Curriculum Vitae of **Pranav C. Khandelwal**

Presidential Postdoctoral Fellow, Virginia Tech, USA
Guest Scientist, Institute of Flight Mechanics and Controls, University of Stuttgart, Germany
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Education

2021 *Ph.D. in Biology*
Biology Department, University of North Carolina at Chapel Hill, USA
Dissertation: How do animals glide in their natural habitat? A holistic approach using the flying lizard *Draco dussumieri*
Advisor: Dr. Tyson L. Hedrick, Comparative Biomechanics Lab

2013 *Masters in Physics with a minor in Biology*
Indian Institute of Science Education and Research, Trivandrum, India (IISER)
Thesis: A characterizational study of doped PEDOT:PSS as viable tissue engineered and optoelectronic constructs
Advisor(s): Dr. Manoj A. G. Namboothiry, MOBEL, School of Physics, IISER
Dr. Namrata Gundiah, Biomechanics Lab, Indian Institute of Science

Academic positions

2024-now *Presidential Postdoctoral Fellow*
Department of Mechanical Engineering, Virginia Tech, USA
Advisor(s): Dr. Jake Socha, Organismal biomechanics & bio-inspired engineering
Dr. Shane Ross, Dynamics Lab
Guest Scientist
Institute of Flight Mechanics and Controls, University of Stuttgart, Germany
Advisor: Dr. Aamir Ahmad, Flight Robotics and Perception Group

2023-2024 *Postdoctoral Researcher*
Institute of Flight Mechanics and Controls, University of Stuttgart, Germany
Advisor: Dr. Aamir Ahmad, Flight Robotics and Perception Group
Guest Scientist
Max Planck Institute for Intelligent Systems, Tübingen, Germany
Perceiving Systems Department

2021-2023 *Postdoctoral Researcher*
Max Planck Institute for Intelligent Systems, Stuttgart, Germany
Advisor: Dr. Ardian Jusufi, Locomotion in Biorobotic and Somatic Systems

2021-now *Research Collaborator*
University of North Carolina at Chapel Hill, USA

2013-14 *Junior Research Fellow*
Mechanical Engineering, Indian Institute of Science, India
Advisor: Dr. Namrata Gundiah, Biomechanics Lab

Awards & Fellowships

2024	$500 - Center for the Mathematics of Biosystems Travel Award (Virginia Tech, USA)
2024	Member of the 2024 Biomimicry Launchpad Program (Biomimicry Institute, USA)
2024	£3,996 – Institute of Advanced Studies Visiting Fellowship (University of Surrey, UK)
2023	$160,000 – Presidential Postdoctoral Fellowship (Virginia Tech, USA)
2020	$5,000 - Gordan W. and Janice L. Plumbee Summer Research Fellowship (UNC Chapel Hill, USA)
2019	$2,500 - Kenan Trust Graduate Student Research Award (UNC Chapel Hill, USA)
2016	$3,737 – 2nd place in crowdfunding grant challenge
2008-13	INSPIRE fellowship, awarded by the Government of India (IISER, India)

