

Darrell L. Robinette, Ph.D., P.E.

<https://www.linkedin.com/pub/darrell-robinette/97/547/9ab>

https://www.researchgate.net/profile/Darrell_Robinette

http://scholar.google.com/citations?user=G_dafSAAAAAJ&hl=en

Home

23181 Chippewa Trail
P.O. Box 404
Dollar Bay, MI 49922
dlrobine@mtu.edu
(810)-360-9388

Office

Rm 933 R.L. Smith Building
Mechanical Engineering-Engineering Mechanics
Michigan Technological University
1400 Townsend Drive
Houghton, MI 49931
(906)-487-2764

Professional Experience

2016-Present Assistant Professor
Mechanical Engineering-Engineering Mechanics
Michigan Technological University
Houghton, Michigan

2015-2016 Advanced Hybrid and Electrification Architecture Engineer
Senior Project Engineer
General Motors Company, Powertrain
Pontiac, Michigan

Support development of next generation hybrid and electric drive units through dynamic analysis and simulation to increase efficiency and performance at component and system level while reducing noise, vibration and harshness.

- Dynamic analysis for next generation transverse hybrid electric drive unit
- Electric drive unit motor and gear radiated noise correlation to simulation
- Electrification architecture selection for fuel economy and performance
- Correlation of electric motor design parameters and radiated noise

2011-2015 Transmission Road-Lab-Math (RLM) Calibration
Senior Project Engineer
General Motors Company, Powertrain
Milford, Michigan

Developed automatic transmission calibrations utilizing math, lab or vehicle based methods with a focus on reducing time and cost associated with producing preproduction calibrations. Served as lead analysis engineer for determining next generation automatic transmission technologies to develop for corporate powertrain strategy to meet 2020/25 emission regulations.

- Energy analysis modeling for powertrain selection and shift point controls
- Powertrain optimization for fuel consumption using statistical methods
- Transmission shifting clutch mu-V performance characterization
- Automatic transmission clutch-to-clutch controls modeling
- Development of simplified gearbox dynamics model
- Clutch-to-clutch model based controls refinement
- Optimized shift time calculation tools
- Closed throttle downshift calibration procedure development

- Transmission parasitic loss algorithm and calibration
- Math based torque converter clutch slip table calibration
- DFSS Black Belt Certification

2007-2011 Powertrain Integration – Noise and Vibration
Development Engineer
General Motors Company, Powertrain
Milford, Michigan

Developed design solutions and recommendations that ensure robust powertrain to vehicle system integration against noise and vibration for engines, transmissions, and hybrid drive units through experimental and analytical techniques.

- Transmission input shaft fatigue failure root cause and dynamic analysis
- Lead integration engineer for 12 volt start/stop
- Lead engineer for drivetrain torsional modeling
- Torque converter clutch integration and optimization
- Strong hybrid startup modeling and damper optimization
- Layshaft transmission gear rattle and development of gear rattle noise metrics
- Corvette racing team (C6R) drivetrain dynamic modeling and analysis

2009-Present General Motors-Michigan Tech University Relations Team
Lead for educational and research partnerships

- Facilitate and mentor various projects related to advanced propulsion
- Lead corporate mentor for Hybrid Electric Vehicle Enterprise

Functional recruiting lead for GM Powertrain

- Develop unique on campus recruiting activities
- Conduct candidate selection and interviews powertrain area

Summer 2004 Engineer

Wolverine Power Cooperative
Cadillac, Michigan

Performed an electrical load flow study for 69/138 kV distribution systems in northern Michigan.

Summer 2003 Engineering Intern

Xcel Energy
Ashland, Wisconsin

Executed continuous improvement projects for a coal and biomass power plant including the design of a turbine lube oil coalescer system, specified equipment for a coal conveyor tramp iron magnet and managed the installation of a new plant service air compressor and dryer.

Summer 2002 Engineering Intern

& 2001 Wolverine Power Supply Cooperative
Cadillac, Michigan

Created P&ID's for gas turbine and diesel generator sets, established recommended best practice gas turbine preventative maintenance program, and implemented a gas turbine performance monitoring program.

