DETAILED PROGRAM – Tuesday 3 September

PLENARY SPEAKER 3 – Aude Billard (Neue Aula, 9:00 – 9:50)

Title: **Toward Human-Like Dexterity for Robots**

Bio: Aude Billard is full professor and head of the LASA laboratory at the School of Engineering at the Swiss Institute of Technology Lausanne (EPFL). Dr. Billard acts as the President of the IEEE Robotics and Automation Society (RAS), after serving in several roles in the administrative and executive committees of IEEE RAS. She also serves as Associate Dean for Education at the EPFL School of Engineering and lead of Swiss Innovation Booster on Robotics. Aude Billard holds a B.Sc and M.Sc. in Physics from EPFL and a Ph.D. in Artificial Intelligence from the University of Edinburgh. A. B. is an IEEE Fellow and the recipient of numerous recognitions, among which the Intel Corporation Teaching award, the Swiss National Science Foundation career award, the Outstanding Young Person in Science and Innovation from the Swiss Chamber of Commerce, the IEEE RAS Distinguished Award, and the IEEE-RAS Best Reviewer Award.

KEY INNOVATOR 2 – Robert Riener (Neue Aula, 9:50 – 10:10)

ETH zürich

***Title*: Rock and Treat during Sleep**

Bio: Robert Riener studied Mechanical Engineering at TU München, Germany, and University of Maryland, USA. He received a Dr.-Ing. degree in Engineering from the TU München in 1997. After postdoctoral work from 1998-1999 at Politecnico di Milano and TU München, he became assistant professor at ETH Zurich and the medical faculty of the University of Zurich ("double-professorship") in 2003. Since 2010 he has been full professor for Sensory-Motor Systems, ETH Zurich. In 2016 Riener became also full professor of medicine at the University of Zurich. Riener's research focuses on the investigation of the sensory-motor interactions between humans and machines. He is the initiator and organizer of the Cybathlon Championship, which was honored with the European Excellence Award and the Yahoo Sports Technology Award. In 2018 Riener obtained the honorary doctoral degree from the University of Basel. Since 2022 Riener is president of the ICORR.

PARALLEL ORAL SESSIONS MORNING

Morning ORAL Sessions (10:40 – 12:00): Parallel oral sessions (talks: 10 min + 2 min Q&A).

[Exoskeletons and exosuits] EE-MO3 – Room HS 5 ***Chair: Sabine Thuerauf, Co-Chair: Satoshi Endo***		
267	Meier, Tess; Nycz, Christopher J; Daudelin, Andrew; Fischer, Gregory Scott	The PneuHOPE Hand Exoskeleton: A Platform for Studying Brain Activation during Robot-facilitated Hand Movement using fMRI
274	Arcobelli, Valerio Antonio; Bruschi, Agnese; Vassallo, Christian; Zauli, Matteo; De Marchi, Luca; Maludrottu, Stefano; Laffranchi, Matteo; Chiari, Lorenzo; Mellone, Sabato	Enhancing TWIN Lower-Limb Exoskeleton Functionalities through Sensorized Crutches and a Trunk Inertial Measurement Unit
288	Kavianirad, Hossein; Missiroli, Francesco; Endo, Satoshi; Masia, Lorenzo; Hirche, Sandra	Toward Dexterous Hand Functional Movement: Wearable Hybrid Soft Exoglove-FES Study
314	Scott, Isaiah; Rose, Chad; Deshpande, Ashish	A Novel Velocity-Based Controller That Targets Unwanted Joint Coordination
352	Palacios, Joaquin; Deli-Ivanov, Alexandra; Chen, Ava; Winterbottom, Lauren; Nilsen, Dawn; Stein, Joel; Ciocarlie, Matei	Grasping Force Modulation with a Wrist Motion-Controlled Hand Orthosis for C6-C7 Spinal Cord Injury

[Neural control of movement and biomechanics] NC-MO3 – Room HS 6
Chair: Massimo Sartori, Co-Chair: Friedl De Groote

127	Lokesh, Rakshith; Sternad, Dagmar	Human control of underactuated objects: Adaptation to uncertain nonlinear dynamics ensures stability
266	D'Hondt, Lars; Falisse, Antoine; Gupta, Dhruv; Van Den Bosch, Bram; Buurke, Tom; Febrer Nafría, Míriam; Vandekerckhove, Ines; Afschrift, Maarten; De Groote, Friedl	PredSim: A Framework for Rapid Predictive Simulations of Locomotion
292	Rook, Jan Willem A; Sartori, Massimo; Mohamed Refai, Mohamed Irfan	Towards Wearable Electromyography for Personalized Musculoskeletal Trunk Models using an Inverse Synergy-based Approach
303	Gogeascoechea, Antonio; Mohamed Refai, Mohamed Irfan; Yavuz, Utku S.; Sartori, Massimo	Towards Real-time Decoding of Motor Unit Firing Events and Resulting Muscle Activation during Human Locomotion and High-force Contractions
309	ye, tian; Manzoori, Ali Reza; Ijspeert, Auke; Bouri, Mohamed	Human-in-the-Loop Optimization for Terrain- and User-Adaptive Gait Phase Estimation in Phase-Portrait-Based Methods
312	Helm, Cody; Sergi, Fabrizio	Model-Based Estimation of Active and Passive Muscle Forces Using MRE in Forearm Muscles During 2-DOF Wrist Tasks
149	Marjaninejad, Ali; Valero-Cuevas, Francisco, J.	Model-agnostic Bio-inspired Autonomous Lifelong-learning of Kinematic Control in Tendon-driven Quadruped Robots

