

SIMEON NEDELICHEV

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PROFESSIONAL EXPERIENCE

Researcher & Senior RL Engineer

Feb 2026 – Present

Institute of Artificial Intelligence

Developing learning-based whole-body control, data-driven motion generation, and estimation methods for humanoid and articulated robotic systems. Building simulation pipelines, motion libraries, and deployable control stacks in collaboration with academic and industry partners.

Senior Optimal Control & RL Engineer

Aug 2023 – Dec 2025

Sber Robotics Center, Sber

Developer of the RL whole-body control (WBC) and locomotion policies demonstrated on the Green humanoid at AIJ Conference 2025. Work centered on control, with modeling and MuJoCo-based simulation and training/evaluation pipelines; partial system identification (mainly motor and actuator parameters).(video).

Senior Lecturer

Apr 2022 – Present

Institute for Robotics and Computer Vision, Innopolis University

Advanced courses in robotics, mathematical modeling, motion planning, applied and nonlinear control. Curriculum development and student mentoring in dynamics, simulation, and embodied AI.

Junior Researcher

Sep 2019 – Sep 2023

Center for Technologies in Robotics and Mechatronics Components, Innopolis University

Mathematical modeling, identification, and control of twisted-string actuators; optimal nonlinear control and trajectory optimization; mechanical and electrical prototyping of novel robotic systems.

Research Assistant

Mar 2017 – Jun 2019

BioRobotics Laboratory, Korea University of Technology and Education

Analysis, prototyping, and nonlinear control of twisted-string actuators (TSA); hardware implementation of advanced control algorithms.

EDUCATION

Ph.D. studies in Computer Science (Robotics track), completed

Jul 2023

Innopolis University

GPA 4.87/5 (97/100). Institute of Robotics and Computer Vision.

Thesis: *Dynamic parameter estimation and adaptive control over robotic systems: generalized momentum approach.*

M.Sc. in Mechanical Engineering

Feb 2019

Korea University of Technology and Education

GPA 4.45/4.5 (98/100).

Thesis: *Design of Robotic Gripper with Constant Transmission Ratio Based on Twisted String Actuator.*

M.Sc. in Robotics & Mechatronics

Jun 2018

Moscow State Technological University STANKIN

GPA 4.9/5 (98/100).

Thesis: *The Dynamics of Controlled Motion of Industrial Robots.*

B.Sc. in Robotics

Jun 2016

Moscow State Technological University STANKIN

GPA 4.35/5 (87/100).

Thesis: *Development and research of dynamic model of robot manipulator.*

SELECTED RESEARCH & SOFTWARE PROJECTS

WBC-Mjlab: Whole Body Control in MuJoCo Lab (github.com/wbc-mjlab/wbc-mjlab) — web demo

Shared MDP for universal whole-body motion tracking in mjlab: multi-clip training, paper-specific task presets (ZEST, BeyondMimic-style RSI, etc.), motion-data pipeline, and sim-to-real export for humanoids.

PSM: Predictive Style Matching for Natural Locomotion (project page)

Offline predictor maps lower-body state and velocity commands to upper-body and gait targets during RL training; deployed on Unitree G1 with task-only inference at run time. arXiv:2606.07083 (2026).

LocoGen: Command-Conditioned Locomotion Generation

Combines learned motion matching (Holden et al.) and flow matching (Control Operators) for online, command-conditioned full-body locomotion. G1-first but robot-agnostic; MuJoCo-grounded state, velocity commands (extensible to waypoints and trajectories), and interactive Viser control with seamless stand/walk/run transitions. Inference at ~800 FPS (LMM) and ~150 FPS (flow); PoC training from a handful of LAFAN clips. Walking and tracking validated with BeyondMimic / ZEST in simulation and on Unitree G1 hardware. Code forthcoming.

Locomotion and Whole Body Control for Sber Green (AIJ 2025 presentation)

Developer of the RL locomotion and whole-body control policies demonstrated on the Green humanoid at AIJ 2025: improved naturalness and human-likeness of locomotion; RL-based whole-body control trained on synthetically generated reference trajectories (without acquiring mocap datasets or retargeting) and unified tracking for teleoperation, dance, and zero-shot skills.

OPEN SOURCE CONTRIBUTIONS

Pinocchio ([stack-of-tasks/pinocchio](https://github.com/stack-of-tasks/pinocchio)) — contributor to the rigid-body dynamics library (inertia parametrizations and physical consistency).

Pink ([stephane-caron/pink](https://github.com/stephane-caron/pink)) — contributor to differential inverse kinematics for Pinocchio (tasks, constraints, and examples).

Mink ([kevinzakka/mink](https://github.com/kevinzakka/mink)) — contributed `EqualityConstraintTask` for closed-chain mechanisms; humanoid and manipulation examples in the MuJoCo port of Pink.

GMR: General Motion Retargeting (YanjieZe/GMR) — contributor (SOMA BVH format and multi-robot configs).

mujoco-sysid ([based-robotics/mujoco-sysid](https://github.com/based-robotics/mujoco-sysid)) — contributor; system identification in MuJoCo and MJX (parameter estimation, dynamics regressors).

