Federico Berto

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Daejeon, South Korea

Research Interests

- Deep Reinforcement Learning (DRL)
- AI for Combinatorial Optimization in discrete spaces ("AI4CO")
- Multi-agent systems, including multi-robot interactions and agentic LLMs
- Deep learning for modeling and control of dynamical systems

Experience

Radical Numerics *07/2025 - present*
AI Scientist Daejeon, South Korea (Remote)
- Research AI agents on Recursive Improvement Systems Architecture
- Automated AI (Cuda/Triton/Cutlass) kernel optimization pipeline
- Agentic platform R&D

Omelet AI *07/2024 - 06/2025*
AI Scientist (Part-time) Daejeon, South Korea
- R&D on foundation models for optimization
- Development of optimization AI Agent platform
- Research in neural combinatorial optimization for real-world applications

Daewoong Pharmaceuticals *07/2021 - 06/2024*
Internship & Scholarship Recipient Seoul, South Korea
- Optimization of pharmaceutical production processes with machine learning
- Automatic document translation optimization via LLMs
- Medical news crawler and notification service

Comau Robotics *10/2019 - 01/2020*
Internship Shanghai, China
- Design of automated engine assembly lines from the FCA group
- PLC Software Design
- International Team Cooperation

Education

Doctor of Philosophy (Ph.D.) *2022 - 2025*
Korea Advanced Institute of Science and Technology (KAIST) Daejeon, South Korea
- Major: Industrial and Systems Engineering
- Advisor: Prof. Jinkyoo Park
- Thesis: "*Learning Foundation Models for Efficient Neural Combinatorial Optimization*"

Master of Science (M.S.) *2020 - 2022*
Korea Advanced Institute of Science and Technology (KAIST) Daejeon, South Korea
- Major: Industrial and Systems Engineering
- Advisor: Prof. Jinkyoo Park
- Thesis: "*Neural Solvers for Fast and Accurate Numerical Optimal Control*"

Bachelor of Science (B.S.) *2016 - 2020*
University of Bologna & Tongji University (double degree) Bologna, Italy & Shanghai, China
- Major: Automation Engineering
- Advisor: Prof. Claudio Melchiorri
- Thesis: "*Design Strategy for Controlling Computer Games Based on Machine Learning Algorithms*"

PUBLICATIONS

* = EQUAL CONTRIBUTIONS

[1] Federico Berto*, Chuanbo Hua*, Laurin Luttmann*, Jiwoo Son, Junyoung Park, Kyuree Ahn, Changhyun Kwon, Lin Xie, Jinkyoo Park. "PARCO: Parallel AutoRegressive Models for Multi-Agent Combinatorial Optimization" In: *Advances in Neural Information Processing Systems (NeurIPS)*, 2025.

[2] Jiwoo Son*, Zhikai Zhao*, Federico Berto*, Chuanbo Hua, Changhyun Kwon, Jinkyoo Park. "Neural Combinatorial Optimization for Real-World Routing" In: *NeurIPS 2025 on Differentiable Learning of Combinatorial Algorithms*, 2025.

[3] Federico Berto*, Chuanbo Hua*, Nayeli Gast Zepeda*, André Hottung, Niels Wouda, Leon Lan, Junyoung Park, Kevin Tierney, Jinkyoo Park. "RouteFinder: Towards Foundation Models for Vehicle Routing Problems" In: *Transactions on Machine Learning Research (TMLR)*, 2025.

[4] Federico Berto*, Chuanbo Hua*, Junyoung Park*, Laurin Luttmann*, Yining Ma, Fanchen Bu, Jiarui Wang, Haoran Ye, Minsu Kim, Sanghyeok Choi, Nayeli Gast Zepeda, André Hottung, Jianan Zhou, Jieyi Bi, Yu Hu, Fei Liu, Hyeonah Kim, Jiwoo Son, Haeyeon Kim, Davide Angioni, Wouter Kool, Zhiguang Cao, Jie Zhang, Kijung Shin, Cathy Wu, Sungsoo Ahn, Guojie Song, Changhyun Kwon, Lin Xie, Jinkyoo Park. "RL4CO: an Extensive Reinforcement Learning for Combinatorial Optimization Benchmark" In: *ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), 2025*.