[Micro/nano robotics] MN-MO3 – Room HS 4 *Chair: Egidio Falotico, Co-Chair: Islam S. M. Khalil*		
259	De Remigis, Eugenia; Dikbas, Fehmi Mustafa; Ibrahimi, Michele; Bianciardi, Francesco; Petrocelli, Elisa Linda; Roberti, Elisa; Iacovacci, Veronica; Palagi, Stefano	Infiltration of cell-inspired ultra-deformable magnetic microrobots in restrictive environments
195	Kim, Min Sung; Park, Chan Young; Lee, Doo Yong	Magnetorheological-elastomer-based and Hydraulically Steerable Actuator for Micro Guidewire and Catheter
223	Srymbetov, Tamerlan; De Angelis, Giordano; Menciassi, Arianna; Iacovacci, Veronica	Millimeter-scale Magnetic Carrier for On-demand Delivery of Magnetic and Non-magnetic Microparticles Suspensions
134	Ligtenberg, Leendert-Jan Wouter; Jongh, de, Luuc; Liefers, Herman Remco; Wasserberg, Dorothee; Klein Rot, Emily A. M.; Ben Ami, Doron; Sadeh, Udi; Lomme, Roger MLM; Tuijthof, Gabrielle; Shoseyov, Oded; Jonkheijm, Pascal; Warle, Michiel; Khalil, Islam S.M.	X-Ray-Guided Robotic Platform for Remote Control of Untethered Magnetic Robots Targeting Blood Clots in the Iliac Artery
173	Manikandan, Aiswarya Lakshmi; Gurboga, Berfin; Munzenrieder, Niko; Raman, Akash; Gardeniers, Han J.G.E.; Susarrey-Arce, Arturo; Abelmann, Leon; Khalil, Islam S.M.	Exploring PEMFCs for Powering Untethered Small-Scale Robots

[Human-machine interaction and assistive robotics] HM-MO3 – Room HS 1
Chair: Alessia Noccaro, Co-Chair: Sebastian Hjorth

162	Du, Mingtian; Kager, Simone; Alexandre Pinto Sales de Noronha, Bernardo; Campolo, Domenico	The effect of haptic delay on robot-mediated dyadic cooperation
269	Kim, GilHwan; Sergi, Fabrizio	Modeling Neuromotor Adaptation to Pulsed Torque Assistance During Walking
300	Wu, Mengnan; Ting, Lena	Novel physical human-robot interactions at the hands alter walking coordination without relying on mechanical effects
41	Rossos, Daniel; Mihailidis, Alex; Laschowski, Brokoslaw	AI-Powered Smart Glasses for Sensing and Recognition of Human-Robot Walking Environments
98	Guachi, Robinson; Napoleoni, Flavio; Kabashi, Burim; Controzzi, Marco	Mechanical Integration of a Sensorized Skin in an Anthropomorphic Hand: Design pipeline and tests
122	Raei, Hamidreza; Gandarias, Juan M.; De Momi, Elena; Balatti, Pietro; Ajoudani, Arash	A Multipurpose Interface for Close- and Far-Proximity Control of Mobile Collaborative Robots

[Neurorobotics and neural interfaces] NN-MO3 – Room HS 7
Chair: Emilia Ambrosini, Co-Chair: Lorenzo Masia

78	Mahmoudi Khomami, Asghar; Khosrotabar, Morteza; Kuhmann, Jannis; Grimmer, Martin; Rinderknecht, Stephan; Ahmad Sharbafi, Maziar	Feasibility of utilizing passive BCI for assistance evaluation: a case study on a knee exoskeleton

372	Kanetis, Jake; Gonzalez, Michael; Vaskov, Alex; Cederna, Paul; Chestek, Cynthia; Gates, Deanna	Assessing the utility of Regenerative Peripheral Nerve Interfaces (RPNIs) in providing referred sensations in functional tasks in a virtual environment
277	Nikonowicz, Rebecca; Sergi, Fabrizio	Development of an MRI-compatible robotic perturbation system for studying the task-dependent contribution of the brainstem to long-latency responses
285	Schmidt, Kristin; Berret, Bastien; Sergi, Fabrizio	Development of an Experimental Protocol to Study the Neural Control of Force and Impedance in Wrist Movements with Robotics and fMRI
341	Lambeth, Krysten; Iyer, Ashwin; Sharma, Nitin	Quantifying Functional Electrical Stimulation-Induced Fatigue Via Ultrasound for Hybrid Neuroprosthesis-Based Walking
242	Savona, Davide; Zanco, Camilla; Sanna, Nicole; Pedrocchi, Alessandra; Ambrosini, Emilia	A Functional Electrical Stimulation and motor-assisted trike for sport rehabilitation therapy