Publications

*indicates corresponding author; †indicates co-first author

1. [Dispatch] Socha, J. J.*, & **Khandelwal, P. C.** (2024). Animal locomotion: Wing-like femoral lobes help orchid mantid nymphs glide. Current Biology, 34, R94–R98.
2. [Conference paper] Ross, S. D., Zakaria. M., Socha, J. J., Hedrick, T. L., **Khandelwal, P. C.** (2024). Tail-assisted pitch control in flying lizards. AIAA 2024-2689. AIAA SCITECH 2024 Forum.
3. [Review] **Khandelwal, P. C.*,** Zakaria. M., Socha, J. J. (2023). A year at the forefront of gliding locomotion. Biol Open 15 August 2023; 12 (8): bio059973.
4. [BioRxiv] Price, E.†, **Khandelwal, P. C.**†, Rubenstein, D. I., & Ahmad, A. (2023). A Framework for Fast, Large-scale, Semi-Automatic Inference of Animal Behavior from Monocular Videos. BioRxiv, 2023.07.31.551177.
5. [Perspective] Chellapurath, M.*, **Khandelwal, P. C.**, Schulz, A. K. (2023). Bioinspired robots can foster nature conservation. Frontiers in Robotics and AI, 10, 1145798.
6. [Book chapter] **Khandelwal, P. C.,** Ross, S. D., Dong, H., Socha, J. J.* (2023). Convergence in Gliding Animals: Morphology, Behavior, and Mechanics. Chapter in Convergent Evolution – Animal Form and Function. Eds V. Bels and A. P. Russel. Springer Link
7. [Research article] **Khandelwal, P. C.***, & Hedrick, T. L. (2022). Combined effects of body posture and three-dimensional wing shape enable efficient gliding in flying lizards. Sci Rep 12, 1793 (2022).
   Part of Scientific Reports Top 100 in Engineering Collection – 2022.
8. [Research article] Chellapurath, M., **Khandelwal, P. C.**, Rottier, T., Schwab, F., & Jusufi, A.* (2022). Morphologically adaptive crash landing on a wall: soft-bodied models of gliding geckos with varying material stiffnesses. Advanced Intelligent Systems, 2200120.
   Featured on Back Cover.
9. [Research article] **Khandelwal, P. C.**, & Hedrick, T. L.* (2020). How biomechanics, path planning and sensing enable gliding flight in a natural environment. Proceedings of the Royal Society B, 287(1921), 20192888.
10. [Research article] **Khandelwal, P. C.**, Agrawal, S. S., Namboothiry, M. A., & Gundiah, N.* (2014). Fabrication of a novel biomaterial with enhanced mechanical and conducting properties. Journal of Materials Chemistry B, 2(42), 7327-7333.

Invited Talks/Lectures

2024	[Lecture] *A holistic understanding of gliding locomotion in flying lizards* Mechanics of Animal Locomotion (course: Engineering Science & Mechanics 4246/5246), Virginia Tech, USA
2024	[Talk] *Understanding animal movement in the wild: from flying lizards to zebras* Virginia Tech Postdoc Scholars Showcase. Awarded the top 3 presenters prize at the Showcase.
2024	[Seminar] *Understanding animal movement in the wild: from flying lizards to zebras* Department of Biological Sciences, Virginia Tech, USA
2023	[Talk] *How do organisms move in the wild?* Institute of Flight Mechanics and Controls, University of Stuttgart, Germany
2021	[Seminar] *How do animals glide in their natural habitat?* Centre for the Advanced Study of Collective Behavior, Konstanz, Germany
2016	[Talk] *Gliding locomotion in animals* Morehead planetarium family science day event on flight, Chapel Hill, USA

Published conference abstracts

*indicates undergraduate student mentee; ** indicates presenter

1. **Khandelwal, P. C.****, Price, E., Rubenstein D. I., Ahmad, Aamir. (2024). A framework for fast, large-scale, semi-automatic inference of animal behavior from monocular videos. *Society for Integrative and Comparative Biology Annual Meeting*, Jan 2-6, Seattle, WA, USA.
2. **Khandelwal, P. C.****, Price, E., Rubenstein D. I., Ahmad, Aamir. (2023). Towards large-scale spatio-temporal tracking of animal behavior in the wild. *Spatio-temporal Data Analysis for Wildlife Conservation. ACM SIGSPATIAL International Workshop,* Nov 13, Hamburg, Germany.
3. **Khandelwal, P. C.****, Socha J J., Hedrick, T L., Jusufi, A (2022). The role of tail during reorientation in flying lizards. *Society for Integrative and Comparative Biology Annual Meeting*, Jan 3-7, Phoenix, AZ, USA.
4. **Khandelwal, P. C.****, Hedrick T L (2020). Gliding through clutter – obstacle avoidance and path planning in the flying lizard *Draco dussumieiri*. *Society for Integrative and Comparative Biology Annual Meeting*, Jan 3-7, Austin, TX, USA.
5. **Khandelwal, P. C.****, Hedrick T L (2018). Take-off biomechanics in gliding lizards. *Society for Integrative and Comparative Biology Annual Meeting*, Jan 3-7, San Francisco, CA, USA.
6. **Khandelwal, P. C.****, Hedrick, T L (2017). The short and long of gliding. *Society for Integrative and Comparative Biology Annual Meeting*, Jan 4-8, New Orleans, LA, USA.
7. *Yu, S.**, **Khandelwal, P. C.**, *Gardner, H., Hedrick, T. L. (2017). Continuous aerodynamic pitch perturbation of hawkmoths. *Society for Integrative and Comparative Biology Annual Meeting*, Jan 4-8, New Orleans, LA, USA.
8. **Khandelwal, P. C.****, Evangelista, D., Hedrick, T. L. (2016). The glide of the dragon – glide characterization and performance in *Draco dussumieri*. *Society for Integrative and Comparative Biology Annual Meeting*, Jan 3-7, Portland, OR, USA.

