Robotics Researcher

Yeshasvi Tirupachuri

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"Start where you are. Use what you have. Do what you can."

Summary

Robotics researcher with 6+ years of experience building robotics software in C++, Matlab, Python, ROS, YARP. Strong theoretical background in robot kinematics, dynamics and control, and thorough practical experience with robots of different complexity ranging from manipulators to humanoids. Experienced in system integration of complex software and hardware systems.

Experience

Postdoctoral Researcher *2020 - Present*

Dynamic Interaction Control, Italian Institute of Technology (IIT) *Genova, Italy*

- Defined the software architecture and development of iFeel wearable technology
- Influenced the project roadmap for iFeel wearable technology by identifying potential market segments
- Coordinated software integration for iFeelYou Bracelet bracelet in COVID19 physical distancing team
- Designed and prepared software infrastructure to communicate with an adaptive Exoskeleton using BLE

Early Stage Researcher & Doctoral Fellow *2016 - 2020*

Dynamic Interaction Control, Italian Institute of Technology *Genova, Italy*

- Designed and produced humanoid whole-body control algorithms for Human-Robot Collaboration
- Improved and maintained modular and extensible Human Dynamics Estimation v2.0 library
- Conceptualized and implemented whole-body human motion retargeting to humanoid robots
- Led software development and maintenance of codebase for Human-Robot Collaboration research axis
- Initiated and facilitated new experimental setup for multi-agent robot experiments
- Streamlined technology transfer of wearable force/torque shoes to industrial partners
- Collaborated with European research project partners to develop practical project roadmap
- Authored over 100+ commits to open source robotics codebase of Github robotology organization
- Facilitated development of agile research methodology for effective and tractable project management
- Trained and mentored new members through research and codebase orientation

Master Thesis *Mar - Sep 2015*

Event-Driven Perception, Italian Institute of Technology *Genova, Italy*

- Bio-inspired optical flow estimation and vergence control with neuromorphic stereo vision system on iCub [C8]

Graduate Student Researcher & Teaching Assistant *2014 - 2015*

The Engine Room, University of Genova *Genova, Italy*

- Implemented human gesture recognition and classification using wearable IMU technology
- Produced an AND-OR graph algorithm for task planning during Human-Robot Collaboration
- Developed a histogram based object tracking and visual servoing algorithm using OpenCV
- Created a pan-tilt setup for teaching Software Architecture using Robot Operating System (ROS)

Automation Engineer *2011 - 2013*

Madras Rubber Factory Ltd. *Pondicherry, India*

- Commissioning and Maintenance of Tyre Manufacturing Machines

Doctoral Research

My doctoral research is aimed at addressing some of the research challenges to enabling human-robot collaboration. In particular, I worked on a holistic human perception framework for real-time monitoring of whole-body human motion and dynamics, to communicate human partner's intentions and needs in real-time to a robot partner for successful realization of a collaborative task [W2, C3, C2, C1]. Furthermore, I worked on the challenge of leveraging assistance from a human partner to improve human-robot collaboration. In this direction, an attempt at methodically defining what constitutes an assistance from a human partner is investigated and proposed partner-aware robot control strategies to endow robots with the capacity to meaningfully engage in a collaborative task [C4, C5, C7].

Education

PhD, Human-Robot Collaboration *2016 - 2020*

University of Genova & IIT *Genova, Italy*

MSc, Advanced Robotics *2014 - 2015*

University of Genova *Genova, Italy*

MSc, Robotics Engineering *2013 - 2014*

École Centrale de Nantes *Nantes, France*

BSc, Electrical Engineering *2007 - 2011*

Pondicherry University *Pondicherry, India*

References

Dr. Daniele Pucci *Researcher*

daniele.pucci@iit.it *IIT*

Dr. Silvio Traversaro *Researcher*

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Dr. Chiara Bartolozzi *Researcher*

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Dr. Fulvio Mastrogiovanni *Professor*

fulvio.mastrogiovanni@unige.it *Genova University*

Scholarships & Awards

Best Student Paper [C4] *2019*

Intelligent Systems Conference *SAI*

Best Blooper *2019*

ICRA *IEEE*

Early Stage Researcher *2016*

Marie Curie Fellowship *European Union*

Technical Skills

Robotics Middleware	ROS, YARP
Operating Systems	Linux
Version Control	Git, GitHub, Bitbucket
Programming	C++, Matlab, Python
Simulation	Gazebo
Tools	Qt, Eclipse, PyCharm Simulink, PlatformIO

Personal Skills

Resourceful Collaborative Dependable

Languages & Hobbies

English (C2) Italian (A2) French (A1)
Hindi (B1) Tamil (B1) Telugu (C2)
Hiking Photography Cooking

Publications

[C1] L. Rapetti, **Y. Tirupachuri**, K. Darvish, S. Dafarra, G. Nava, C. Latella, and D. Pucci. "Model-Based Real-Time Motion Tracking using Dynamical Inverse Kinematics". In: *Algorithms* (2020). DOI: https://doi.org/10.3390/a13100266.

