Matthias Preindl

Curriculum Vitae

April 20, 2018

Assistant Professor
Columbia University in the City of New York
Fu Foundation School of Engineering and Applied Science (SEAS)
Department of Electrical Engineering (EE)

1300 S. W. Mudd Building, MC 4712
500 W. 120th Street
New York, NY 10027, USA

Phone: +1 (212) 853-0791
Email: matthias.preindl@columbia.edu
Web: mplab.ee.columbia.edu

Education

Doctor of Philosophy (PhD) awarded 03.2014
University of Padua, Doctoral School of Industrial Engineering, Specialization in Energy Engineering

Thesis: *"Novel Model Predictive Control of a PM Synchronous Motor Drive; Design of the Innovative Structure, Feasibility and Stability Analysis, Efficient Implementation, Experimental Validation,"* adviser: S. Bolognani

Visiting Scholar 02.2012 - 11.2012
University of California Berkeley, Department of Mechanical Engineering

Master of Science (MSc) awarded 03.2010
Swiss Federal Institute of Technology (ETH) Zurich, Master Program in Electrical Engineering and Information Technology, Specialization in Electrical Energy Systems and Mechatronics

Thesis: *"Switching Frequency Reduction Using Sensorless Model Predictive Direct Current Control for High Power Voltage Source Inverters,"* adviser: E. Schaltz and J. W. Kolar

Visiting Student - MSc Thesis Project 07.2009 - 12.2009
Aalborg University (Denmark), Department of Energy Technology

Bachelor of Science (BSc) *summa cum laude*, awarded 07.2008
University of Padua, Bachelor Program in Electrical Engineering

Thesis: *"Development of a Simulation Tool for the Halo Current Patterns on the First Wall of a Fusion Reactor,"* adviser: F. Gnesotto and G. Chitarin

Research Period - BSc Thesis Project 03.2008 - 06.2008
National Research Council (Padua, Italy), Consortium Reverse Field Pinch Experiment

High School Diploma awarded 07.2005
Industrial Technical Institute (Gewerbeoberschule), Specialization in Industry Informatics

Appointments

Professional Appointments

Assistant Professor since 01.2016
Columbia University, Department of Electrical Engineering (EE)

Sessional Professor 01.2015 - 06.2015
McMaster University, Department of Electrical and Computer Engineering (ECE)

Post Doctoral Research Associate 05.2014 - 12.2015
McMaster University, McMaster Institute for Automotive Research and Technology (MacAUTO)
Canada Excellence Research Chair in Hybrid Powertrain Program

Independent Contractor 01.2014 - 04.2014
BFT SpA, Italy

Graduate Research Assistant 10.2011 - 12.2013
University of Padua, Department of Industrial Engineering

R&D Engineer 03.2010 - 09.2012
Leitwind AG (Italy), Electrical Engineering Group

Research Centers

Affiliated Faculty since 09.2017
Columbia University, Data Science Institute, Sense, Collect and Move Data Center

Core Faculty since 09.2017
Columbia University, The Earth Institute, Lenfest Center for Sustainable Energy

Editorial Board

Editor since 10.2017
IEEE Transactions on Vehicular Technology

Associate Editor since 11.2016
IEEE Transactions on Transportation Electrification

Society Memberships

Institute of Electrical and Electronics Engineers (IEEE)
Member since 2014; Student member 2012 - 2013

Südstern Planet Science, Planet HiTech Engineering, Planet NYC & East Cost
Member since 2016

South Tyrolean student association (sh.asus)
Member 2005 - 2014; Organizing committee (Padua branch) 2007 - 2008 and 2011 - 2012

Awards and Honors

National Scientific Qualification as Associate Professor 03.2017
Art.16 of the law 30 December 2010, n.240: "abilitazione scientifica nazionale"
Ministry of Education, Universities and Research (MIUR), Italy

Career Award 02.2017
National Science Foundation (NSF)