[IEEE RAL Session 2 of 2] RAL2-MO3 – Room HS 9

Chair: Francisco Valero-Cuevas, Co-Chair: Wesley Roozing

394	Lang, Guodong,Gao, Yongsheng*,Luo, Zhewen,Liang, Guanlin,Zhu, Yanhe,Zhao, Jie	Kinematic analysis for the spatial interlocking 3-UU mechanism with the wide range of motion
395	Nuesslein, Christoph*,Young, Aaron	A Deep Learning Framework for End-To-End Control of Powered Prostheses

396	Chathuranga, Damith Suresh*,Lloyd, Peter Robert,Chandler, James Henry,Harris, Russell,Valdastri, Pietro	Assisted Magnetic Soft Continuum Robot Navigation via Rotating Magnetic Fields
399	Kaito Mizuno*,Mitsuru Higashimori	Internal Pressure Pattern Design for Variable Surface Shapes of Tongue-type Pneumatic Soft Actuator
400	Fraai, Tristan,Wen, Jian,Taghavi, Majid*	Electrically Zipping Bending Actuators for Prosthetic Fingers
401	Panzirsch, Michael*,Singh, Harsimran,Sierotowicz, Marek,Dietrich, Alexander	Extension of the Deflection-Domain Passivity Approach for Variable Stiffnesses to SO(3)

[IEEE RAS EMBS Best paper Awards] BP-MO3 – Room HS 8

Chair: Tamim Asfour, Co-Chair: Philipp Beckerle

185	Schumacher, Pierre; Krause, Lorenz; Schneider, Jan; Büchler, Dieter; Martius, Georg; Haeufle, Daniel Florian Benedict	Learning to Control Emulated Muscles in Real Robots: Towards Exploiting Bio-Inspired Actuator Morphology
326	Eveld, Maura; Van Asseldonk, Edwin; Van der Kooij, Herman	A disturbance-cancelling approach for exoskeleton balance assistance
118	De Vicariis, Cecilia; Ivanova, Ekaterina; Sanguineti, Vittorio; Burdet, Etienne	Haptic Communication in a Redundant Sensorimotor Interactive Task
261	Abdulali, Arsen; Costa Cornella, Aliex; Sirithunge, Chapa; Iida, Fumiya	Effect of Material Viscosity on Tactile Compliance Discrimination

48	Smyrnakis, Nikolaos; Karakostas, Tasos; Cotton, R. James	Advancing Monocular Video-Based Gait Analysis Using Motion Imitation with Physics-Based Simulation
187	Marx, Lennard; Groenhuis, Vincent; Stramigioli, Stefano; Niu, Kenan	Augmented-Reality based digital twin to control an MR safe robot for breast biopsy: A benchmark study

PARALLEL ORAL SESSIONS AFTERNOON

Afternoon ORAL Sessions (13:30 – 14:45): Parallel oral sessions (talks: 10 min + 2 min Q&A).

[Exoskeletons and exosuits] EE-AF3 – Room HS 1 ***Chair: Robert D. Gregg, Co-Chair: Aaron Young***		
353	Ophaswongse, Chawin; Puma, Patrick; Daley, Ian; Santamaria, Victor; Agrawal, Sunil	Training Seated Postural Coordination in a Virtual Reality Reaching Game by Active Pelvic Guidance from a Robotic Exoskeleton
355	Chen, Ava; Lee, Katelyn S.; Winterbottom, Lauren; Xu, Jingxi; Lee, Connor; Munger, Grace; Deli-Ivanov, Alexandra; Nilsen, Dawn; Stein, Joel; Ciocarlie, Matei	Volitional Control of the Paretic Hand Post-Stroke Increases Finger Stiffness and Resistance to Robot-Assisted Movement
363	Eraky, Mohamed; Rocha, Mariana; Hernandez-Rocha, Mariana; Teker, Aytac; Gebre, Biruk; Nolan J., Karen; Pochiraju, Kishore; Zanotto, Damiano	A Novel Personalized Ankle Exoskeleton with Co-Located SEA for Gait Training
380	Mahdian, Zahra S.; Van der Kooij, Herman; MacLean, Mhairi	Iterative Learning Compensation Control for Torque Tracking of Short Pulses throughout Gait Cycle with an Ankle Exoskeleton
387	Bywater, Emily A.; Van Crey, Nikko; Rouse, Elliott	Optimizing the Mechanics of a Variable-Stiffness Orthosis with Energy Recycling to Mitigate Foot Drop
63	Ciaramella, Alessandro; Bagneschi, Tommaso; Tricomi, Enrica; Missiroli, Francesco; Zhang, Xiaohui; Frisoli, Antonio; Masia, Lorenzo	Design and Control of a Hip Exosuit for Assistance in Running