[C2] I. Sorrentino, F. J. Andrade Chavez, C. Latella, L. Fiorio, S. Traversaro, L. Rapetti, **Y. Tirupachuri**, N. Guedelha, M. Maggiali, S. Dussoni, G. Metta, and D. Pucci. "A Novel Sensorised Insole for Sensing Feet Pressure Distributions". In: *Sensors* 20.3 (2020). ISSN: 1424-8220. DOI: 10.3390/s20030747. URL: https://www.mdpi.com/1424-8220/20/3/747.

[C3] C. Latella, S. Traversaro, D. Ferigo, **Y. Tirupachuri**, L. Rapetti, F. J. Andrade Chavez, F. Nori, and D. Pucci. "Simultaneous Floating-Base Estimation of Human Kinematics and Joint Torques". In: *Sensors* 19.12 (2019). ISSN: 1424-8220. DOI: 10.3390/s19122794. URL: https://www.mdpi.com/1424-8220/19/12/2794.

[C4] **Y. Tirupachuri**, G. Nava, C. Latella, D. Ferigo, L. Rapetti, L. Tagliapietra, F. Nori, and D. Pucci. "Towards Partner-Aware Humanoid Robot Control Under Physical Interactions". In: *Proceedings of SAI Intelligent Systems Conference*. Springer. 2019, pp. 1073–1092.

[C5] **Y. Tirupachuri**, G. Nava, L. Rapetti, C. Latella, and D. Pucci. "Trajectory Advancement during Human-Robot Collaboration". In: *2019 28th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*. IEEE. 2019, pp. 1–8. DOI: 10.1109/RO-MAN46459.2019.8956339.

[C6] **Y. Tirupachuri**, S. Traversaro, F. Nori, and D. Pucci. "Momentum-Based Topology Estimation of Articulated Objects". In: *Proceedings of SAI Intelligent Systems Conference*. Springer. 2019, pp. 1093–1105.

[C7] **Y. Tirupachuri***, K. Darvish*, G. Romualdi, L. Rapetti, D. Ferigo, F. J. Andrade Chavez, and D. Pucci. "Whole-Body Geometric Retargeting for Humanoid Robots". In: *Humanoids*. IEEE. 2019, in press.

[C8] V. Vasco, A. Glover, **Y. Tirupachuri**, F. Solari, M. Chessa, and C. Bartolozzi. "Vergence control with a neuromorphic iCub". In: *2016 IEEE-RAS 16th International Conference on Humanoid Robots (Humanoids)*. 2016, pp. 732–738. DOI: 10.1109/HUMANOIDS.2016.7803355.

Workshops

[W1] L. Rapetti, **Y. Tirupachuri**, A. Ranavolo, C. Latella, and D. Pucci. "Multi-Humanoid-Robot system: balancing and effort distribution during collaboration". In: (2020), Foundational Problems in Multi–Robot Coordination Under Uncertainty and Adversial Attacks, International Conference on Robotics and Automation (ICRA) 2020, Paris, France. arXiv: 2001.00411 [cs.RO]. URL: https://drive.google.com/file/d/1bAerev1fongOZU-JL93wZowrGgxoPfve/view.

[W2] **Y. Tirupachuri**, G. Nava, L. Rapetti, C. Latella, K. Darvish, and D. Pucci. "Recent Advances in Human-Robot Collaboration Towards Joint Action". In: (2020), The Communication Challenges in Joint Action for Human–Robot Interaction Workshop, International Conference on Social Robotics (ICSR) 2019, Madrid, Spain. arXiv: 2001.00411 [cs.RO].

[W3] C. Latella, **Y. Tirupachuri**, L. Rapetti, D. Ferigo, S. Traversaro, I. Sorrentino, F. J. Andrade Chavez, F. Nori, and D. Pucci. "A Human Wearable Framework for Physical Human-Robot Interaction". In: (2019), I–RIM, Rome, Italy. URL: https://bit.ly/35iy9k7.

[W4] **Y. Tirupachuri**, G. Nava, L. Rapetti, C. Latella, and D. Pucci. "Trajectory Advancement for Robot Stand-up with Human Assistance". In: (2019), I–RIM, Rome, Italy. arXiv: 1910.06786 [cs.RO].

[W5] C. Latella, L. Tagliapietra, D. Ferigo, **Y. Tirupachuri**, F. Nori, and D. Pucci. "Advancing Human-Robot Collaboration through Online Human Inverse Dynamics Estimation". In: *2018 IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO)*. 2018, pp. 21–22. DOI: 10.1109/ARSO.2018.8625806.

[W6] **Y. Tirupachuri**, P. Ramadoss, B. Bruno, and F. Mastrogiovanni. "Human-Robot Cooperation: is Wearable Sensing the Way to Go?" In: (2015), Robot and Human Interactive Communication (RO–MAN), 2015 IEEE 24th IEEE International Symposium on. eprint: https://bit.ly/2Qmgi7W.