South Tyrolean of the Day 28.12.2016
Südtirol 1 Radio, Italy

Futura Award 12.2016
Futura foundation, South Tyrol, Italy

Best Presentation Recognition 2015
Session: Transportation Electrification 1
Annual Conference of the IEEE Industrial Electronics Society (IECON)

PhD Fellowship (borsa di ateneo) 2012 - 2013
Granted by University of Padua, Italy

Postgraduate Fellowship 2011
Granted by Province Bozen, Italy

Award for outstanding achievements during academic studies 2011
Granted by Province Bozen, Italy

Best presentation award 2009
Conference for MSc Energy Students (CES), Aalborg University, Denmark

Merit scholarship for graduate students 2009, 2010
Granted by Province Bozen, Italy

Merit scholarship for undergraduate students 2007, 2008
Granted by Province Bozen, Italy

Youth tour guide (Jugendführer) 2006
Alpine association South Tyrol (Alpenverein SÃŒdtirol AVS)

Youth musician merit badges 1999, 2002, 2004
Jungmusiker Leistungsabzeichen (JMLA) in bronze, silver, and gold; instrument: clarinet

Teaching Experience

Courses

Year	Number	Title	Enrollment	Course quality	Instructor quality
2017/18	E6902[(2)]	Renewable Power Systems	14	TBD/5.0	TBD/5.0
2017/18	E9501[(2)]	Advanced Power Electronics	5	TBD/5.0	TBD/5.0
2017/18	E4361[(2)]	Power Electronics	19	4.57/5.0	4.71/5.0
2016/17	E6904[(2)]	Motor Drive Systems	9	4.60/5.0	4.60/5.0
2016/17	E4361[(2)]	Power Electronics	20	4.50/5.0	4.50/5.0
2015/16	E4361[(2)]	Power Electronics	16	4.75/5.0	4.75/5.0
2014/15	4PK4[(1)]	Power Electronics	71	N/A	N/A

Student overall course and instructor quality evaluations: 1 - poor, 2 - fair, 3 - good, 4 - very good, 5 - excellent
[(2)] ELEN: Department of Electrical Engineering, Columbia University
[(1)] Elec Eng: Department of Electrical and Computer Engineering, McMaster University

Advising and Mentorship

PhD students: Thesis Supervision, Columbia University

Liwei Zhou since 09.2017

Weizhong Wang since 09.2016

William Michael Eull since 09.2016
Recipient of the Presidential Distinguished Fellowship, Columbia University, 2016

Xiaoqing Yong since 01.2016
Recipient of the Millman Teaching Assistant Award, Columbia University, 2017

PhD students: Thesis Co-Supervision, McMaster University

Ephrem Chemali 01.2015 - 03.2018
Thesis: *"Intelligent State-of-Charge and State-of-Health Estimation Framework for Li-ion Batteries in Electrified Vehicles using Deep Learning Techniques"*

Shamsuddeen Nalakath 09.2014 - 03.2018
Thesis: *"Robust Position Sensorless Model Predictive Control for Interior Permanent Magnet Synchronous Motor Drives"*
Nomination for Deans' Award of Excellence

Yingguang Sun 09.2014 - 12.2016
Thesis: *"Unified Position Sensorless Solution with Wide Speed Range Capabilities for IPMSM Drives"*
Recipient of the Best Presentation Recognition in Modeling and Design of IPMSM, IECON, 2015

Visiting Scholars, Columbia University

Francesco Toso 04.2018 - 11.2018
Home institution: University of Padua, Italy

MSc students: Project Supervision, Columbia University

Nico Hoernle spring 2018
Class project: *"Battery Pack for an E-FSAE vehicle drivetrain"*

Jack Bott 2017/18
Semester project(s): *"Design and implementation of a smart motor control interface"*

Paul Young 2016/17
Semester project: *"Design and experimental validation of a soft-switching non-isolated DC-DC converter"*
MS EE Honors Program (2017), Columbia University