[5] Zhikai Zhao*, Chuanbo Hua*, Federico Berto*, and Kanghoon Lee, Zihan Ma, Jiachen Li, Jinkyoo Park. "TrajEvo: Designing Trajectory Prediction Heuristics via LLM-driven Evolution". In: *ICML 2025 Workshop on Building Physically Plausible World Models*, 2025.

[6] Haeyeon Kim, Junghyun Lee, Seonguk Choi, Federico Berto, Taein Shin, Joonsang Park, Jihun Kim, Jiwon Yoon, Byeongmok Kim, Youngwoo Kim, Joungho Kim. "Advanced Chiplet Placement and Routing Optimization considering Signal Integrity". In: *IEEE Transactions on Components, Packaging and Manufacturing Technology*, 2025.

[7] Chuanbo Hua*, Federico Berto*, Zhikai Zhao, and Jiwoo Son, Changhyun Kwon, Jinkyoo Park. "USPR: Learning a Unified Solver for Profiled Routing". In: *arXiv preprint arXiv:2505.05119*, 2025

[8] Haeyeon Kim*, Federico Berto*, Junghyun Lee, Hyunjun An, Taein Shin, Chuanbo Hua, Jinkyoo Park, Youngwoo Kim, Joungho Kim. "Accelerating Chiplet Placement & Routing Optimization with Machine Learning" In: *DesignCon* (Best Paper Award Finalist), 2025.

[9] Chuanbo Hua*, Federico Berto*, Jiwoo Son*, Seunghyun Kang, Changhyun Kwon, Jinkyoo Park. "CAMP: Collaborative Attention Model with Profiles for Vehicle Routing Problems" In: *International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, 2025.

[10] Haoran Ye, Jiarui Wang, Zhiguang Cao, Federico Berto, Chuanbo Hua, Haeyeon Kim, Jinkyoo Park, Guojie Song. "ReEvo: Large Language Models as Hyper-Heuristics with Reflective Evolution" In: *Advances in Neural Information Processing Systems (NeurIPS)*, 2024.

[11] Huijie Tang*, Federico Berto*, Jinkyoo Park. "Ensembling Prioritized Hybrid Policies for Multi-agent Pathfinding" In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024.

[12] Huijie Tang*, Federico Berto*, Zihan Ma, Chuanbo Hua, Kyuree Ahn, Jinkyoo Park. "Ensembling Prioritized Hybrid Policies for Multi-agent Pathfinding" In: *AAMAS*, 2024.

[13] Chuanbo Hua*, Federico Berto*, Michael Poli, Stefano Massaroli, Jinkyoo Park. "Learning Efficient Surrogate Dynamic Models with Graph Spline Networks" In: *Advances in Neural Information Processing Systems (NeurIPS)*, 2023.

[14] Minsu Kim, Federico Berto, Sungsoo Ahn, Jinkyoo Park. "Bootstrapped Training of Score-Conditioned

Generator for Offline Design of Biological Sequences" In: *Advances in Neural Information Processing Systems (NeurIPS)*, 2023.

[15] Haeyeon Kim*, Minsu Kim*, Federico Berto, Joungho Kim, Jinkyoo Park. "DevFormer: a symmetric transformer for context-aware device placement" In: *International Conference on Machine Learning (ICML)*, 2023.

[16] Michael Poli*, Stefano Massaroli*, Federico Berto*, Jinkyoo Park, Tri Dao, Christopher Re, Stefano Ermon. "Transform Once: Efficient Operator Learning in Frequency Domain" In: *Advances in Neural Information Processing Systems (NeurIPS)*, 2022.

