

ALESSANDRO ALLA

aalla@fsu.edu · +1 (850) 339-5778

400 Dirac Science Library · Tallahassee, Florida, 32306

www.alessandroalla.com

RESEARCH INTERESTS

Scientific Computing, Numerical Analysis, Numerical Optimization, Numerical Partial Differential Equations, Optimization with PDE constraints, Open-Loop Control, Closed-Loop Control, Model Predictive Control, Hamilton-Jacobi-Bellmann equations, Reduced Order Modeling, Proper Orthogonal Decomposition, Centroidal Voronoi Tessellation, Dynamic Mode Decomposition, Compressed Sensing.

EMPLOYMENT

Florida State University, USA.*February 2016–present*

PostDoctoral Researcher in the group of Prof. Max Gunzburger.

Research Area: Model Order Reduction for Nonlinear Dynamical Systems and best approximation for the p -Laplace equation.

University of Hamburg, Germany.*February 2014–January 2016*

PostDoctoral Researcher in the group of Prof. Michael Hinze.

Research Area: Model Order Reduction and Optimal Control within the project *SIMUROM*. Further information available on www.simurom.de.

EDUCATION

Sapienza, University of Rome, Italy.*November 2010–January 2014*

Ph.D. in Applied Mathematics.

Advisor: Prof. Maurizio Falcone.

Thesis: *Model Reduction for a Dynamic Programming Approach to Optimal Control Problems with PDE Constraints*.

Committee: Prof. Elisabetta Carlini, Prof. Michael Hinze, Prof. Gianluigi Rozza.

Sapienza, University of Rome, Italy.*September 2007–December 2009*

M.Sc. in Applied Mathematics

Advisor: Prof. Maurizio Falcone.

Sapienza, University of Rome, Italy.*September 2004–September 2007*

B.Sc. in Mathematics.

PUBLICATIONS, CONFERENCE PROCEEDINGS, PREPRINTS, THESES

Peer Reviewed Publications

1. A. Alla, J.N. Kutz. *Nonlinear model order reduction via Dynamic Mode Decomposition*, to appear in SIAM Journal on Scientific Computing, 2016.
<http://arxiv.org/abs/1602.05080>
2. A. Alla, M. Falcone, D. Kalise. *A HJB-POD feedback synthesis approach for wave equation*, Bulletin of the Brazilian Mathematical Society, New Series, **47**, 2016, 51-64.

3. A. Alla, S. Volkwein. *Asymptotic Stability and Suboptimality of Model Predictive Control for semilinear PDEs*, in *Advances in Computational Mathematics*, Springer US, **41**, 2015, 1073-1102.
4. A. Alla, M. Falcone, D. Kalise. *An efficient Policy Iteration algorithm for dynamic programming equations*, *SIAM J. Sci. Comput.*, **37**, 2015, 181-200.

Submitted Papers

5. A. Alla, C. Graessle, M. Hinze. *A-posteriori snapshots location for POD in optimal control of linear parabolic equations*, submitted to ESAIM:M2AN, 2016.
<http://arxiv.org/abs/1608.08665>
6. A. Alla, M. Falcone, S. Volkwein. *Error analysis for POD approximations of infinite horizon problems via the dynamic programming approach*, submitted to *Siam Journal on Control and Optimization*, 2015.
<http://arxiv.org/abs/1511.00265>
7. A. Alla, J.N. Kutz. *Randomized Model Order Reduction*, submitted to *Advances in Computational Mathematics*, 2016.
<https://arxiv.org/abs/1611.02316>