Yao Song summer 2016, semester project

MSc students: Thesis Co-Supervision, McMaster University

Bharat Agrawal 01.2015 - 06.2017
Thesis: *"Loss Minimization using Linear Soft-Switching with Wide Bandgap Devices in Efficient High-Frequency DC-DC Converters"*
Recipient of the Certificate of Excellence awarded for Outstanding Thesis, McMaster University, 2017
Recipient of the (merit based) Student Travel Support, APEC, 2017

William Michael Eull 04.2014 - 08.2016
Thesis: *"Wide-bandgap three-phase inverter design with high power density"*

Lucas McCurlie 06.2014 - 08.2016
Thesis: *"Redistributive Non-Dissipative Battery Balancing Systems with Isolated DC/DC Converters: Theory, Design, Control and Implementation"*

BSc students, Columbia University

Max Moeller spring 2018
Class project: *"Battery Pack for an E-FSAE vehicle drivetrain"*

Dawei Ren, Ibrahima Niang, Albert Gao, Xuexin Wei spring 2018
Senior project: "Electric Motor Drive for an E-FSAE vehicle drivetrain"

Amritha Sai Musipatla fall 2016, semester project

Publications

Journal Papers

S. Nalakath, Y. Sun, **M. Preindl**, and A. Emadi, "Optimization-based position sensorless finite control set model predictive control for ipmsms," *IEEE Transactions on Power Electronics*, vol. PP, pp. 1–1, 2018. DOI: 10.1109/TPEL.2017.2784816

E. Chemali, P. Kollmeyer, **M. Preindl**, R. Ahmed, and A. Emadi, "Long short-term memory-networks for accurate state of charge estimation of li-ion batteries," *IEEE Transactions on Industrial Electronics*, vol. PP, pp. 1–1, 2018. DOI: 10.1109/TIE.2017.2787586

Y. Miao, H. Ge, **M. Preindl**, J. Ye, B. Cheng, and A. Emadi, "Mtpa fitting

and torque estimation technique based on a new flux-linkage model for interior permanent magnet synchronous machines," *IEEE Transactions on Industry Applications*, vol. 53, pp. 5451–5460, 2017. DOI: 10.1109/TIA.2017.2726980

A. D. Callegaro, J. Guo, **M. Eull**, B. Danen, J. Gibson, **M. Preindl**, B. Bilgin, and A. Emadi, "Bus bar design for high-power inverters," *IEEE Transactions on Power Electronics*, vol. 33, pp. 2354–2367, 2018. DOI: 10.1109/TPEL.2017.2691668

M. Preindl, "A battery balancing auxiliary power module with predictive control for electrified transportation," *IEEE Transactions on Industrial Electronics*, vol. 65, pp. 6552–6559, 2017. DOI: 10.1109/TIE.2017.2682030

S. Nalakath, **M. Preindl**, and A. Emadi, "Online multi-parameter estimation of ipm motor drives with finite control set model predictive control," *IET Electric Power Applications*, vol. 11, pp. 944–951, 2017. DOI: 10.1049/iet-epa.2016.0514

Y. Sun, **M. Preindl**, S. Sirouspour, and A. Emadi, "Unified wide speed range ipm sensorless scheme using nonlinear optimization," *IEEE Transactions on Power Electronics*, vol. 32, pp. 6308–6322, 2017. DOI: 10.1109/TPEL.2016.2621064

L. McCurlie, **M. Preindl**, and A. Emadi, "Fast model predictive control for redistributive lithium ion battery balancing," *IEEE Transactions on Industrial Electronics*, vol. 64, pp. 1350–1357, 2017. DOI: 10.1109/TIE.2016.2611488

Y. Yang, B. Bilgin, M. Kasprzak, **S. Nalakath**, H. Sadek, **M. Preindl**, J. Cotton, N. Schofield, and A. Emadi, "Thermal management of electric machines," *IET Electrical Systems in Transportation*, vol. 7, pp. 104–116, 2017. DOI: 10.1049/iet-est.2015.0050