[17] Junyoung Park, Federico Berto, Arec Jamgochian, Mykel J. Kochenderfer, Jinkyoo Park. "Meta-SysId: A Meta-Learning Approach for Simultaneous Identification and Prediction" In: *ArXiv preprint arXiv:2206.00694*, 2022.

[18] Federico Berto, Stefano Massaroli, Michael Poli, Jinkyoo Park. "Neural Solvers for Fast and Accurate Numerical Optimal Control" In: *International Conference on Learning Representations (ICLR)*, 2022.

Awards and Scholarships

Best Paper Award Finalist *2025*
DesignCon Santa Clara, CA, USA
Paper: "*Accelerating Chiplet Placement & Routing Optimization with Machine Learning*"

Top Reviewer (x2) *2023 - 2024*
NeurIPS New Orleands, USA; Vancouver, Canada
Received complimentary NeurIPS pass each time

International Scholarship *2020 - 2025*
KAIST Daejeon, South Korea
Full-tuition scholarship and monthly stipend for top applicants

Venture Research Program for Graduate Students *2024*
KAIST Daejeon, South Korea
Scholarship for cross-department project collaborations with the Electrical Engineering Department

Song Hyun-sang Award *2023*
KAIST Daejeon, South Korea
Based on academic excellence and contribution to the development of the Department through leadership, service, and creativity

Korean Speech Contest Winner *2023*
KAIST International House Daejeon, South Korea
Third place winner

Outstanding Reviewer *2022*
International Conference of Machine Learning (ICML) Remote
Top 10% of reviewers

AI and Big Data Scholarship *2021 - 2024*
Daewoong Foundation Remote
Monthly scholarship for talented applicants in AI & Big Data

AI Hackaton Award *2021*
Daewoong Foundation Gangwon-do, South Korea
Third place winner for developing "*Olppaemi: an AI assessment and monitoring tool for skin analysis*"

Almatong Program Scholarship *2017 - 2020*
University of Bologna and Tongji University Shanghai, China
Full scholarship for double degree abroad

Academic Reviewer

International Conference on Machine Learning (ICML)	2022 - 2025
Conference on Neural Information Processing System (NeurIPS)	2022 - 2025
International Conference on Learning Representation (ICLR)	2024 - 2026
AAAI Conference on AI (AAAI)	2025 - 2026
Knowledge Discovery and Data Mining (KDD)	2024 - 2026
International Joint Conference on Artificial Intelligence (IJCAI)	2024 - 2025
International Conference on Artificial Intelligence and Statistics (AISTATS)	2025 - 2026
Reinforcement Learning Conference (RLC)	2025
Learning and Intelligent Optimization (LION)	2025
Transactions on Machine Learning Research (TMLR)	2025

Skills

- **Programming Languages:** Python, C, MatLab
- **Deep Learning Frameworks:** PyTorch, TensorFlow, Jax, TorchRL, Transformers
- **General Software Frameworks:** NumPy, Streamlit, Langchain/Langgraph, FastAPI, MkDocs
- **Open-Research Communities:** AI4CO (founder), DiffEqML
- **Software Tools:** Linux, Git, Docker, GPU Server Management, Copilot & AI Coding Assistants, LaTeX
- **Soft Skills:** Problem-Solving, Adaptability, Teamwork, Leadership, Active Listening, Motivation

Certifications

English Language Certification (IELTS)	*Level 8.0*
Chinese Language Certification (HSK)	*Level 3*
Driving Licenses	*Italy, China, South Korea, International*

Additional Information

Languages: Italian (Native), English (Proficient), Chinese (Lower Intermediate), Spanish (Intermediate), Korean (Basic)
Extracurricular Activities: Traveling, Cultural exchanges, Tech trends, Hiking and multi-day trekking, Board games, Developing the most random software
Open-Source Contributions: Active contributor to various projects from research libraries to practical applications such as these examples