9. Evangelista, D.**, **Khandelwal, P. C.**, Rader, J., Hedrick, T. L. (2015). Free flight kinematics of massed Chimney Swifts entering a chimney roost at dusk. *Society for Integrative and Comparative Biology Annual Meeting*, Jan 3-7, West Palm Beach, FL, USA.

Journals/Conferences served as manuscript reviewer

1. Proceedings of the Royal Society B
2. Journal of Experimental Biology
3. Journal of the Royal Society Interface
4. PNAS Nexus
5. IEEE International Conference on Intelligent Robots and Systems 2024

Published data and software

1. [Software] Price E.†, **Khandelwal, P. C.**†, Rubenstein D. I., Ahmad, Aamir*. (2024). Accelerated video annotation driven by deep detector and tracker. https://github.com/robot-perception-group/animal-behaviour-inference
2. [Data] Khandelwal P. C. & Hedrick T. L., (2022). Free-flight kinematics and aerodynamics data on flying lizards. https://doi.org/10.6084/m9.figshare.16602368
3. [Data] Khandelwal P. C. & Hedrick T. L., (2020). Kinematic data on freely behaving flying lizards. https://doi.org/10.5061/dryad.70rxwdbt6

Teaching and mentoring experience

2024-now	*Ph.D. mentor at Virginia Tech, USA* Mentoring 3 graduate students: Jeff Anderson, Yohan Sequeira, Mohamed Zakaria
2024	Undergraduate mentor as part of the Research Experience for Undergraduates program at Virginia Tech - Solving problems with Data Science Mentored 2 students: Trevor Bryan II, Morehouse College Alan Mach, Brown University
2023-now	*Masters mentor (remote)* Mentoring 1 student remotely in Switzerland: Kinga Kaszap
2023	*Undergraduate mentor at University of Stuttgart, Germany* Mentored 1 visiting student from India: Stuti Wadhwa
2015-20	*Teaching Instructor for Introductory BIOL 101 lab at UNC Chapel Hill, USA* Independently conducted the course for 10 semesters including lecturing, test making, grading, and experiments. The course consisted of over 60 students each semester
2020	*Undergraduate tutor at UNC Chapel Hill, USA* Tutored athletes in 100 level Math, Physics, Biology, Computer Science Each tutoring session had between 2 to 5 students
2015-20	*Undergraduate mentor at UNC Chapel Hill, USA* Mentored 3 students: Stephanie Yu, Hannah Gardner, Raghuvara Padma
2018	*High school student mentor at UNC Chapel Hill, USA* Mentored 1 student over the summer: Pragya

Software developed for teaching and research (unpublished)

2020	*Virtual teaching lab for Biology 101* Developed 5 interactive apps simulating lab experiments used by ~500 undergraduate students. The apps have allowed instructors to successfully conduct remote labs and students to actively engage and learn experimental design, conduct experiments, and collect data for analysis

2020 *Handling images for a Deep Learning pose-estimation toolbox*
An app to quickly transition back and forth between pre-existing annotating video package DLTdv and deep learning toolbox DeepLabCut. The app functionality can read video, extract annotated frames, and create datasets for neural network training and refinement

2018 *Saving bats! Processing 3D trajectories and kinematics*
A user-friendly app to visualize field recordings of bat flight in the presence of wind turbines. App processes 3D position data and generates kinematic metrics like velocity, acceleration, and track curvature to inform decisions for wind energy facilities to minimize the detrimental effect of wind turbine on bats