[Neural control of movement and biomechanics] NC-AF3 – Room HS 4 ***Chair: Adriano Siqueira, Co-Chair: Fabrizio Sergi***		
334	Ornelas Kobayashi, Rafael; Mooiweer, Rienke; Sartori, Massimo	Towards personalized neurorehabilitation technologies: neural data-driven models of person-specific alpha-motoneuron pools
362	Ton, Vincent; Solav, Dana; Song, Seungmoon	Impact of sole designs of offloading AFO on gait dynamics: a predictive neuromechanical simulation study
368	Yoshihara, Masahiro; Ishii, Yuta; Itami, Taku; Yoneyama, Jun; Aoki, Takaaki	Effects of Insole-Type Device with Controllable Ankle Joint Angle on the Peroneus Longus Muscle During Foot Stomping Motion
47	Buchmann, Alexandra; Renjewski, Daniel	An open-source framework for sensitivity analysis of predictive neuromuscular simulations: how muscle-tendon stiffness and tendon slack length affect push-off
56	Eddy, Ethan; Campbell, Evan; Bateman, Scott; Scheme, Erik	Human-Machine Interaction Using Discrete Myoelectric Control: Contrastive Learning Reduces False Activations During Activities of Daily Living
60	Sabbah, Maxime; Dumas, Raphaël; Pomarat, Zoe; Robinet, Lucas; Adjel, Mohamed; Watier, Bruno; Bonnet, Vincent	Ground Reaction Forces and Moments Estimation from Embedded Insoles using Machine Learning Regression Models

[Surgical and medical robotics] SR-AF3 – Room HS 5 ***Chair: Ting Zhang, Co-Chair: Daniel Häufle***		
102	Wochner, Isabell; Nadler, Tobias; Stollenmaier, Katrin; Pley, Christina; Ilg, Winfried; Wolfen, Simon; Schmitt, Syn; Haeufle, Daniel Florian Benedict	ATARO: a muscle-driven biorobotic arm to investigate healthy and impaired motor control
130	Bauer, Christian Johannes Eugen; Schäfer, Max Bert; Riepe, Sarah; Parenzan, Matthias; Weiland, Sophie; Pott, Peter	Achieving High-Quality Haptic Feedback in Robot-Assisted Surgery With a Model-Based Approach
327	Kenanoglu, Celal Umut; Le Mesle, Valentin; Luarasi, Gjergji; Sadeghian, Hamid; Haddadin, Sami	Design and Evaluation of a Surgical Tool Drive Unit for Sustainable Training in Robot-Assisted Minimally Invasive Surgery
83	Zhu, Guangpu; Gao, Zheng; Gong, Zhenhua; Zhang, Ting	Bionic Super Redundant Robot with Variable Stiffness and Telescopic Based on Origami Theory for Medical Applications
123	Rota, Alberto; Sun, Xianyi Federica; De Momi, Elena	Performance-driven tasks with adaptive difficulty for enhanced surgical robotics training

[Haptics] HP-AF3 – Room HS 6 ***Chair: Matthias Harders, Co-Chair: Marta Gherardini***		
182	Noccaro, Alessia; Boljanic, Tanja; Strbac, Matija; Di Pino, Giovanni; Formica, Domenico	Closed-loop Platform for Human Movement Augmentation with Electrotactile Feedback

258	Blanco-Diaz, Cristian Felipe; Degl'Innocenti, Gianmarco; Vendrame, Eleonora; Uliano, Manuela; Controzzi, Marco; Cappello, Leonardo	Design and characterization of a low-profile haptic system for telemanipulation
275	Arink, Wouter; Poggensee, Katherine; Beckers, Niek; Abbink, David A.; Marchal-Crespo, Laura	Indirect Haptic Disturbances Enhance Motor Variability, with Divergent Effects on Skill Transfer
280	Cecamore, Matteo; Gaponov, Igor; Miller, Stuart; Farkhatdinov, Ildar	Design and Validation of a Haptic Ankle Platform for Physical Human-Machine Interaction
87	Ratschat, Alexandre Lionel; Martin-Rodriguez, Ruben; Vardar, Yasemin; Ribbers, Gerard M.; Marchal-Crespo, Laura	Design and evaluation of a multi-finger skin-stretch tactile interface for hand rehabilitation robots

[Bionic prostheses] BP-AF3 – Room HS 7
Chair: Herman van der Kooji, Co-Chair: Elliott Rouse

178	Pett, Nicholas; Rawal, Nundini; Shetty, Varun Satyadev; Wontorcik, Leslie; Rouse, Elliott	Preferred Ankle Stiffness of a Variable-Stiffness Prosthesis Across Five Activities
273	Patwardhan, Shriniwas; Bashatah, Ahmed; Joiner, Wilsaan; Schofield, Jonathon; Sikdar, Siddhartha	Closed-loop Shared Proportional Position Control of a Prosthetic Hand using Sonomyography
388	Mituniewicz, Austin; Hong, Woolim; Huang, He (Helen)	Continuous Gait Phase Estimation from Translational Kinematics: Towards Implementation in Powered Ankle Prostheses
40	Bendfeld, Robin; Remy, C. David	Squatting with Prostheses-inspired Compliant Robotic Legs
42	Happold, Johanna; Morais, Diogo; Capsi Morales, Patricia; Piazza, Cristina	Preliminary validation of an immersive virtual reality framework for prosthetic embodiment quantification

69	Shepherd, Max; Rouse, Elliott	Rethinking Energy Storage and Return in Prosthetic Feet: User Preferences Challenge Conventional Wisdom

[IEEE RAS EMBS Best Student Paper Awards] BSP-AF3 – Room HS 8
Chair: Marcia O'Malley, Co-Chair: Hyung-soon Park