E. Chemali, **M. Preindl**, P. Malysz, and A. Emadi, "Electrochemical and electrostatic energy storage and management systems for electric drive vehicles: State-of-the-art review and future trends," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 4, pp. 1117–1134, 2016. DOI: 10.1109/JESTPE.2016.2566583

M. Preindl, "Robust control invariant sets and lyapunov-based mpc for ipm synchronous motor drives," *IEEE Transactions on Industrial Electronics*, vol. 63, pp. 3925–3933, 2016. DOI: 10.1109/TIE.2016.2527722

B. Bilgin, P. Magne, P. Malysz, Y. Yang, V. Pantelic, **M. Preindl**, A. Korobkine, W. Jiang, M. Lawford, and A. Emadi, "Making the case for electrified transportation," *IEEE Transactions on Transportation Electrification*, vol. 1, pp. 4–17, 2015. DOI: 10.1109/TTE.2015.2437338

M. Preindl and S. Bolognani, "Optimal state reference computation with constrained MTPA criterion for PM motor drives," *IEEE Transactions on Power Electronics*, vol. 30, pp. 4524–4535, 2015. DOI: 10.1109/TPEL.2014.2354299

M. Preindl and S. Bolognani, "Model predictive direct torque control with finite control set for PMSM drive systems, part 2: Field weakening operation," *IEEE Transactions on Industrial Informatics*, vol. 9, pp. 648–657, 2013. DOI: 10.1109/TII.2012.2220353

M. Preindl and S. Bolognani, "Model predictive direct torque control with finite control set for PMSM drive systems, part 1: Maximum torque per ampere operation," *IEEE Transactions on Industrial Informatics*, vol. 9, pp. 1912–1921, 2013. DOI: 10.1109/TII.2012.2227265

M. Preindl and S. Bolognani, "Model predictive direct speed control with finite control set of PMSM drive systems," *IEEE Transactions on Power Electronics*, vol. 28, pp. 1007–1015, 2013. DOI: 10.1109/TPEL.2012.2204277

M. Preindl and E. Schaltz, "Sensorless model predictive direct current control using novel second-order PLL observer for PMSM drive systems," *IEEE Transactions on Industrial Electronics*, vol. 58, pp. 4087–4095, 2011. DOI: 10.1109/TIE.2010.2100331

M. Preindl, E. Schaltz, and P. Thøgersen, "Switching frequency reduction using model predictive direct current control for high power voltage source inverters," *IEEE Transactions on Industrial Electronics*, vol. 58, pp. 2826–2835, 2011. DOI: 10.1109/TIE.2010.2072894

M. Preindl and E. Schaltz, "Load torque compensator for model predictive direct current control in high power PMSM drive systems," *Journal of Energy and Power Engineering*, vol. 5, pp. 554–561, 2011

D. Testa, M. Toussaint, R. Chavan, J. Guterl, J. B. Lister, J. M. Moret, A. Perez, F. Sanchez, B. Schaller, G. Tonetti, A. Encheva, G. Vayakis, C. Walker, Y. Fournier, T. Maeder, A. Le-Luyer, P. Moreau, G. Chitarin, E. Alessi, R. S. Delogu, A. Gallo, N. Marconato, S. Peruzzo, **M. Preindl**, H. Carfantan, E. Hodgson, J. Romero, R. Vila, B. Brichard, and L. Vermeeren, "The magnetic diagnostic set for ITER," *IEEE Transactions on Plasma Science*, vol. 38, pp. 284–294, 2010. DOI: 10.1109/TPS.2009.2037226

International Conferences

L. Zhou and **M. Preindl**, "Bidirectional transformerless ev charging system with low device cost and leakage current," in *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018

L. Zhou and **M. Preindl**, "Bidirectional transformerless ev charging system via reconfiguration of 4x4 drivetrain," in *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018

L. Zhou and **M. Preindl**, "Transformerless three phase npc inverter with reduced switches," in *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2018

