

# HARMEET SINGH

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Assistant Professor, Mechanical Engineering, IIT Gandhinagar

## RESEARCH INTERESTS

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Continuum mechanics, applied mathematics, elasticity, mechanics of thin bodies.

## EDUCATION

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Virginia Tech, Blacksburg, VA. Ph.D., Engineering Mechanics, Aug 2014 - Dec 2018.

Thesis: *Discontinuities, Balance Laws, and Material Momentum*. Advisor: James Hanna.

I.I.T. Kharagpur, West Bengal, India. M.Tech., Structural Engineering, July 2010 - May 2012.

Thesis: *Nonlinear Vibrations of Circular Cylindrical Shells*. Advisor: Lingadahally Ramachandra.

G.B.P.U.A.&T., Uttarakhand, India. B.Tech., Civil Engineering, July 2006 - May 2010.

Senior project: *Design of an R.C.C. T-Beam bridge for a single lane of 18 meters span on Bhakra river*.

Advisor: Virendra Kumar.

## PROFESSIONAL EXPERIENCE

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École Polytechnique Fédérale de Lausanne, Postdoctoral Associate (*Collaborateur Scientifique*), Institute of Mathematics, Feb 2019 - present. Advisor: John H. Maddocks.

Airbus India, Bangalore, Associate Engineer, Structures, July 2012 - July 2014.

*Nonlinear finite element analysis* on parts of A320 and A350 aircraft.

Received quarterly and annual awards for contributions to the *A350-900 Virtual Full Scale Testing* project.

## PUBLICATIONS

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H. Singh and E. G. Virga. Bending and stretching in a narrow ribbon of nematic polymer networks. *Journal of Elasticity*, 2023. <https://doi.org/10.1007/s10659-022-09978-1>

H. Singh. Planar equilibria of an elastic rod wrapped around a circular capstan. *Journal of Elasticity*, 151: 321–346, 2022.

H. Singh and E. G. Virga. A ribbon model for nematic polymer networks. *Journal of Elasticity*, 2022. <https://doi.org/10.1007/s10659-022-09900-9>

H. Singh and J. A. Hanna. Pseudomomentum: origins and consequences. *Zeitschrift für Angewandte Mathematik und Physik*, 72:122, 2021.

P. Grandgeorge, C. Baek, H. Singh, P. Johanns, T. G. Sano, A. Flynn, J. H. Maddocks, and P. M. Reis. Mechanics of two filaments in tight orthogonal contact. *Proceedings of the National Academy of Sciences*, 118:e2021684118, 2021.

T. Elder, T. Twohig, H. Singh, and A. B. Croll. Adhesion of a tape loop. *Soft Matter*, 16:10611–10619, 2020.

H. Singh and J. A. Hanna. On the planar elastica, stress, and material stress. *Journal of Elasticity*, 136:87–101, 2019.

N. A. Corbin, J. A. Hanna, W. R. Royston, H. Singh, and R. B. Warner. Impact-induced acceleration by obstacles. *New Journal of Physics*, 20:053031, 2018.

Perspective – Acquiring momentum: simple strategies by simple objects.

J. A. Hanna, H. Singh, and E. G. Virga. Partial constraint singularities in elastic rods. *Journal of Elasticity*, 133:105–118, 2018.

H. Singh and J. A. Hanna. Pick-up and impact of flexible bodies. *Journal of the Mechanics and Physics of Solids*, 106:46–59, 2017.

## PRESENTATIONS

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### Invited Talks

Indian Institute of Science, Department of Mechanical Engineering, “A ribbon model for nematic polymer networks”, Bangalore, Apr 2022.

Indian Institute of Technology Kanpur, Department of Mechanical Engineering, “A ribbon model for nematic polymer networks”, Apr 2022.

Indian Institute of Technology Roorkee, Department of Civil Engineering, “Strings, rods, and ribbons”, Feb 2022.

Indian Institute of Technology Delhi, Department of Applied Mechanics, “A ribbon model for nematic polymer networks”, Dec 2021.

Indian Institute of Technology Gandhinagar, Department of Mechanical Engineering, “Strings, rods, and ribbons”, Nov 2021.

Indian Institute of Technology Kanpur, Department of Mechanical Engineering, “Material momentum and elastic rods”, Dec 2019.

Indian Institute of Technology Kanpur, Department of Mechanical Engineering, “Pick-up and impact”, Dec 2016.

### Talks

International Congress of Theoretical and Applied Mechanics, “Finite string radius strongly modifies the classic capstan problem”, Milan, Aug 2021.

American Physical Society Division of Fluid Dynamics, “Impulse and material symmetry”, Atlanta, GA, Nov 2018.

Fall Fluid Mechanics Symposium, Virginia Tech, “Impulse and material symmetry”, Blacksburg, VA, Nov 2018.

United States Congress of Theoretical and Applied Mechanics, “Material symmetry and conservation laws”, Chicago, IL, June 2018.

American Physical Society March Meeting, “Material symmetry and conservation laws”, Los Angeles, CA, 2018.

Society of Engineering Science, “Geometric singularities in the mechanics of rods”, Boston, MA, July 2017.

American Physical Society March Meeting, “Geometric singularities in the mechanics of strings and rods”, New Orleans, LA, 2017.

Society of Engineering Science, “Pick-up, impact, and peeling”, College Park, MD, Oct 2016.

International Congress of Theoretical and Applied Mechanics, “Pick-up, impact, and peeling”, Montreal, Aug 2016.

American Physical Society March Meeting, “Pick-up, impact, and peeling”, Baltimore, MD, 2016.

Virginia Soft Matter Workshop, “Pick-up, impact, and peeling”, Charlottesville, VA, Nov 2015.

### Posters

Center for Soft Matter and Biological Physics Symposium, “Pick-up, impact, and peeling”, Blacksburg, VA, May 2016.

Summer School on Soft Matter and Complex Fluids, “Pick-up, impact, and peeling”, Amherst, MA, May 2016.

Dynamics Days, “Pick-up, impact, and peeling”, Durham, NC, Jan 2016.

## AWARDS

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The Amir Chand and Dewki Bai Batra Scholarship, Engineering Science and Mechanics program, Virginia Tech, Spring 2018.

## TEACHING EXPERIENCE

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### Teaching Assistant

MATH 111 - Linear Algebra, Institute of Mathematics, EPFL, Autumn 2019 - 2021.

ESM 5014 - Introduction to Continuum Mechanics, Department of Biomedical Engineering and Mechanics, Virginia Tech, Fall 2018.

ESM 2024 - Mechanics of Deformable Bodies, Department of Biomedical Engineering and Mechanics, Virginia Tech, Fall 2018.

ESM 2304 - Dynamics, Department of Biomedical Engineering and Mechanics, Virginia Tech, Spring 2015.

ESM 2104 - Statics, Department of Biomedical Engineering and Mechanics, Virginia Tech, Fall 2014.

### Lectures

Several lectures on Linear Algebra as teaching assistant, EPFL, Oct - Nov 2019.

A guest lecture entitled *Noether's theorem in classical mechanics* for a senior level class on nonlinear dynamics and chaos, Virginia Tech, Mar 2017.

## PROFESSIONAL SERVICE

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Reviewer for: European Journal of Physics, Zeitschrift für Angewandte Mathematik und Mechanik, Journal of Applied Mechanics, Proceedings of the Royal Society A, Journal of Engineering Mechanics, Mathematics and Mechanics of Solids.