Peer Reviewed Conference Proceedings

8. A. Alla, G. Fabrini, M. Falcone. *A HJB-POD approach to the control of the level set equation*, to appear in *Conference Proceedings of Model Reduction of Parametrized Systems III (MoRePas III)*, 2016.
9. A. Alla, A. Schmidt, B. Haasdonk. *Model order reduction approaches for infinite horizon optimal control problems via the HJB equation*, to appear in *Conference Proceedings of Model Reduction of Parametrized Systems III (MoRePas III)*, 2016.
<http://arxiv.org/abs/1607.02337>
10. A. Alla, U. Matthes. *Model order reduction for a linearized robust PDE constrained optimization*, to appear in *Conference Proceedings of the 2nd IFAC Conference on Control of Partial Differential Equations*, 2016.
11. A. Alla, C. Graessle, M. Hinze. *A residual based snapshot location strategy for POD in distributed optimal control of linear parabolic equations*, to appear in *Conference Proceedings of the 2nd IFAC Conference on Control of Partial Differential Equations*, 2016.
12. A. Alla, G. Fabrini, M. Falcone. *Coupling MPC and DP methods for an efficient solution of optimal control problems*, in *Conference Proceedings of IFIP 2015*.
13. A. Alla, M. Hinze. *HJB-POD feedback control of advection-diffusion equation with a model predictive control snapshot sampling*, in *Conference Proceedings of the 5th IFAC Conference on Nonlinear Model Predictive Control*, 2015.
14. A. Alla, M. Hinze, O. Lass, S. Ulbrich. *Model order reduction approaches for the optimal design of permanent magnets in electro-magnetic machines*, in *Conference Proceedings MATHMOD 2015*.
15. A. Alla, M. Hinze. *HJB-POD feedback control for Navier-Stokes equations*, in *Conference Proceedings ECMI 2014*.

16. A. Alla, M. Falcone, D. Kalise. *An accelerated value/policy iteration scheme for the solution of DP equations*, Numerical Mathematics and Advanced Applications - ENUMATH 2013, LNCSE **103**, 2015, 489-497.
17. A. Alla, M. Falcone, D. Kalise. *An efficient Policy Iteration algorithm for dynamic programming equations*, PAMM, **37**, 2013, 467-468.
18. A. Alla, M. Falcone. *A time adaptive POD method for optimal control problems*, in Conference Proceedings of the 1st IFAC Conference on Control of Systems Governed by Partial Differential Equations, **1**, 2013, 245-250.
19. A. Alla, M. Falcone. *An adaptive POD approximation method for the control of advection-diffusion equations*, in Control and Optimization with PDE Constraints, K. Kunisch, K. Bredies, C. Clason, G. von Winckel (eds), International Series of Numerical Mathematics, **164**, Birkhäuser, Basel, 2013.

Phd Thesis

21. A. Alla. *Model Reduction for a Dynamic Programming Approach to optimal control problems with PDE constraints*, PhD Thesis, 2014.

In Preparation

22. A. Alla, K. Carlberg, J.N. Kutz. *Adaptive DEIM refinement via compressed sensing*, in preparation, 2016.
23. A. Alla, W. Dahmen, M. Gunzburger. *Best approximation for the p -laplacian*, in preparation, 2016.
24. A. Alla, M. Gunzburger, A. Quaini, G. Rozza. *Localize Reduced Basis method for bifurcation problems*, in preparation, 2016.
25. A. Alla, M. Hinze, O. Lass, S. Ulbrich. *A certified Model Reduction approach for robust optimal control with PDE constraints*, in preparation, 2016.

HONORS AND AWARDS

European Science Foundation (ESF). Stipend for a three-month long research visit at the University of Konstanz, Germany. Grant n. 4160.

University of Seville. Stipend for a four-month research visit at the University of Seville, Spain.

Sapienza, University of Rome, Italy. Fellowship *Master's thesis abroad*. Stipend for a two-month research visit at Karl Franzens University of Graz, Austria.

European Region Action Scheme for the Mobility of University Students. Erasmus stipend exchange student for a six-month visit at Karl Franzens University of Graz, Austria.

SHORT RESEARCH VISITS (>1 MONTH)

University of Konstanz, Germany.
Visiting Professor. Stefan Volkwein.

January 2013–May 2013

University of Seville, Spain. *March 2010–June 2010*
 Post graduate intensive course: *Constructive Approximation, Optimization and Mathematical Modelling.*

Karl Franzens University of Graz, Austria. *April 2009–May 2009*
 Visiting Professor Karl Kunisch.