M. Eull, M. Mohamadian, D. Luedtke, and **M. Preindl**, "A current observer to reduce the sensor count in three-phase pm synchronous machine drives," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2018

A. D. Callegaro, L. N. Srivatchan, D. Luedtke, and **M. Preindl**, "Optimization-based position sensorless for induction machines," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2018

L. Sun, **S. Nalakath**, H. B. Polli, D. Luedtke, and **M. Preindl**, "IPMSM sensorless control with accounting for risk of the voltage error and cross-coupling magnetic saturation in 48v hybrid system," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2018

W. Wang and **M. Preindl**, "Design and implementation of a dual cell link for battery-balancing auxiliary power modules," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2018

W. Wang and **M. Preindl**, "Modeling and control of a dual cell link for battery-balancing auxiliary power modules," in *IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2018

D. Wang, **M. Preindl**, F. Peng, J. Ye, and A. Emadi, "Dc-bus design with hybrid capacitor

bank in single-phase pv inverters," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2017. DOI: 10.1109/IECON.2017.8216408

X. Yong and **M. Preindl**, "Homotopy continuation based observer for sensorless pmsm," in *Symposium on Predictive Control of Electrical Drives and Power Electronics (PRECEDE)*, 2017. DOI: 10.1109/PRECEDE.2017.8071280

M. Eull, **M. Preindl**, and A. Emadi, "A stochastic optimization technique for discrete dc capacitor bank design," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2017. DOI: 10.1109/ITEC.2017.7993239

M. Eull and **M. Preindl**, "Bidirectional three-level dc-dc converters: Sum-difference modeling and control," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2017. DOI: 10.1109/ITEC.2017.7993334

B. Agrawal, **M. Preindl**, and A. Emadi, "Turn-off energy minimization for soft-switching power converters with wide bandgap devices," in *IEEE International Conference on Industrial Technology (ICIT)*, 2017. DOI: 10.1109/ICIT.2017.7913089

X. Yong and **M. Preindl**, "Smallest control invariant set and error boundaries of fcs-mpc for pmsm," in *IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2017. DOI: 10.1109/APEC.2017.7930848

P. Young and **M. Preindl**, "Optimal generalized overmodulation for multiphase pmsm drives," in *IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2017. DOI: 10.1109/APEC.2017.7930740

B. Agrawal, **M. Preindl**, and A. Emadi, "Estimating switching losses for sic mosfets with non-flat miller plateau region," in *IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2017. DOI: 10.1109/APEC.2017.7931075

S. Nalakath, **M. Preindl**, B. Nahid-Mobarakeh, and A. Emadi, "Low speed position estimation scheme for model predictive control with finite control set," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2016. DOI: 10.1109/IECON.2016.7793482

B. Agrawal, **M. Adam**, B. Vadala, H. Koke, **L. McCurlie**, **M. Preindl**, R. Ahmed, and A. Emadi, "Non-dissipative cell balancing using half-bridge switching circuit," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2016. DOI: 10.1109/ITEC.2016.7520303

Y. Miao, **M. Preindl**, P. Cheng, and A. Emadi, "Mtpa fitting and torque estimation technique based on a new flux-linkage model for interior permanent magnet synchronous machine," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2016. DOI: 10.1109/ITEC.2016.7520215

D. Schumacher, **M. Preindl**, P. Magne, B. Bilgin, and A. Emadi, "Closed loop control of a six phase interleaved bidirectional dc-dc boost converter for an ev/hev application," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2016. DOI: 10.1109/ITEC.2016.7520233

M. Eull, **M. Preindl**, and A. Emadi, "Analysis and design of a high efficiency, high power density silicon carbide inverter," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2016. DOI: 10.1109/ITEC.2016.7520282

Z. Nie, **M. Preindl**, and N. Schofield, "Svm strategies for multiphase voltage source inverters," in *IET Power Electronics, Machines, and Drives (PEMD) Conference*, 2016. DOI: 10.1049/cp.2016.0214

