Worked towards automation of Data Driven Data Centers - Skills used- Reinforcement Learning, Deep Learning, Tensorflow, DockerHUB
August'18–	**Graduate Research Assistant**, *The University of Texas at Austin*. - Part of the NSF project 1835013 "EAGER/Collaborative Research: Unlocking Legged Mobility Through Structured Prediction" - Skills used- Trajectory Optimization, Robotics control, Spatial Vector Algebra, C++, Fortran
August'15– December'17	**Graduate Research Assistant**, *System of Systems Lab, Purdue University*. - Part of the NASA Human Space Exploration Mission Systems Architecture research project - Skills used- Network theory, Data Analysis
June'15– December'17	**Graduate Research Assistant**, *Rapid Design of Systems Lab, Purdue University*. - Implementing indirect trajectory optimization methods for Hypersonic mission design - Skills used- Hypersonic Missile Trajectory Optimization, Mission Design
June'13– August'13	**Summer Research Intern**, *Turbulence Research Lab, University of Toronto*. - Skills used- LABview, Hardware/software integration

Publications

1. **Singh, S.**, Russell, R. P., & Wensing, P. M. ,*Closed-Form Second-Order Partial Derivatives of Rigid-Body Inverse Dynamics*, Under-Review for IROS 2022. (Pre-print) (Code)

2. **Singh, S.**, Russell, R. P., & Wensing, P. M. , *Efficient Analytical Derivatives of Rigid-Body Dynamics using Spatial Vector Algebra.*, in IEEE Robotics and Automation Letters, vol. 7, no. 2, pp. 1776-1783, April 2022, doi: 10.1109/LRA.2022.3141194. (Pre-print) (Code)

3. **Singh, S.**, Russell, R. P., & Wensing, P. M. , *Efficient Analytical Derivatives of Rigid-Body Dynamics using Spatial Vector Algebra.*, Accepted for ICRA 2022.

4. Russell, R., **Singh, S.**, & Wensing, P. (2019). *Advancing the Runtime and Robustness of Differential*

Dynamic Programming. Workshop: Toward Online Optimal Control of Dynamic Robots, ICRA , Montreal, Canada. (Slides)

5. **Singh, S.**, & Grant, M. (2018). *The use of Homotopy Analysis Method for indirect trajectory optimization.* Scitech AIAA, Kissimmee, Florida. (Paper)

6. O'Neill, W., Guariniello, C., Das-Stuart, A., Mall, K., **Singh, S.**, & Delaurentis D., (2017). *Application Of A Top Down System-of Systems Approach To Enable Human Mars Exploration Missions.* International Astronautical Congress, Adelaide, Australia. (Paper)

7. **Singh, S.** (2016). Applications of the homotopy analysis method to optimal control problems. Purdue University. (Thesis)

8. **Singh, S.**, & Zunaid, M. (2014). Numerical Study of the Generic Sports Utility Vehicle Design with a Drag Reduction Add-On Device. Journal of Computational Engineering, Hindawi. (Paper)

Achievements & Awards

Feb'22	**UT Austin Graduate Professional Travel Award**, *Graduate School, UT Austin.*
August'21	**Warren A. and Alice L. Meyer Endowed Scholarship in Engineering**, *Cockrell School of Engineering Scholarship, UT Austin.*
May'17	**AIAA Graduate Mission Design Competition 2016-17** , *Third Place for Mid-Tier Defense Against Hypersonic Glide Vehicles (Team-Lead, Purdue University).*
June'13	**MITACS Globalink Scholarship, Canada**, *Summer Research Intern, University of Toronto.*
May'11	**Merit Scholarship, Mechanical Engineering**, *Undergraduate Student, Delhi Technological University.*

Skills

, *Programming Skills:*.
- **Fortran 90/77 (Libraries-BLAS,MKL), C++ (Libraries-Eigen,Pinocchio), Python (Tensorflow, Numpy)**
- **Mathematica, Maple**: Symbolic Manipulators
- **SOLIDWORKS, CATIA, Pro-Engineer, AutoCAD**: CAD Tools
- **FLUENT, STK-AGI, LABview, LATEX**: Commerical Engineering/Type-setting Software
- **MATLAB & Simulink**: Expertise in MATLAB programming

, *Technical Skills:*.
- Expertise in Design Optimization (IPOPT/SNOPT), Systems Engineering, Dynamics & Controls, Optimized based Robotics, Dynamic Locomotion, Machine/Reinforcement Learning, ROS, Physics simulation engines (PyBullet), Version control (Git).

, *Non-Technical Skills:*.
- Public Speaking and Effective Communication- Member of UT Science Toastmasters
- Scientific Communication- Scientist in Residence (2018), UT Environmental Science Institute

References

1. Dr. Ryan P. Russell (Ph.D. Supervisor)- Professor, Aerospace Engineering & Engineering Mechanics, The University of Texas at Austin, contact - ryan.russell@austin.utexas.edu
2. Dr. Patrick M. Wensing - Asst. Professor, Aerospace & Mechanical Engineering, University of Notre Dame, contact - pwensing@nd.edu
3. Dr. Michael J. Grant (M.S. Supervisor) - Sandia National Laboratory, contact - mjgrant@purdue.edu