Karl Franzens University of Graz, Austria. *February 2009–July 2008*
 Erasmus Exchange Project.

CONFERENCES, SEMINARS, GIVEN TALKS

Invited Conference Talks

Optimal Control of Partial and Ordinary Differential Equations, Paris, France. *November 2015*
Optimal snapshot location for POD model reduction in optimal control.

SIAM Conference on Control and its Applications, Paris, France. *July 2015*
A POD-MOR approach for robust optimal control with PDE constraints.

From Open Loop to Closed Loop control, Graz, Austria. *June 2015*
On the stabilization of feedback controls in a dynamic programming framework.

SIAM Conference on Computational Science, Salt Lake City, USA. *March 2015*
HJB-POD feedback control for advection-diffusion equations.

Mathmod, Vienna, Austria. *February 2015*
Model order reduction approaches for the optimal design of permanent magnets in electro-magnetic machines.

18th European Conference on Mathematics for Industry (ECMI), Taormina, Italy. *June 2014*
HJB-POD feedback control for Navier-Stokes equations.

1st IFAC Workshop on Control of Systems Modeled by PDEs, Paris, France. *September 2013*
A Time-Adaptive POD Method for the Optimal Control Problems.

Modeling and Control of Large Interacting Dynamical Systems, Paris, France. *September 2013*
Asymptotic Stability and Suboptimality of Model Predictive Control for Semilinear PDEs.

Model Reduction and Approximation for Complex Systems, Luminy, France. *June 2013*
Asymptotic Stability and Suboptimality of Model Predictive Control for Semilinear PDEs.

Contributed Conference Talks

4th Workshop on Sparse Grids and Applications, Miami, USA. *October 2016*
Nonlinear Model Reduction via Dynamic Mode Decomposition.

2nd IFAC Workshop on Control of Systems Governed by PDEs, Bertinoro, Italy. *June 2016*
Model order reduction for a linearized robust PDE constrained optimization.

36th NoKo, Bremen, Germany. *April 2015*
On the coupling between MPC and DP methods for optimal control problems.

XV International Conference on Hyperbolic Problems, Rio De Janeiro, Brazil. *July 2014*
HJB-POD feedback control for Navier-Stokes equations.

Recent trends in Computational Science and Engineering, Plön, Germany. *March 2014*
HJB-POD feedback control for Navier-Stokes equations.

84th GAMMA Annual Meeting, Novi Sad, Serbia. *March 2013*
An adaptive POD approximation method for the control of evolutive equations.

Adaptivity and MOR in PDE Constrained Optimization, Hamburg, Germany. *July 2012*
An adaptive POD approximation method for the control of advection-diffusions equation.

Summer School on Optimal Control of Partial Differential Equations, Cortona, Italy. *July 2010*
Optimal control problems for PDEs via POD and HJB.

Seminars

Scientific Computing Colloquium, FSU, USA. *September 2016*
The HJB-POD approach for infinite dimensional control problems.
Invited by Prof. Max Gunzburger.

Seminari di Modellistica Numerica, Sapienza University of Rome, Italy. *February 2016*
Nonlinear Model Reduction via Dynamic Mode Decomposition.
Invited by Prof. Maurizio Falcone.

Lothar-Collatz Seminar, Hamburg, Germany. *January 2016*
Nonlinear Model Reduction via Dynamic Mode Decomposition.
Invited by Lothar-Collatz Center.

SimTech MOR-Seminar, Stuttgart, Germany. *December 2015*
Model order reduction for infinite horizon optimal control problems via the dynamic programming principle.
Invited by Prof. Bernard Haasdonk.

Seminari di Modellistica Numerica, Sapienza University of Rome, Italy. *March 2015*
Optimization and Model Reduction for a permanent magnet.
Invited by Prof. Maurizio Falcone.

Group Seminar, RICAM, Linz, Austria. *February 2015*
On the coupling between MPC and DP methods for optimal control problems.
Invited by Dr. Dante Kalise and Prof. Karl Kunisch.

