Vittorio (Vitto) Pastore

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Summary

Reinforcement Learning and Controls Engineer specializing in **loco-manipulation policy training**, whole-body control, nonlinear model predictive control, and sim-to-real transfer for high-DOF legged humanoids. Experienced owning the full pipeline from simulation training through production deployment and field monitoring, and building training/eval infrastructure for research teams. Active academic contributor and technical reviewer for IEEE RA-L, IROS, and TCST.

Professional Experience

Foundation Robotics — San Francisco, CA
Tech Lead — May 2026 – Present

- Led development and deployment of Ghost-WBC, a novel production **whole-body control framework** for Phantom humanoids, achieving **20x faster training** and comparable performance to NVIDIA SONIC and SOTA baselines.
- Replaced PPO with **backpropagation through a learned differentiable world model**, shipping motion, end-effector, and velocity control on one shared decoder to the MK1 humanoid.
- Trained and deployed **PPO/SAC** loco-manipulation policies, including box pick-and-place, floor-level object retrieval, and **variable-stiffness hands**, tracking field task success rate and compute solve times.
- Engineered sim-to-real pipelines with domain randomization and shaped rewards, plus a MuJoCo **sim-as-robot harness** that runs production deploy containers with no hardware.
- Co-built the **real-time C++ inference node** and operator console, and built a generative **kinematic motion planner** and PICO VR teleoperation pipeline that stream live references to the tracking policy.
- Built standardized training and evaluation infrastructure (benchmark suites, sweep tooling) adopted by a 15-person AI research team; GPU profiling cut iteration time 20% at 16k parallel envs.

Agile Robots for Control, Optimization, and Learning Lab — Blacksburg, VA
Graduate Research Assistant — Aug 2024 – May 2026

- Formulated a Nonlinear MPC framework targeting quadrupedal loco-manipulation accounting for non-negligible manipulator dynamics, resulting in a publication in **IEEE RA-L**.
- Synthesized multi-agent navigation policies leveraging **distributed NMPC, ADMM**, and Control Barrier Functions (CBFs) to mathematically guarantee collision avoidance within dense robotic swarms.
- Scaled reinforcement learning training loops across massive **HPC cluster infrastructures via SLURM**, optimizing simulation throughput and reducing iteration overhead by 200%.

Terrestrial Robotics Engineering & Controls Lab — Blacksburg, VA
Undergraduate Researcher — May 2022 – May 2024

- Architected full-stack low-level embedded system logic and physical modular sub-assemblies for *Greyhound*, an open-source research quadruped platform, integrating real-time perception feedback loops.
- Contributed to the kinematic joint and structural design for the upper extremities of *PANDORA*, a large-scale, 30-DoF 3D-printed humanoid robot optimized for highly dynamic locomotion profiles.
- Optimized computational rigid-body robot dynamics formulations, yielding a **25% boost in real-time execution speeds** and drastically minimizing CPU compute allocation.

Publications

- R. Sambhus, ..., **V. Pastore**, et al. "A Nonlinear MPC Framework for Loco-Manipulation of Quadrupedal Robots with Non-Negligible Manipulator Dynamics," Published in ***IEEE Robotics and Automation Letters (RA-L)***.
- Y. Zeng, ..., **V. Pastore**, et al. "ADMM-Based Distributed MPC with Control Barrier Functions for Safe Multi-Robot Quadrupedal Locomotion," *Under review.*
- **V. Pastore**, et al. "A Hybrid Framework for Multi-Agent Navigation: Integrating ADMM-Based Distributed NMPC with Reinforcement Learning," *Under review.*
- **V. Pastore**, "Multi-Agent Hierarchical Distributed NMPC with Learned Locomotion," *Master's Thesis, Virginia Tech*, 2026.

Education

Virginia Tech — Blacksburg, VA
M.S. in Mechanical Engineering, Specialization in Robotics — May 2026
Focused Track: Reinforcement Learning, Whole-Body Control, Distributed NMPC, Sim-to-Real Optimization.

B.S. in Mechanical Engineering, Cum Laude — May 2024
Double Major: Robotics & Mechatronics (RBMT) and Mechanical Engineering.

Technical Skills

Software & Languages	Control & Learning	Simulation & Systems
C++, Python, ROS 2, Swift	RL (PPO, SAC), Whole-Body Control (WBC)	Isaac Lab / Gym, RaiSim, MuJoCo
PyTorch, Core ML, NumPy	Distributed NMPC, ADMM	SLURM, HPC Clusters, Linux
MATLAB, Simulink, C	Sim-to-Real Policy Transfer, Manipulation & Loco-Manipulation	Docker, Singularity, Git / CI-CD