57	Marsh, David Michael; Puliti, Marco; Goldfarb, Michael	A Novel Swing Assistance Control Approach for a Powered Transfemoral Prosthesis
113	Polizzotto, Maria Grazia; Zaidi, Ahmed Zohaib; Paterno, Linda; Menciassi, Arianna	Self-adaptive upper limb prosthetic socket
201	van der Mijle Meijer, Joep Kobus; Mulder, Iris; Ligtenberg, Leendert-Jan Wouter; Liefers, Herman Remco; Magdanz, Veronika; Khalil, Islam S.M.	Controlled Locomotion of IRONSperm Clusters: Evaluating Maneuverability with X-Ray-Guided Magnetic Fields
75	Gonzalez cely, aura ximena; blanco-diaz, cristian felipe; delisle rodriguez, denis; bastos filho, teodiano freire	EEG-Based Multiclass Classification for Recognizing Pedaling Velocities: A Promising Approach for Brain-Computer Interface-Enhanced Lower-Limb Robotic Rehabilitation
169	Tamai, Hayato; Sankai, Yoshiyuki; Uehara, Akira; Kawamoto, Hiroaki	The Development of Anorectal and Core Activation Method with Wearable Cyborg HAL for Defecation Disorder Treatment
279	Deng, Yuanzhe; Roshanfar, Majid; Mayer, Haley; He, Changyan; Drake, James; Looi, Thomas; Diller, Eric D.	Towards Bimanual Operation of Magnetically Actuated Surgical Instruments

PLENARY SPEAKER 4 – Pietro Valdastri (Neue Aula, 15:15 – 16:05)

UNIVERSITY OF LEEDS

***Title*: Lifesaving Soft Magnetic Surgical Robots**

Bio: Pietro Valdastri is Full Professor and Chair in Robotics and Autonomous Systems at the University of Leeds. He directs the Science and Technologies Of Robotics in Medicine (STORM) Lab, focusing on intelligent robots to fight cancer, the Institute of Robotics, Autonomous System and Sensing (IRASS), and the Robotics at Leeds network. He graduated in Electronic Engineering from the University of Pisa in 2001 and received his PhD in Biomedical Engineering from Scuola Superiore Sant'Anna in 2006. He has published more than 150 peer reviewed journal papers in the field of medical robotics and has been principal investigator on grants in excess of $24M. STORM Lab's research has been featured by several news outlets, including the BBC, The Times, The Washington Post, to cite a few. Prof Valdastri also completed a successful entrepreneurial cycle with WinMedical s.r.l., a company he co-founded in 2009 and that was acquired by a larger enterprise in 2017. He recently started a new company, Atlas Endoscopy Limited, to bring his robotic colonoscopy platform to patients.

KEY INNOVATOR 3 – Cecilia Laschi (Neue Aula, 16:05 – 16:30)

***Title*: Robotics goes soft: from nature to robotics … and back**

Bio: Cecilia Laschi is Provost's Chair Professor of robotics at the National University of Singapore, leading the Soft Robotics Lab. She is Co-Director of CARTIN – Centre for Advanced Robotics Technology and Innovation. She graduated in Computer Science at the University of Pisa and received a Ph.D. in Robotics from the University of Genoa. Cecilia Laschi is a pioneer of soft robotics, exploring marine applications of soft robots and their use in the biomedical field. She investigates fundamental challenges for building robots with soft materials, with a bioinspired approach which started with a study of the octopus as a model for robotics. She has worked in humanoid and neuro-robotics, applying brain models in humanoid robots. She serves in the Editorial Boards of many scientific journals, including Science Robotics and IEEE Robotics & Automation Letters. She is IEEE Fellow and member of other scientific societies, like AAAS (American Association for the Advancement of Science), and the IEEE Robotics & Automation Society (RAS).

KEY INNOVATOR 4 – Michael Goldfarb (Neue Aula, 16:30 – 16:50)

VANDERBILT UNIVERSITY

***Title*: An appreciation of passive dynamics in the context of powered leg prostheses**

Bio: Michael Goldfarb is the H. Fort Flowers Professor of Mechanical Engineering at Vanderbilt University, with secondary appointments as a professor in Electrical Engineering and Physical Medicine and Rehabilitation. Dr. Goldfarb has authored over 250 publications on topics related to wearable robotics, has been awarded over 50 US patents, was inducted into the US National Academy of Inventors in 2020, and was recognized in 2021 by Stanford University as among the Top 2% of most cited scientists. Among his papers are ones awarded best-paper awards in 1997, 1998, 2003, 2007, 2009, 2013, 2020, and 2022 and others that were finalists for best paper awards in 2015, 2017, and 2020. Research interests include the development of robotic limbs for upper and lower extremity amputees, and the development of exoskeletons for individuals with spinal cord injury and stroke, including the development of a lower limb exoskeleton now sold as the Indego exoskeleton.

POSTER SESSION 2

Afternoon Poster Sessions (16:50 – 18:10).