R. Rodriguez, **M. Preindl**, and A. Emadi, "Maximum power point tracking for thermoelectric generators with high frequency injection," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2015. DOI: 10.1109/IECON.2015.7392744

S. Nalakath, **M. Preindl**, Y. Yang, B. Bilgin, and A. Emadi, "Modeling and analysis of core loss of an ipm machine for online estimation purposes," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2015. DOI: 10.1109/IECON.2015.7392740

Y. Sun, **M. Preindl**, S. Sirouspour, and A. Emadi, "Nonlinear modeling and design of initial position estimation and polarity detection of ipm drives," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2015. DOI: 10.1109/IECON.2015.7392732

E. Chemali, **L. McCurlie**, B. Howey, T. Stiene, M. M. Rahman, **M. Preindl**, R. Ahmed, and A. Emadi, "Minimizing battery wear in a hybrid energy storage system using a linear quadratic regulator," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2015. DOI: 10.1109/IECON.2015.7392603

S. Nalakath, **M. Preindl**, B. Bilgin, and A. Emadi, "Modeling and analysis of ac resistance of high-speed permanent magnet machines for online estimation purposes," in *IEEE Energy Conversion Congress and Exposition (ECCE)*, 2015. DOI: 10.1109/ECCE.2015.7309704

L. McCurlie, **M. Preindl**, P. Malysz, and A. Emadi, "Simplified control for redistributive balancing systems using bidirectional flyback converters," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2015. DOI: 10.1109/ITEC.2015.7165817

R. Gu, P. Malysz, **M. Preindl**, H. Yang, and A. Emadi, "Linear programming based design and analysis of battery pack balancing topologies," in *IEEE Transportation Electrification Conference and Expo (ITEC)*, 2015. DOI: 10.1109/ITEC.2015.7165793

M. Preindl, C. Danielson, and F. Borrelli, "Performance evaluation of battery balancing hardware," in *European Control Conference (ECC)*, 2013. [Online]. Available: http://ieeexplore.ieee.org/document/6669307/

M. Preindl, C. Danielson, and S. Bolognani, "Model predictive torque control with PWM using fast gradient method," in *IEEE Applied Power Electronic Conference and Exposition (APEC)*, 2013. DOI: 10.1109/APEC.2013.6520661

M. Preindl and S. Bolognani, "Comparison of direct and PWM model predictive control for power electronic and drive systems," in *IEEE Applied Power Electronic Conference and Exposition (APEC)*, 2013. DOI: 10.1109/APEC.2013.6520651

M. Preindl and S. Bolognani, "Optimization of the generator to rotor ratio of MW wind turbines based on the cost of energy with focus on low wind speeds," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2011. DOI: 10.1109/IECON.2011.6119431

M. Preindl and S. Bolognani, "Optimized design of two and three level full-scale voltage source converters for multi-MW wind power plants at different voltage levels," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2011. DOI: 10.1109/IECON.2011.6119899

M. Preindl and S. Bolognani, "Model predictive direct speed control of the interior permanent magnet synchronous machine with finite control set," in *Workshop on Predictive Control of Electrical Drives and Power Electronics (PRECEDE)*, 2011. DOI: 10.1109/PRECEDE.2011.6078682

M. Preindl and E. Schaltz, "Load torque compensator for model predictive direct current control in high power PMSM drive systems," in *IEEE International Symposium Industrial Electronics (ISIE)*, 2010. DOI: 10.1109/ISIE.2010.5637144

S. Waffler, **M. Preindl**, and J. Kolar, "Multi-objective optimization and comparative evaluation of Si soft-switched and SiC hard-switched automotive DC-DC converters," in *Annual Conference of the IEEE Industrial Electronics Society (IECON)*, 2009. DOI: 10.1109/IECON.2009.5415123