Lothar-Collatz Seminar, Hamburg, Germany. *April 2014*
Model Reduction for a Dynamic Programming Approach to optimal control problems with PDE constraints.
Invited by Lothar-Collatz Center.

Seminari di Modellistica Numerica, Sapienza University of Rome, Italy. *November 2013*
Model Reduction for a Dynamic Programming Approach to optimal control problems with PDE constraints.
Invited by Prof. Maurizio Falcone.

Kolloquium, Constance, Germany. *September 2012*
An adaptive POD approximation method for the control of advection-diffusions equation.
Invited by Prof. Stefan Volkwein.

Seminari di Modellistica Numerica, Sapienza University of Rome, Italy. *February 2010*
POD Method and reduced order model.

Invited by Prof. Maurizio Falcone.

Poster Session

Optimal Control of Partial and Ordinary Differential Equations, Paris, France. *November 2015*
A POD-MOR approach for robust optimal control with PDE constraints.

MoRePas 2015, Model Reduction of Parametrized Systems III, Trieste, Italy. *October 2015*
A POD-MOR approach for robust optimal control with PDE constraints.

5th IFAC Conference on Nonlinear Model Predictive Control, Seville, Spain. *September 2015*
HJB-POD feedback control of advection-diffusion equation with a Model Predictive Control snapshot sampling.

New trends on optimal control, Torus, France. *June 2014*
MPC initialization for Bellman equations.

TEACHING EXPERIENCE

Teaching Assistant at Florida State University, USA.
 Finite Element, Department of Scientific Computing. *Fall 2016*

Lecturer at University of Hamburg, Germany.
 Model Reduction, Department of Mathematics. *Fall 2015*

Teaching Assistant at University of Hamburg, Germany.
 Model Reduction, Department of Mathematics. *Fall 2015*
 Model Reduction, Department of Mathematics. *Fall 2014*

Teaching Assistant at Sapienza, University of Rome, Italy.
 Programming and Computing Laboratory, Department of Mathematics. *Fall 2013*
 Calculus I, Department of Engineering. *Fall 2013*
 Programming and Computing Laboratory, Department of Mathematics. *Fall 2012*
 Numerical Analysis, Department of Mathematics. *Spring 2011*
 Programming and Computing Laboratory, Department of Mathematics. *Fall 2011*
 Calculus I, Department of Aerospace Engineering. *Fall 2010*
 Calculus II, Department of Aerospace Engineering. *Fall 2010*
 Calculus I, Department of Chemistry. *Fall 2010*

ACADEMIC SERVICE

Referee for Advances in Computational Mathematics, SIAM Journal in Optimization and Control, SIAM Journal on Scientific Computing, ESAIM Control, Optimization and Calculus of Variations, IFAC Journals, American Control Conference.

Minisymposium organizer for the 2015 SIAM Conference on Control and its Applications and the 2017 SIAM Conference on Computational Science and Engineering.

COMPUTER SKILLS

C++, Fortran, L^AT_EX, Linux, Mac OS X, Matlab, Microsoft Windows, OpenOffice.

LANGUAGES

Italian: Native Speaker
English: Fluent
Spanish: Intermediate
German: Elementary

REFERENCES

The following individuals can offer research, teaching, and character references.

- Maurizio Falcone falcone@mat.uniroma1.it
Professor, Sapienza, Università di Roma, Italy.
- Max Gunzburger, Professor mgunzburger@fsu.edu
Robert O. Lawton Distinguished Professor
Frances Eppes Eminent Professor
Florida State University, USA.
- Bernard Haasdonk, Professor haasdonk@mathematik.uni-stuttgart.de
Professor, Universität Stuttgart, Germany.
- Michael Hinze michael.hinze@uni-hamburg.de
Professor in Optimization of Complex Systems
Universität Hamburg, Germany.
- J. Nathan Kutz, Professor kutz@uw.edu
Robert Bolles and Yasuko Endo Professor
Adjunct Professor of Electrical Engineering and Physics
University of Washington, USA.
- Stefan Volkwein stefan.volkwein@uni-konstanz.de
Professor, Universität Konstanz, Germany.