Panel	ID	Authors	Title
1	218	Santos, André; Ferreira Duarte, Nuno; Dehban, Atabak; Santos-Victor, José	Learning the Sequence of Packing Irregular Objects from Human Demonstrations: Towards Autonomous Packing Robots
2	38	Ivanyuk-Skulskiy, Bogdan; Kurbis, Andrew Garrett; Mihailidis, Alex; Laschowski, Brokoslaw	Sequential Image Classification of Human-Robot Walking Environments using Temporal Neural Networks
3	88	Moreau, Emile; Herman, Benoît; Chatelain, Philippe; Ronsse, Renaud	Design and Characterization of a Robotic Cyber-Physical System for Real-Time Flow-Device Experiments
4	252	Cittadini, Roberto; Buonocore, Luca Rosario; Di Castro, Mario; Zollo, Loredana	Contactless Respiration Rate Monitoring and Human Body Pose Detection for Search and Rescue Robots
5	270	Brilli, Dionysia Danai; Georgaras, Evangelos; Tsilivaki, Stefania; Melanitis, Nikos; Nikita, Konstantina	AIris: An AI-powered Wearable Assistive Device for the Visually Impaired
6	297	Xygonakis, Ioannis; Seganfreddo, Riccardo; Hamad, Mazin; Schneider, Samuel; Schroeder, Axel; Krieg, Sandro; Meyer, Bernhard; Chiari, Lorenzo; Zavaglia, Melissa; Haddadin, Sami	Transcranial Magnetic Stimulation Robotic Assistant: towards a fully automated stimulation session
7	342	Cavaglià, Maria Sole; Sierra M., Sergio D.; Palmerini, Luca; Orlandi, Silvia; Munera, Marcela; Cifuentes, Carlos A.	Towards Safer Mobility: Developing and Evaluating a Fall Detection System for a Smart Walker

8	58	Sasaki, Tomoya; Ayusawa, Ko; Yoshida, Eiichi	Optimizing and Predicting Human-Symbiotic Robot Trajectory
9	124	Lee, I-Chieh; liu, ming; Huang, He (Helen)	Enhancing User-Prosthesis Integration through Intelligent Transparency
10	114	Loureiro, Matheus; Santos, Fabiana; Mello, Ricardo; Frizera, Anselmo	Ensuring Proper Interaction: VR-based Visual Feedback Interface For Smart Walker Training
11	146	Vonwirth, Patrick; Sivak, Olekasndr; Berns, Karsten	Foundations of Probabilistic Behavior Networks for Distributed, Dynamic Control of Legged Robots
12	180	Bamorovat Abadi, Mohammad Hossein; Shahabian Alashti, Mohamad Reza; Menon, Catherine; Holthaus, Patrick; Amirabdollahian, Farshid	Robotic Vision and Multi-View Synergy: Action and activity recognition in assisted living scenarios
13	10	Saeedi-Givi, Christine; Schwaab, Lennard; Bohné, Thomas; Tadeja, Slawomir Konrad	Exergame-Like Feedback for Passive Upper Limbs Exoskeleton Fitting: A Feasibility Study with Augmented Reality
14	231	Charaja, Jhon Paul Feliciano; Schelhaas, Booker; Campo, Jonathan; Moreno, Yecid; Siqueira, Adriano	Controlling Human Elbow Movements Using Electrical Stimuli and Deep Reinforcement Learning
15	115	Shen, Junyi; Ghosh, Swaninda; Miyazaki, Tetsuro; Kawashima, Kenji	Walking Condition Estimation Using Physical Reservoir Computing with External Echo State Network
16	116	Zhao, Peijun; Alencastre-Miranda, Moises; Whiteman, David; Gervas-Arruga, Javier; Krebs, Hermano Igo	Modeling Uncertainty in Computer Vision based Gross Motor Function Assessment of Children with Cerebral Palsy

17	189	Zhao, Peijun; Shen, Zhan; Alencastre-Miranda, Moises; Whiteman, David; Gervas-Arruga, Javier; Krebs, Hermano Igo	Distilling Knowledge in Vision-based Human Motor Assessment for Improved Accuracy and Running Efficiency
18	196	Tsuruta, Chihiro; Toriya, Shutaro; Nishimura, Kiichi; Iwata, Hiroyasu	Construction of a Sensory Feedback-Agnostic Transitional Tuning Method to Maintain Volitionality during Continuous Supine Walking
19	276	Peiffer, J.D.; Shah, Kunal; Anarwala, Shawana; Abdou, Kayan; Cotton, R. James	Fusing uncalibrated IMUs and handheld smartphone video to reconstruct knee kinematics
20	325	Frias-Miranda, Eugenio; Nguyen, Hong-Anh; Hampton, Jeremy; Jones, Trenner; Spotts, Benjamin; Cochran, Matthew; Chan, Deva; Blumenschein, Laura	A Wearable Resistance Device's Motor Learning Effects in Exercise
21	365	Riggio, Domenico; Breschi, Sofia; Peloso, Angela; Spadea, Maria Francesca; De Momi, Elena	Augmented Reality in Microinvasive Cardiac Surgery: Towards a Training Simulator for Mitral Valve Repair Intervention
22	25	Dashkovets, Andrii; Laschowski, Brokoslaw	Reinforcement Learning for Control of Human Locomotion in Simulation
23	46	Zhang, Shen; Zhou, Hao; Tchantchane, Rayane; Alici, Gursel	Enhancing Hand Gesture Recognition for Varied Arm Positions through the Integration of Co-located sEMG-pFMG Armband
24	67	firouzi, vahid; Mohseni, Omid; von Stryk, Oskar; Seyfarth, Andre; Ahmad Sharbafi, Maziar	Sensory modulation of gait balance in human locomotion: A neuromusculoskeletal modeling study
25	89	Le, Hongquan; in het Panhuis, Marc; Spinks, Geoffrey M.; Alici, Gursel	The effect of dataset size on EMG gesture recognition under diverse limb positions