Fellowship and Grant Support

Present Support

Faculty Research Grant - $15k 08.2017 - 07.2018
Columbia University, School of International and Public Affairs (SIPA)
Center on Global Energy Policy (CGEP)
Project: *"Vehicle to Grid Everywhere"*
Investigator(s): Matthias Preindl (PI)

CAREER Award - $500k 03.2017 - 02.2022
National Science Foundation (NSF)
Division of Electrical, Communications and Cyber Systems (ECCS)
Core program of Energy, Power, Control, and Networks (EPCN)
Award n. 1653574: *"CAREER: Virtual Modular Power (VMP) Conversion"*
Investigator(s): Matthias Preindl (PI)

Awarded discretionary fund - $45k 03.2017
Columbia University, Faculty of Engineering
Investigator(s): Matthias Preindl (PI)

Innovation project - $65k 02.2017 - 01.2018
FIAT Chrysler Automobiles N.V. (FCA)
Project: *"Fail-safe current observer for motor drives with two current sensors"*
Investigator(s): Matthias Preindl (PI)

Past Support

Sendyne Corp. - $21k 09.2016
Laboratory donation

Invited and Peer-Selected Presentations

M. Preindl, "Optimization-based control and estimation," Keynote, IEEE International Symposium on Predictive Control of Electrical Drives and Power Electronics (PRECEDE), 2017

M. Preindl, "The future of electric vehicles and the grid," Invited Talk, Inter-American Development Bank (IADB), Information Communication Technologies (ICT) Conference, 2017

M. Preindl, "Nondissipative balancing of battery and supercapacitor modules," Invited Talk, Oxford

University, Department of Engineering Science, 2015

M. Preindl, "Power electronics: A shift to systems integration," Invited Talk, Columbia University, Department of Electrical Engineering, 2015

M. Preindl, "Model predictive control in pmsm drive systems," Invited Talk, Leuphana University of Lueneburg, Institute of Product and Process, 2012

M. Preindl, "Model predictive control of power electronics and drives," Invited Talk, University of California Berkeley, Department of Mechanical Engineering, Model Predictive Control Laboratory, 2012

M. Preindl, "Switching frequency reduction using sensorless model predictive direct current control for high power vsi," Invited Talk, Aalborg University, Department of Energy Technology and KK Electronic, 2010

Patents and Inventions

Patents

M. Preindl and D. Bagnara, "Wind turbine for generating electric energy," WO2013001496, 2013. [Online]. Available: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2013001496

M. Casazza, F. Oberbichler, and **M. Preindl**, "Wind power turbine for generating electric energy," WO2013093855, 2013. [Online]. Available: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2013093855

Patent Applications

E. Chemali and **M. Preindl**, "Using deep learning algorithms for state of charge and state of health estimation of li-ion batteries," 2018

M. Preindl and A. Emadi, "Energy storage balancing system," US20170214252, 2017. [Online]. Available: https://patentscope.wipo.int/search/en/detail.jsf?docId=US201065871

M. Preindl and D. Bagnara, "Wind turbine for generating electric energy," WO2013093856, 2013. [Online]. Available: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2013093856

A. Fasolo, **M. Preindl**, M. Scuotto, and T. Kaessner, "Wind power turbine and wind power turbine control method," WO2013093894, 2013. [Online]. Available: https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2013093894

Service

Professional Service

Peer Reviewer

Publications (recurrent)
IEEE Transactions on Power Electronics
IEEE Transactions on Industrial Electronics
International IEEE conferences, mainly APEC, ECCE, IECON, ITEC

International Conferences

Organizator and chair 2017
Columbia 2017 Forum - Electrified Transportation: Challenges and Future Trends

Assistant program chair and publication chair
IEEE Transportation Electrification Conference & Expo (ITEC), 2018

Technical program co-chair
IEEE Transportation Electrification Conference & Expo (ITEC), 2017

Topic chair
IEEE Energy Conversion Congress and Exposition (ECCE), 2017
IEEE Energy Conversion Congress and Exposition (ECCE), 2016