MJINX: Differentiable GPU-accelerated Numerical IK ([based-robotics/mjinx](https://github.com/based-robotics/mjinx)) — co-author (JAX and MuJoCo MJX).

PUBLICATIONS

Preprints

- **Nedelchev S**, Chaikovskaia E, Davydenko E, Zaliaev E, Gorbachev R. Predictive Style Matching: Natural and Robust Humanoid Locomotion. arXiv:2606.07083, 2026.
- Maslennikov E, Zaliaev E, Dudorov N, Shamanin O, Karanov D, Afanasev G, Burkov A, Lygin E, **Nedelchev S**, Ponomarev E. Robust RL Control for Bipedal Locomotion with Closed Kinematic Chains. arXiv:2507.10164, 2025.
- Alentev I, Kozlov L, Domrachev I, **Nedelchev S**, Ryu JH. VIMPPI: Enhancing Model Predictive Path Integral Control with Variational Integration for Underactuated Systems. arXiv:2505.05507, 2025.

Journals

- **Nedelchev S**, Kozlov L, Khusainov RR, Gaponov I. Enhanced Adaptive Control over Robotic Systems via Generalized Momentum Dynamic Extensions. *Russian Journal of Nonlinear Dynamics*, 19(4):633–646, 2023.
- Fam CA, **Nedelchev S**. Optimization Driven Robust Control of Mechanical Systems with Parametric

Uncertainties. *Russian Journal of Nonlinear Dynamics*, 19(4):585–597, 2023.

- Skvortsova V, **Nedelchev S**, Brown J, Farkhatdinov I, Gaponov I. Design, characterisation and validation of a haptic interface based on twisted string actuation. *Frontiers in Robotics and AI*, 2022.
- **Nedelchev S**, Skvortsova V, Guryev B, Gaponov I, Ryu JH. On Energy-Preserving Motion in Twisted String Actuators. *IEEE Robotics and Automation Letters*, 2021.
- **Nedelchev S**, Gaponov I, Ryu JH. Accurate Dynamic Modeling of Twisted String Actuators Accounting for String Compliance and Friction. *IEEE RA-L*, 2020.

Conference papers

- Jnadi A, Khusainov RR, **Nedelchev S**, Savin S. Explicit Model Predictive Control Design based on Constrained Zonotope Propagation. *DCNA*, 2023.
- **Nedelchev S**, Kirsanov D, Gaponov I, Seong H, Ryu JH. On Smooth Time-Optimal Trajectory Planning in Twisted String Actuators. *ICRA*, 2021.
- Sabirova A, **Nedelchev S**, Gaponov I. Parameter Identification in Mechanical Systems with Energy-Based Regressor: Preliminary Study. *NIR*, 2021.
- **Nedelchev S**, Kirsanov D, Gaponov I. IMU-based Parameter Identification and Position Estimation in Twisted String Actuators. *IROS*, 2020.
- Balakhnov O, **Nedelchev S**, Gaponov I. Preliminary Study on Slack-Free MPC of Twisted String-Based Antagonistic Joints. *NIR*, 2020.
- **Nedelchev S**, Gaponov I, Ryu JH. High-Bandwidth Control of Twisted String Actuators. *ICRA*, 2019.
- **Nedelchev S**, Gaponov I, Ryu JH. Design of Robotic Gripper with Constant Transmission Ratio Based on Twisted String Actuator. *IROS*, 2018.
- Kosterev D, Vorotnikov A, **Nedelchev S**, Romash E, Poduraev Y. Development of 2-DoF Adaptive Mechatronic Device with Corrective Adjustment of Laser Tracker Reflector for Industrial Robot Calibration. *Annals of DAAAM & Proceedings*, 28, 2017.

TEACHING

Innopolis University — Senior Lecturer (2022–present), Teaching Assistant (2019–2022)

FORC: Fundamentals of Robot Control (github.com/simeon-ned/forc)

Introductory course on state-space modeling, stability, linear and nonlinear control, and feedback linearization for robotic systems (lectures and Colab/Python labs).

MCP: Modern Control Paradigms (github.com/simeon-ned/mcp)

Course materials on modern control via numerical methods and convex optimization, with interactive notebooks.

- Applied Nonlinear Control; Modern Control Paradigms; Fundamentals of Robot Control
- Modeling and Simulation of Robotic Systems; Linear Control Theory; Robotic Systems
- Computational Intelligence; Advanced Robotics

TECHNICAL SKILLS

Programming: Python, C/C++, Bash

Robotics & ML: MuJoCo, mjlab, Isaac Sim, Isaac Lab, RL/WBC training pipelines, system identification

Embedded: STM32, ARM, ESP32, RP2040 (MicroPython, HAL, FreeRTOS, mbed)

Tools: Linux, LaTeX, Docker, uv, pixi

HONORS

- Best Master Thesis Award, Korea University of Technology and Education, 2019
- First Prize, Russian thesis competition “Be-First” (Computer & Information Technologies), 2018

RESEARCH INTERESTS

Nonlinear and learning-based control; whole-body control and humanoid locomotion; system identification and estimation; differentiable simulation; data-driven motion; novel actuators; convex optimization for control.