26	138	Wang, Junyi; Xiong, Xiaofeng	A Learning-based Control Framework for Human-like Whip Targeting
27	140	Charaja, Jhon Paul Feliciano; Wochner, Isabell; Schumacher, Pierre; Ilg, Winfried; Giese, Martin; Maufroy, Christophe; Bulling, Andreas; Schmitt, Syn; Haeufle, Daniel Florian Benedict	Generating Realistic Arm Movements in Reinforcement Learning: A Quantitative Comparison of Reward Terms and Task Requirements
28	142	Damonte, Federica; Khanapuri, Vineeta; Durandau, Guillaume; Sartori, Massimo	Optimization of a Synergy-driven musculoskeletal model to estimates estimates muscle excitations and joint moments of the ankle joint at different walking speeds
29	159	Chen, Chen; Zhu, Xiangyang	Tracking motor unit discharges across days based on the pre-trained separation vectors
30	198	Lin, Hao-Ping; Kager, Simone; Cheng, Hsiao-ju; Woolley, Daniel Graham; Zhang, Xue; Wenderoth, Nicole	Implementing Markerless Body Tracking and Multi-Modal Feedback for Trunk Flexion Reduction in Post-Stroke Rehabilitation Robotic Training
31	209	Mohammadi Nejad Rashty, Aida; Ahmad Sharbafi, Maziar; Seyfarth, Andre	Variability in hopping is largely individual and reduced by a metronome
32	238	Salinas, Sergio Alexander; Grolinger, Katarina; LeBel, Marie-Eve; Trejos, Ana Luisa	Evaluating Mixed Reality Technology for Tracking Hand Motion for Shoulder Rehabilitation Assessment
33	257	Cravero, Grazia; Siri, Debora; Moro, Matteo; Ricci, Serena; Pierella, Camilla; Canessa, Andrea; Preiti, Deborah; De Grandis, Elisa; Nobili, Lino; Casadio, Maura	A personalized driving simulator for the assessment of adolescents with attention deficit hyperactivity disorder

34	265	Sperduti, Marika; Tagliamonte, Nevio Luigi; Cordella, Francesca; Zollo, Loredana	Accurate and Repeatable Identification of Mechanical Innocuous and Pain Thresholds Using a New Mechatronic Testbed
35	313	Iverson, Juliana; Rabe, Kaitlin G.; Fey, Nicholas	Task Dependent Sonomyography Signal Features Extracted with Task Independent Non-Negative Matrix Factorization Decomposition are Sensitive to Ambulation Mode
36	349	Firouzabadi, Pouyan; Murray, Wendy; Sobinov, Anton; Peiffer, J.D.; Shah, Kunal; Miller, Lab; Cotton, R. James	Biomechanical Arm and Hand Tracking with Multiview Markerless Motion Capture
37	221	Massardi, Stefano; Rodriguez-Cianca, David; Moreno, Juan C.; Lancini, Matteo; Torricelli, Diego	Effects of knee joint misalignments on human-exoskeleton interaction dynamics
38	278	Josse, Eva; Gaultier, Pierre-Louis; Kager, Simone; Cheng, Hsiao-ju; Gassert, Roger; Lambercy, Olivier	Optimizing digital health metrics to quantify functional upper limb movements with inertial measurement units
39	107	Liu, Juncheng; Xiaoran, Yang; Hong, Jing-Chen; Iwata, Hiroyasu	Analysis of Lifting Posture by Two Inertial Measurement Units and a Classification Model Based on a Convolutional Neural Network
40	111	Adjel, Mohamed; Sabbah, Maxime; Dumas, Raphaël; Mirkov, Marta; Mansard, Nicolas; Mohammed, Samer; Bonnet, Vincent	Lower Limbs Human Motion Estimation From Sparse Multi-Modal Measurements
41	133	Santos, Laura; Carvalho, Bernardo; Barata, Catarina; Santos-Victor, José	Extending 3D body pose estimation for robotic-assistive therapies of autistic children

Forum 2 – Linking One Health to Environmental Intelligence and Ecorobotics

Barbara Mazzolai

Room HS 14

Morning Session:
10:40 – 12:00

Afternoon Session:
13:30 – 14:45

Abstract

The “One Health” approach recognizes the interdependence of human health with ecological changes. Protecting and improving air, water, and soil quality, safeguarding biodiversity, and effectively managing natural resources are fundamental for healthy ecosystems and, consequently, human welfare.

This vision is shared by “Environmental Intelligence” (EI), a relatively recent field that synergizes environmental science, advanced sensor research, data science, robotics, and Artificial Intelligence to better understand the natural environment and coordinate responses to associated challenges.