2017 *Let's measure! Extracting morphometric measurements*
A graphical interface to read images, calibrate them and measure user-defined features. Stores a detailed log of time, pixel location, version, and measurements of user, allowing to check and average out measurement errors across multiple users for the same feature measurement

2016 *Assessing student academic performance*
Automated student performance monitoring for a class of ~400 students for the Introductory Biology 101 course. The program routinely gathered assignment/test scores from database and performed analysis to list students with potential grade concerns

Workshops attended

2024 *Presenting Effectively, Virginia Tech, USA*
Effective presentation skills for communicating science

2023 *Spatio-temporal Data Analysis for Wildlife Conservation*
ACM SIGSPATIAL International Workshop, Hamburg, Germany
Paper selected for presentation

2022 *Movement academy, Technische Universität Darmstadt, Germany*
Movement control in humans and animals bringing together researchers from academia, industry, and medical practitioners

2020 *DeepLabCut workshop, Rowland Institute, Cambridge, USA*
Deep learning for markerless tracking of animal pose

Science outreach and community service

2022 *Guest Scientist for discussion on gliding biomechanics of flying lizards*
Undergraduate course on animal biomechanics taught by Dr. Vanessa Young
Saint Mary's College, Notre Dame, Indiana, USA

2021 *How Did Animals Inspire Human Flight? - STEM in 30: Season 8, Episode 4*
Smithsonian National Air and Space museum, USA
Contributed field season footage of the lizard *Draco dussumieiri* to showcase gliding flight in flying lizards

2020 *Science feature for Indian news outlet NDTV Gadgets*
Authored an article that candidly talks about the use and challenges of technology for field data collection. The article can be found here

2019 *Wild Karnataka documentary, State of Karnataka, India*
Part of the research team and supported video recording of flying lizards in the jungle

2015-19 *Science Expo, UNC Chapel Hill, USA*
Discussing insect flight with hawkmoth flight demonstrations for the public

2018 *Meet a scientist, Science Expo, UNC Chapel Hill, USA*

	One-on-one interactions with all age groups answering questions on animal locomotion
2017	*Public outreach through regular updates of my 2017 field season on flying lizards* All updates can be accessed here
2016	*Darwin Day, North Carolina Museum of Natural Sciences, NC, USA* Discussing insect flight with hawkmoth flight demonstrations for the public
2014-20	*SEWA International (Non-profit organization), RTP Chapter, USA* In charge of organizing monthly community service activities

Press & Media

2022	*BNR Dutch news radio interview on flying lizard aerodynamics* highlighted paper: **Khandelwal, P. C.***, & Hedrick, T. L. (2022). Sci Rep 12, 1793.
2020	*Outside JEB – featured article covering flying lizard research* highlighted paper: **Khandelwal, P. C.**, & Hedrick, T. L.* (2020). Proceedings of the Royal Society B, 287(1921), 20192888.
2020	*Endeavors – featured article in the UNC research magazine on flying lizard research* highlighted paper: **Khandelwal, P. C.**, & Hedrick, T. L.* (2020). Proceedings of the Royal Society B, 287(1921), 20192888.

Self-published Media

2024	YouTube - Animal Behavior Inference from Drone Videos
2020	Crowdfunding campaign - How the dragon glides: the biomechanics of a flying lizard
2016	YouTube – How *Draco* glide in a cluttered environment

Professional affiliations

2015-21	Society for Integrative and Comparative Biology (SICB)

Professional service

2024	Part of a 3-member panel to discuss postdoc opportunities with new Virginia Tech postdocs
2021-23	PostdocNet election committee member at MPI-IS
2022	Division of Animal Behavior poster judge at the SICB national meeting
2021	Grassroots grant reviewer. Internal grants at MPI-IS
2021	IMPRS PhD program application evaluator for MPI-IS
2018	Session co-chair, Flight: Birds, Bats and Gliders, SICB national meeting
2018	Graduate student ambassador, Biology Department, UNC Chapel Hill
2017-19	Treasurer and Event Organizer, Badminton Club, UNC Chapel Hill
2016-17	Officer and Webmaster, Biology Graduate Student Association, UNC Chapel Hill