Session chair
IEEE Transportation Electrification Conference & Expo (ITEC), 2014

Steering committee
IEEE Symposium on Predictive Control of Electrical Drives and Power Electronics (PRECEDE), 2017

Academic Service

Committees, Department of Electrical Engineering, Columbia University

Undergraduate Affairs
UG Affairs/Recruiting (2017/18)

Graduate Affairs
MS Program: MS Career/Development/Internships (2016/17, 2017/18)
MS Program: MS CVN Advising/Monitoring/Awards (2016/17, 2017/18)
PhD Program: PhD Admissions (2016/17)

Services
Minutes/Records (2016/17, 2017/18)

Relevant Invited Talks at Columbia University

M. Preindl, "Electrified transportation: Challenges and future trends," Columbia University, Board of Visitors, Fall Board Meeting, 2017

M. Preindl, "Electrified transportation," Columbia University, Engineering for Humanity - Smart Cities: Sustainable, Healthy, Secure, Connective, Creative, 2017

M. Preindl, "Generation, sensing/control, power electronics, building/vehicle integration," Columbia University, Engineering for Humanity - Repowering the Planet, 2017

Organization of Talks and Seminars

A. Darvishi, "Threshold-based monitoring of cascading outages with pmus," Invited Talk at Columbia University, 2017, Speaker affiliation: New York Power Authority (NYPA)

B. Nahid-Mobarakeh, "Stability analysis of standalone microgrids: Application to electrified transportation systems," Invited Talk at Columbia University, 2017, Speaker affiliation: Université de Lorraine

D. Gu, "Power conversion for hydrogen fuel cell hybrid electric vehicles propulsion," Invited Talk at Columbia University, 2017, Speaker affiliation: Unique Technical Services (UTS)

A. Mohamed, "Recuperation of regenerative braking energy in electric rail systems," Invited Talk at Columbia University, 2017, Speaker affiliation: City College of New York

P. Zanchetta, "Application of repetitive control to power electronics systems," Invited Talk at Columbia University, 2017, Speaker affiliation: University of Nottingham

M. O'Grady, "Sic enabling ev power conversion," Invited Talk at Columbia University, 2017, Speaker affiliation: United Silicon Carbide

D. Da Rù and M. De Soricellis, "Model-based control," Invited Talk at Columbia University, 2017, Speaker affiliation: University of Padua

P. P. Malysz, "Advanced battery modeling and estimation for electrified transportation," Invited Talk at Columbia University, 2017, Speaker affiliation: FIAT Chrysler Automobile (FCA)

N. Clauvelin, "Battery modeling for system design," Invited Talk at Columbia University, 2017, Speaker affiliation: Sendyne

L. Gauchia, "Multi-life opportunities of ev batteries for grid applications," Invited Talk at Columbia University, 2017, Speaker affiliation: Michigan Technological University

A. Reid, "The future of ev and electric grid," Invited Talk at Columbia University, 2017, Speaker affiliation: Consolidated Edison

M. Payne, "Challenges and solutions for next generation vehicel batteries," Invited Talk at Columbia University, 2017, Speaker affiliation: Gotion

D. Sciano and A. Reid, "The evolution of electric power systems," Invited Talk at Columbia University, 2017, Speaker affiliation: Consolidated Edison

A. Khaligh, "Maryland power electronics laboratory," Invited Talk at Columbia University, 2016, Speaker affiliation: University of Maryland

B. Arnet, "PLECS: Advanced modeling and simulation of power electronic systems," Seminar at Columbia University, 2016, Speaker affiliation: Plexim

M. H. Nazari, "Distributed control of prosumer-based smart grids," Invited Talk at Columbia University, 2016, Speaker affiliation: California State University, Long Beach

Languages

German native

English fluent
C1, TOEFL Certificate, 2008

Italian fluent
Exam of bilingualism (German and Italian), highest level (A - referred to the doctoral degree)
Province Bolzano/Bozen Certificate, 2006