Research in EI explores new materials, processes, and systems—incorporating bio-inspired, nature-based, chemical, biological, and physical technologies to reduce environmental pollution through sustainable methods. Robotics also play a crucial role by providing reliable data on ecosystems through continuous or periodic measurements of physical and chemical parameters, and by being deployed for remediation actions or emergency responses.

An emerging trend in robotics envisions environmentally responsible, bio-inspired systems that can adapt to unstructured urban or natural environments, include sensing capabilities, and are built with recyclable, biodegradable, or biohybrid materials. We refer to these as ‘EcoRobots’. They are designed to imitate the adaptability of living organisms, allowing them

to navigate and function effectively in complex and unpredictable environments, and to be seamlessly integrated into natural ecosystems. EcoRobots can be employed in a wide range of applications, including the exploration and monitoring of natural environments and infrastructures, precision agriculture, medicine, archaeological research, space missions, and search-and-rescue operations.

By incorporating an ecological approach to robot design, the use of EcoRobots aligns with the mission of Environmental Intelligence, as well as the model of One Health. The forum will discuss the themes of Environmental Intelligence and One Health, highlighting the contribution of healthy ecosystems to human well-being and the use of EcoRobotics as a tool for these fields: What are the current scientific and technological advancements driving the EcoRobotics revolution? What are the main challenges and opportunities in integrating EcoRobotics into existing ecological and industrial systems? How can EcoRobotics contribute to sustainable development and environmental conservation efforts? What are the key advantages of utilizing bio-inspired systems in EcoRobotics?

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Tutorial from MathWorks (Room HS 4a)

Morning Session (10:40-12:00)

MATLAB, Simulink & Co for Robotics: Simulation and Modeling of a Humanoid Robot

Speakers: Daniele Sportillo, Kathi Kugler

Join us for a special session at BioRob 2024, where Daniele Sportillo and Kathi Kugler from MathWorks will delve into the intricacies of simulating and modeling humanoid robots. Tailored for engineers and scientists, the objective of this session is to enhance your usage of MathWorks tools for advanced robotics applications.

Session Highlights:

Experience a blend of theory and hands-on coding examples to gain a comprehensive understanding of robot simulation and modeling with MATLAB, Simulink and Simscape. Gain a better understanding of the workflow with our example of a humanoid robot. As code, models and workshop licenses will be provided, you will be able to get hands-on experience during the session and tailor the materials to your own projects afterwards.

This session is ideal for engineers, scientists, and robotics enthusiasts who are looking to master the workflow of simulating and modeling robotic systems. Do not miss this opportunity to learn from MathWorks engineers and elevate your robotics projects to new heights!

Afternoon Session (13:30-14:45)

MathWorks & Partners Session: Community Research Toolbox for pHRC and Hardware Integration Examples with MATLAB, Simulink & Co

Speakers: Junnan Li, Haowen Yao, Janosch Marquart, Kathi Kugler, Luis Figueredo

Discover the cutting-edge advancements in robotics through the lens of MATLAB and Simulink at our special session at BioRob 2024. This presentation will highlight community contributions and hardware integration examples, providing valuable insights into cutting-edge research and inspiration for attendees. This comprehensive session aims to motivate and inspire you to elevate your own research by showcasing the practical and innovative applications of MATLAB and Simulink in the field of robotics.

Part 1: RhuMAn - Rapid Human Manipulability Assessment Toolbox

Recent advances in robotics have narrowed the gap between humans and robots, yet physical engagement remains rare. Physical collaboration requires mutual understanding of capabilities and a shared sense of embodiment. For better physical human-robot interaction (pHRI) and decision-making, it's crucial to quantitatively assess human biomechanics and physical modeling both in real-time, for reactive response, and globally, for predictive planning, akin to human-human interaction.

This session will introduce the RHuMAn (Rapid Human-Manipulability Assessment) Toolbox, a powerful MATLAB-based tool for collaborative AI applications. RHuMAn creates human manipulation quality distribution metrics within the human workspace, customizable for specific tasks and filtered for design purposes. It integrates force generation, acceleration capabilities, self-collision, joint-limits, nullspace, and ergonomics, simplifying human manipulability assessment for general and task-specific applications in real-time and resource-limited scenarios. The tool supports non-experts, enhancing the use of musculoskeletal model-based methods in robotics and industry. Demonstrations

will show RHuMAn's ability to minimize muscular effort and predict human-robot interaction, extending its concepts to designing human-like tendon-driven structures, such as robotic fingers and hands.

Part 2: From Desktop to Real-Time Simulation – Modeling and Hardware Integration for Robotic Applications

This segment covers modelling concepts for robotic applications with a focus on bringing MATLAB and Simulink models into real-time testing hardware. Its focus is on fundamental control applications, the concept of Digital Twin and Data-Driven Modeling (Reduced Order Modeling)

You will gain practical insights through use-case examples and live demonstrations, showcasing how MathWorks software can be used with Speedgoat real-time testing hardware. The session will include an overview of general applications with specific examples in biorobotics, including an exploration of exoskeleton robots and their requirements. The transition from desktop to real-time using Simulink and Simscape will be illustrated, along with motor control examples related to exoskeletons.