Education

- 2004-2007 Ph.D., Mechanical Engineering – Engineering Mechanics
Michigan Technological University
Houghton, Michigan
Ph.D. Dissertation “Detecting and Predicting the Onset of Cavitation in Automotive Torque Converters”
Advisor: Drs. Carl Anderson and Jason Blough
- 2000-2004 B.S. Mechanical Engineering
Summa Cum Laude
Michigan Technological University
Houghton, Michigan

Publications

Peer Reviewed Journal Articles

- 2016 **Robinette, D.** and Singh, T., "Internal Combustion Engine - Automatic Transmission Matching for Next Generation Power Transfer Technology Development in Automotive Applications," SAE Int. J. Engines 9(3):2016, doi:10.4271/2016-01-1099.
- 2015 **Robinette, D.** and Wehrwein, D., "Automatic Transmission Gear Ratio Optimization and Monte Carlo Simulation of Fuel Consumption with Parasitic Loss Uncertainty," SAE Int. J. Commer. Veh. 8(1):2015, doi:10.4271/2015-01-1145.
- 2015 **Robinette, D.**, Gibson, G., Szpara, D., and Tehansky, E., "Performance Characterization of Automatic Transmission Upshifts with Reduced Shift Times," SAE Int. J. Engines 8(3):2015, doi:10.4271/2015-01-1086.
- 2014 **Robinette, D.**, "A Two Degree of Freedom, Lumped Inertia Model for Automatic Transmission Clutch-to-Clutch Shift Dynamics," SAE Int. J. Passeng. Cars - Mech. Syst. 7(3), 2014.
- 2014 **Robinette, D.**, "A DFSS Approach to Determine Automatic Transmission Gearing Content for Powertrain-Vehicle System Integration," SAE Int. J. Passeng. Cars - Mech. Syst. 7(3), 2014.
- 2013 **Robinette, D.**, "Performance Characterization of a Triple Input Clutch, Layshaft Automatic Transmission Using Energy Analysis," SAE Int. J. Engines 6(4):1984-1994, 2013.
- 2012 **Robinette, D.**, Anderson, C. and Blough, J., “Development of a Dimensionless Model for Predicting Onset of Cavitation in Torque Converters”, New Advances in Vehicular Technology and Automotive Engineering, InTech, ISBN 979-953-307-838-9, July 2012.
- 2011 **Robinette, D.**, Grimmer, M., and Beikmann, R., "Dynamic Torque Characteristics of the Hydrodynamic Torque Converter," SAE Int. J. Passeng. Cars – Mech. Syst. 4(2):1023-1032, 2011.

- 2011 **Robinette, D.** and Powell, M., "Optimizing 12 Volt Start - Stop for Conventional Powertrains," SAE Int. J. Engines 4(1):850-860, 2011.
- 2011 **Robinette, D.**, Grimmer, M., Horgan, J., Kennell, J. et al., "Torque Converter Clutch Optimization: Improving Fuel Economy and Reducing Noise and Vibration," SAE Int. J. Engines 4(1):94-105, 2011.
- 2009 **Robinette, D.**, Beikmann, R., Piorkowski, P., and Powell, M., "Characterizing the Onset of Manual Transmission Gear Rattle Part I: Experimental Results," SAE Int. J. Passeng. Cars - Mech. Syst. 2(1):1352-1364, 2009.
- 2009 **Robinette, D.**, Beikmann, R., Piorkowski, P., and Powell, M., "Characterizing the Onset of Manual Transmission Gear Rattle Part II: Analytical Results," SAE Int. J. Passeng. Cars - Mech. Syst. 2(1):1365-1376, 2009.
- 2008 **Robinette, D.**, Schweitzer, J., Maddock D., Anderson, C., Blough, J., and Johnson, M., "Predicting the Onset of Cavitation in Automotive Torque Converters Part I: Designs with Geometric Similitude," International Journal of Rotating Machinery, Vol. 2008.
- 2008 **Robinette, D.**, Schweitzer, J., Maddock D., Anderson, C., Blough, J., and Johnson, M., "Predicting the Onset of Cavitation in Automotive Torque Converters Part II: A Generalized Model", International Journal of Rotating Machinery, Vol. 2008.
- 2007 **Robinette, D.**, Anderson, C., Blough, J., Johnson, M., Maddock D. and Schweitzer, J., "Characterizing the Effect of Torque Converter Design Parameters on the Onset of Cavitation at Stall", SAE Transactions J. of Passeng. Cars – Mech. Syst., Vol 116:1735-1746, 2007.

Conference Proceedings

Peer Reviewed Conference Papers

- 2016 **Robinette, D.** and Blough, J. "Transient Heat Transfer and Energy Balance Model for Hydrodynamic Torque Converters While Operating at Extreme Speed Ratios", ISROMAC 16, Honolulu, HI, April 2016.
- 2013 **Robinette, D.** and Skrzycke, T., "A Dual Clutch Torque Converter for Dual Input Shaft Transmissions," SAE Technical Paper 2013-01-0232, 2013.
- 2011 **Robinette, D.**, Grimmer, M., and Beikmann, R., "Determining Physical Properties for Rotating Components Using a Free-Free Torsional FRF Technique," SAE Technical Paper 2011-01-1663, 2011.

Presentations

- 2016 **Robinette, D.** "Next Generation RWD Transmission With Integrated Electrification," *10th Car Training Institute (CTI) Symposium – Automatic Transmissions, HEV and EV Drives*, Novi, MI, May 2016.
- 2015 **Robinette, D.** and Wehrwein, D., "Automatic Transmission Technology Selection Using Energy Analysis," *9th Car Training Institute (CTI) Symposium – Automatic Transmissions, HEV and EV Drives*, Novi, MI, May 2015.

- 2014 **Robinette, D.** and Wehrwein, D., “Utilizing Energy Analysis Methods to Select Transmission Technologies and Optimize Powertrain-Vehicle System Fuel Consumption,” *2014 SAE Int. Transmission and AWD Symposium*, Plymouth, MI, October 2014.
- 2008 **Robinette, D.**, Schweitzer, J., Maddock D., Anderson, C., Blough, J., and Johnson, M., “Development of a Model to Predict the Onset of Cavitation in Automotive Torque Converters,” *2nd Car Training Institute (CTI) Transmission Symposium*, Novi, MI, May 2008.
- 2007 **Robinette, D.**, “Detecting and Predicting the Onset of Cavitation in Automotive Torque Converters,” *Sigma Xi Colloquium*, Houghton, MI, April 2007.

Intellectual Property

Granted

- 2016 Triple Input Clutch Transmission
General Motors Company – Patent Granted July 5, 2016, US 9382975 B2
- 2015 Dual Clutch Transmission with Integral Electric Motor
General Motors Company – Defensive Publication
- 2015 Transmission Clutch Control Using Lumped Inertia Modeling
General Motors Company – Patent Granted March 10, 2015, US 8977457 B2
- 2014 Mechanism to Reduce Powertrain Rigid Body Motion During Start/Stop
General Motors Company – Patent Granted December 16, 2014, US 8910607 B2
- 2014 Multiple Gear Ratio Starter Motor
General Motors Company – Patent Granted September 9, 2014, US 8826878 B2
- 2014 In-Situ Determination of Automatic Transmission Shifting Clutch μ -V Characteristics
General Motors Company – Tool/Method/Trade Secret
- 2014 Nine Speed Dual Clutch Transmission
General Motors Company – Patent Granted March 11, 2014, US 8668616 B2
- 2014 Torque Transmission Assembly with Clutches
General Motors Company – Patent Granted January 21, 2014, US 8631918 B2
- 2014 Torque Splitting Torque Converter Assembly
General Motors Company – Patent Granted January 14, 2014, US 8628441 B2
- 2013 Variable Ratio Powersplit Hybrid Transmission
General Motors Company – Patent Granted November 19, 2013, US 8585521 B2
- 2013 Multi-Speed Hybrid Powertrain with Series and Parallel Operating Modes
General Motors Company – Patent Granted September 10, 2013, US 8532858 B1
- 2013 Variable Ratio Power-split Hybrid Transmission
General Motors Company – Patent Granted July 16, 2013, US 8485930 B2

- 2013 Analysis Procedure for Hybrid Powertrain Motor Growl Noise Assessment and Mitigation
General Motors Company – Tool/Method/Trade Secret
- 2013 Eight Speed Triple Input Shaft Automatic Transmission
General Motors Company – Defensive Publication
- 2012 Model Based Shift Time and Torque Management Calibration Tool for Automatic
Transmissions
General Motors Company – Tool/Method/Trade Secret
- 2012 Single Mode Compound Powersplit Hybrid Drive Unit
General Motors Company – Patent Granted Nov 27, 2012, US 8317648 B2
- 2012 Multi-stage Propeller Shaft Damper for Variable Cylinder Engines
General Motors Company Patent – Patent Granted Sept 4, 2012, US 8256562 B2
- 2011 Series Step Ratio Automatic Transmission with P2 Hybrid Drive
General Motors Company – Defensive Publication
- 2011 Starter Actuated DMF Lockout
General Motors Company – Defensive Publication
- 2008 Optimized Torque Converter Clutch Slip Speed Method
General Motors Company – Tool/Method/Trade Secret

Patent Applications – Under Review

- 2016 Step Gear Automatic Transmission with Configurable Parallel Electrification
General Motors Company – application under preparation
- 2016 Transverse Front Wheel Drive Hybrid
General Motors Company – application under preparation
- 2012 Dual Mass Flywheel Centrifugal Lockout Clutch
General Motors Company – USPTO Application # 2012/0234131 A1

Teaching/Mentoring Experience

- 2014-Present Senior Project Engineer, General Motors Company
GM Automatic Transmission Design Class
Lecture on gearbox modeling, dynamics and controls
- 2011-Present Project Engineer, General Motors Company
Lead corporate mentor for Michigan Tech Hybrid Electric Vehicle Enterprise
- 2011 Michigan Technological University
Senior Design Project Mentor
High Speed 12V Starter System
On Vehicle Flexible Fuel Cell for Fuel Economy Measurements

- 2010-Present Volunteer, FIRST Robotics
Mentor for high school robotics team
Huron Valley Schools, Milford, MI Team #67 “The HOT” Team
- 2009 Development Engineer, General Motors Company
Developed and taught a two week short course on automotive powertrain and driveline torsional modeling and integration
General Motors Daewoo, Seoul, South Korea
General Motors Adam Opel, Russelsheim, Germany
- 2002-2004 Engineering Learning Center Coach
Michigan Technological University
Mechanical Engineering
Coach and tutor students in statics, mechanics of materials, thermodynamics and dynamics

Funding

- 2010-Present GM Foundation Grant
Annual Gift in Kind to Michigan Technological University on behalf of General Motors
Assisted in determining fund appropriations for projects and initiatives
Approximately \$100 to 150K annually
- 2015 General Motors Sponsored Graduate Research Project
Michigan Technological University
Developed project proposal for dynamic torsional shaker for APS lab
Approximately \$95K annual, 2-year master’s project

Honors/Awards/Recognitions

- 2013 Featured Article on DrivelineNews.com
“GM Explores Torque Converter DCT” June 20, 2013
Excerpt from SAE Technical Paper 2013-01-0232
- 2013 General Motors Company
TeamGM Transformer Award
Contributions towards corporate transmission strategy to meet 2025 emissions requirements
- 2013 SAE Foundation Stefan Pischinger Young Industry Leadership Award - Nominee
- 2004 Summa cum laude, B.S. Mechanical Engineering
GPA 3.92 overall, 4.00 departmental
- 2003-2005 GLIAC All-Academic Team, Cross Country and Outdoor Track
- 2002-2004 Varsity Letter Winner – Michigan Technological University, Cross Country
- 2000-2004 Michigan Technological University Dean’s List
- 2000-2004 Detroit Edison Lloyd Coombe Memorial Scholarship recipient

Extracurricular/Community Activities

- 2010-present FIRST Robotics, Mentor
Huron Valley Schools, Milford, MI Team 67 HOT
Volunteer mentor for high school robotics competition
- 2000-2003 NCAA Varsity Cross Country Athlete, Captain 2003
Michigan Technological University
- 2003-2004 NCAA Varsity Track Athlete
Michigan Technological University
- 2002-2004 Engineering Learning Center Coach/Tutor
Michigan Technological University

Memberships and Affiliations

- 2015-Present SAE Committee Member for Transmissions and Drivelines
- 2010-Present Professionally Licensed Engineer, State of Michigan, License #6201057501
Mechanical Engineering – Thermal and Fluid Systems Concentration
- 2007-Present Society of Automotive Engineers (SAE)
- 2002-2004 Pi Tau Sigma
President 2003-2004
National Mechanical Engineering Honor Society

Related Skills Summary

Automotive powertrain systems and how they integrate into the vehicle are my principal area of knowledge, backed by a variety of critical skills in test and analysis. Conventional automatic transmissions and drivetrains are of primary expertise in the areas of noise and vibration, physical system behavior and characterization, model based control, testing, simulation and component design. Hybrid transmissions, electric drive units and internal combustion engines are of secondary expertise in the areas of powerflow design and analysis, testing, simulation and physical system behavior. For all areas of automotive powertrain systems, I have a thorough background in firing and non-firing dynamometer test facilities, with standard and unique setups using data acquisition equipment coupled with microphones, accelerometers, in cylinder pressure measurement, high-speed encoders, torsional vibrometers, and magnetic speed sensors. Complimenting data acquisition of powertrain related data are skills in the digital signal processing in the time and frequency domains as well as order tracking and signal filtering. In addition to physical testing, I have analytical capability in a number of software packages to perform analysis on a variety of powertrain systems and operating conditions, namely drivetrain torsional analysis and integration, fundamental control algorithm design, and vehicle/powertrain energy analysis. All the skill sets and capabilities mentioned as developed and applied to automotive powertrains are easily applied and transferred to other mechanical or electromechanical systems of interest. A summary of special skill sets and/or software/hardware packages are listed below:

- MATLAB – general data analysis, modeling and optimization tool
- LMS TestLab – data acquisition and post processing package for noise and vibration testing
- AMESim – lumped parameter modeling software
- ETAS INCA – powertrain controller software for calibration development
- Minitab – software package for data reduction using statistics, DOE or DFSS
- MASTA – gear design and optimization software
- CAS – ICE in cylinder pressure measurement system
- Experimental Design and Design of Experiments (DOE)
- Design for Six Sigma (DFSS), black belt certification